

The place of ISO 18404:2015 in organisational improvement

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ISO 18404:2015

Radouane Oudrhiri

Systemomy Limited, London, UK and

Eagle Genomics, Hinxton, UK

Mustafa Al-Balushi

Unique Creativity Consulting, Suhar, Oman

Stuart Anwyl

Balfour Beatty plc, Lancashire, UK

Anthony Bendell

Services Ltd, Southwell, UK and

Anti-Fragility Academy, Southwell, UK

Sabet Chamie

BSI, Dubai, United Arab Emirates

Shirley Yvonne Coleman

Department of Maths, Stats and Physics, Newcastle University,

Newcastle upon Tyne, UK

Mark Hayman

M A Hayman Business Improvement Consultancy, London, UK

Roger Hilton

Lean Sigma Institute, Armadale, Australia and

La Trobe University, Melbourne, Australia

Osama Ahmad Melhem

Abu Dhabi Quality and Conformity Council, Abu Dhabi, United Arab Emirates

Jayeshkumat Patel

Lean Expert, Dubai, United Arab Emirates

Steve Ward

Lean Construct, Bristol, UK

Simon White

Continuous Improvement Squared Limited, London, UK, and

Peter Whitehouse

Nottingham City Council, Nottingham, UK

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Abstract

Purpose – This paper gives the background to the ISO 18404:2015 standard and explains its rationale. It aims to correct misconceptions and erroneous statements about the standard appearing in the paper by Antony *et al.* (2021) and to demonstrate the usefulness of the standard in a wide range of application sectors.

Design/methodology/approach – A review of recently reported misconceptions and erroneous statements is presented and clarifications are provided. A qualitative interview approach was utilised to obtain the views of leading academics and practitioners familiar with Six Sigma and Lean in a range of sectors and from different parts of the world. This includes the results of a survey for capturing expectations and requirements for the next ISO18404 version.



Findings – Clarifications were needed to correct some misconceptions and erroneous statements in recently published work. However, on review, the reports of the interviews in Antony *et al.* (2021) indicate that most Lean Six Sigma professionals have positive experiences with ISO 18404:2015 and see the advantages of a common standard in helping continuous improvement deployment. Possible causes of some reported negative results are already scheduled to be addressed in the forthcoming review of ISO 18404:2015.

Research limitations/implications – A very real constraint when conducting research into ISO 18404:2015 is to obtain a balanced view of the standard from those who have a vested interest in its continuation and evolution, or not. Whilst the authors cannot claim to be any more objective than Antony *et al.*'s (2021) authors and commentators, they are, in contrast to that group, highly knowledgeable about the reality of the standard, rather than speculating in ignorance.

Practical implications – A very real constraint when conducting research into ISO 18404:2015 is to obtain a balanced view of the standard which is balanced with respect from those who have a vested interest in its continuation and evolution, or not. Whilst the current authors cannot claim to be any more objective than previous authors, Antony *et al.*'s (2021) authors and commentators, they are, in contrast to that group, highly knowledgeable about the reality of the standard, rather than speculating in ignorance.

Originality/value – The paper gives a clear description of the ISO standard development process and provides a resource for people to obtain insight into the value or non-value add of a standard in Six Sigma and Lean, and the appropriate details of such a standard. These results can form the basis of a case for the implementation of the standard for those organisations currently trying to decide whether or not to implement it.

Keywords Six sigma, Lean, Lean six sigma, Quality, Standards, Continuous improvement, Practitioners

Paper type Research paper

1. Introduction

The recent paper by Antony *et al.* (2021) is welcomed by the authors as one of a limited number of articles to date on the ISO 18404:2015 Six Sigma and Lean standard published in 2015 (ISO 18404, 2015). Nevertheless, that paper may be seen to contain a number of errors and misunderstandings of the ISO standard development process, inconsistencies and contradictions, as well as potential bias in the summarisation of the views of the academics and practitioners it surveys. This is unfortunate since a review paper on the transformational aspects of the global ISO 18404 standard, in contrast to earlier certification approaches, would be highly beneficial in explaining the transition from a “body of knowledge” to a “competency based” approach, and the need for a structured management system, to the global Six Sigma and Lean community.

The current paper aims to clear up misconceptions and clarify issues raised that may erroneously prevent organisations and practitioners of Six Sigma and Lean from realizing the benefits of ISO 18404:2015. The current authors represent an international cross section of practitioners, experts, academics and users of the ISO 18404:2015 standard that have come together specifically in response to the concerns expressed. As well as several qualified Six Sigma Master Black Belts and Lean Experts qualified under the standard, the group includes expert members of the BSI/MS006 Technical Committee that have been actively involved in the drafting, review and development of ISO 18404:2015, members of the Royal Statistical Society's Oversight Committee for ISO 18404, and employees of international organisations involved in ISO 18404:2015 certification activities, and those from organisations certified under the standard. Whilst this group cannot claim to be any more objective than previous authors and commentators, they are highly knowledgeable about the reality of the standard development and its application.

The paper analyses the theory and practice behind ISO 18404:2015 and aims to achieve a broadly objective view by reviewing the previous literature as well as inputs from the practice of an International group of experts, and the analysis of the results from a quantitative survey conducted as part of the regular review of the standard.

Therefore, the methodological steps are the following:

- (1) Review of the theoretical basis of ISO 18404:2015

- (2) Review of the literature
- (3) Inputs from ISO 18404:2015 practitioners' use of the standard
- (4) Make use of the results of the regular three-yearly review of the standard by a survey of international experts and practitioners

At the basic level, there are a number of errors in [Antony *et al.* \(2021\)](#), including confusion between ISO 9000 and ISO 9001 in their section entitled “Why have standards?” and on subsequent pages ([ISO 9000, 2015](#); [ISO 9001, 2015](#)). Furthermore, the provenance of the literature review and other parts of this work is called into doubt by a clear error in the referencing, viz “Bendell, 2016” is reputed to include some comment on ISO18404, whereas the reference provided as “Bendell, 2016” is in fact a book about Anti-Fragility and was published by Tony Bendell in 2014, which is before the publication of ISO 18404 in 2015 ([Bendell, 2014](#)).

Throughout their paper, [Antony *et al.* \(2021\)](#) show a misunderstanding of the ISO standard development process. The creation of international standards by the international community through the International Organisation for Standardisation (ISO) began in 1946. Today, ISO remains an independent, non-governmental international organization with a membership of 165 national standards bodies. Through its members, it brings together experts to share knowledge and develop voluntary, consensus-based, market relevant International Standards that support innovation and provide solutions to global challenges.

The process used for the development of ISO 18404:2015 was identical to that used for other standards. So, despite [Antony *et al.*'s \(2021\)](#) claims of minimal involvement of leading Six Sigma and Lean academics and practitioners in the creation of ISO 18404:2015, each national standards body identified and involved its own national experts, who were then brought together globally by ISO to develop and agree the standard. Indeed, one of these was Dr TM Kubiak, an interviewee in [Antony *et al.* \(2021\)](#), whose reported complaint appears to be not that experts such as he were not involved, but that the other international experts disagreed with his negative views on the standard. In fact, these reported views are somewhat ASQ centric, as arguably is much of [Antony *et al.* \(2021\)](#), which appears in places to be an advertisement for the American Society for Quality's Lean Six Sigma certification. This is in conflict with ISO 18404's purpose to democratize Six Sigma and Lean.

Another apparent misunderstanding of the ISO standard development process is the lack of understanding that an international standard needs to reflect the consensus of the global community. This means that many good ideas and suggestions may not be included, especially in the initial version of the standard, if currently the international community cannot agree on them. However, regular review and update of the standard, typically on a five year cycle, still allows for further development and updating of the standard, as appropriate. There are some good ideas from [Antony *et al.*'s \(2021\)](#) interviewees that are already proposed for inclusion when the standard is revised. For example, Yellow Belts were always intended for inclusion when agreement on requirements could be reached.

Similar is true for Lean Six Sigma. [Antony *et al.* \(2021\)](#) discuss the omission of this from the initial version of ISO 18404:2015 at length, but the initial difficulty was international agreement on a definition. Interestingly, the correct position is actually expressed by an interviewee in [Antony *et al.* \(2021\)](#), but is then ignored by the authors of that paper. As correctly stated by Dr Gregory H. Watson, past President of ASQ within their article, the various complaints about not covering Lean Six Sigma are spurious anyway as Lean Six Sigma is only a remarketing. Nevertheless, there is an intent to include it when ISO 18404:2015 is revised.

Comments in relation to small companies and small to medium enterprises (SMEs) are also noteworthy. SME issues with standards are a well-known topic in their own right and are not

specific to ISO 18404:2015, for which the effect is likely to be much less than for say ISO 9001. For instance, Google identifies 182 million sources for “SME problems with ISO 9001.”

Indeed, the original certified ISO 18404 company was small, so small size is not prohibitive. Further, it is incorrect to say that it is difficult to reconcile ISO 18404:2015 with a tailored approach. In fact, it is designed to be flexible, and provides opportunities for this very well. Tailoring, e.g. to the public sector, is not the main purpose of the standard itself and is being dealt with elsewhere, but see [Whitehouse and Bendell \(2021\)](#).

Later in the paper, we discuss issues related to [Antony *et al.*'s \(2021\)](#) research methodology in more detail. Here, it is sufficient to identify concerns related to their sample selection and bias. How members of the “sample” were actually chosen is unstated and given the known sceptics of ISO 18404:2015, a number appear to have been chosen for that reason. It is unfortunate that it is reported that “some respondents declined” the interview as they did not know enough, as the researchers apparently did not adequately brief them, but those that did respond show extreme ignorance of the actual standard in their misconceptions. The authors acknowledge, correctly, their researcher bias, but show little proficiency as claimed in conducting interviews.

The sample selected is very biased. Christoph Roser is a pre-published critic of ISO 18404:2015, who purely repeats his erroneous previously published views, as he admits himself. Two interviewees represent the ASQ Six Sigma community, both being known to have negative views on ISO 18404:2015, which were specifically voted down by the international community when ISO18404 was approved. From what is presented in their paper, there appear to be just these three critical interviewees, all previously known as such; two representing ASQ and one who has not changed his previously published view.

Interestingly, the rest of the 14 interviewees are not negative, many being complimentary about the standard, although some purely point out that naturally there is room for further improvement in ISO 18404, which will take place naturally as part of the ISO standard’s ongoing review process. It is a strange conflict arguing incorrectly that ISO 18404:2015 is about making money on certification (which it can be more correctly argued perhaps is the case for ASQ Six Sigma certification), whilst making a point of saying that there have been few certifications.

The deductions in the Discussions and Implications section from the evidence presented are seriously flawed. The “Conclusions, limitations and future work” section repeats previous erroneous statements. The current standard will be improved as part of the standard ISO process. SME-specific material is not suitable for a general standard, but via their national committees, the ISO community would continue to welcome, as it always has, national experts who wish to contribute to a specific SME focused standard in this field. This is true, of course, for all other ISO standards as well.

The main purpose of this paper is to make a major contribution to the debate about ISO 18404:2015. It stands alone and adds to the body of knowledge about Six Sigma and Lean by reporting observations from practitioners experienced in using ISO 18404:2015 and giving a thorough and concise overview of the ISO process, both of which are relevant, timely and interesting in their own right.

The rest of the paper is arranged as follows. [Section 2](#) critiques the scientific methodology and approach of [Antony *et al.* \(2021\)](#). [Section 3](#) clarifies the ISO standard development process and gives a flow chart showing the various stages. The next section describes the need for the ISO 18404:2015 standard. We then formally address the misconceptions in [Antony *et al.* \(2021\)](#). After this scene setting, in [Section 6](#) we report comments from experienced practitioners including several qualified Master Black Belts and Lean Experts qualified under the standard, members of the BSI/MS006 Technical Committee that has been actively involved in the drafting, review and development of ISO 18404:2015, members of the Royal Statistical Society’s Oversight Committee for ISO 18404:2015, and employees of international

organisations involved in ISO 18404:2015 certification activities, and those from organisations certified under the standard. [Section 7](#) gives concluding remarks.

2. Review of scientific methodology/approach in [Antony et al. \(2021\)](#)

In their methodology section, [Antony et al. \(2021\)](#) describe a wide ranging and in depth methodical approach to their data capture and analysis that unfortunately does not appear congruent with either the conclusions drawn, or indeed with the actual methods used.

There were three research questions posed in the Introduction section but only one is referred to in the methodology. No attempt has been made properly to quantify and present the data captured, for example using Likert scales, or to analyse it in a way that may lead to further progress, for example using ordered categorical analysis, etc.

In the abstract/limitations section they state that “*The interviews were short and at high level*”; however, later in the methodology it is also stated that data were “. . . collected through in-depth interviews.”

A concerning aspect of the methodology surrounds the question about *deployment* of the ISO 18404:2015 and not just Six Sigma and/or Lean in general which was, “*What are the pros and cons of ISO 18404:2015?*” It is clearly stated that this was the main question used during the interviews.

It is also noted that the sample of interviewees were specifically chosen for their extensive subject knowledge in line with Delphi methodology. However it is also clearly stated that: “*very little was known to many participants about ISO 18404:2015*”.

The Lean Six Sigma credentials of the respondents were clearly excellent; however it is also clear that an “expert” opinion is captured and subsequently analysed from a group that holds no experience of the key research question. The various methods intended to be used include grounded theory, Colaizzi, Delphi, exploratory studies, empirical phenomenological approach and an analysis reliability metric to name a few. Such a robust approach is laudable – if the selected sample of interviewees actually knew anything about the specific research question, which for clarity, by [Antony et al.’s \(2021\)](#) own admission, the majority did not. One could go further, for example noting that by definition “empirical” implies that the research is based on actual experience of the subject in focus.

It would be known to [Antony et al. \(2021\)](#) that there exist some experienced Six Sigma and Lean practitioners who have actually used the ISO 18404:2015 standard in practice and would have been able to provide opinions based on real-world experience; however, none of these people appear in the respondent list.

[Antony et al. \(2021\)](#) do not state the actual sample size in terms of number of interviews conducted and analysed. They do provide a table that shows fourteen respondents. The same number of transcribed interviews are also usefully provided as “*Key findings from the Interviews*”.

The 14 respondents are made up of eight academics, three consultants and three Lean Six Sigma practitioners. For clarity the term practitioner in this context means that the person currently holds a full time role in industry. As the sample size is not stated, and the profile of respondents and number of transcribed interviews match we must assume the actual sample size to be $n = 14$.

A particularly worrying conclusion reported in the abstract is “*An overwhelming majority of the panel questioned the ‘quality’ of the standard and whether it is ‘fit for purpose’, while others see the advantages of a common standard in helping continuous improvement deployment*”.

If a very simple content analysis is undertaken of the 14 transcriptions provided, then a different conclusion can easily be reached, as portrayed in the bar chart in [Figure 1](#).

When looked at this way, there is no basis for [Antony et al.’s \(2021\)](#) claim that there was “*an overwhelming majority*” who thought the standard was not fit for purpose. In addition,

a simple word search of the paper reveals no mention or comment about fitness for purpose anywhere within the transcribed text.

Following this simple analysis of the data, it is difficult not to conclude that researcher bias is present. This critique of the methodology is important as it underlies the issues we are concerned about.

3. Clarification of the ISO standardisation process

ISO – International Standards Organization – is an independent, non-governmental international organization with a membership of 167 national standards bodies. It is the world's largest developer of voluntary international standards, and it facilitates world trade by providing common standards among nations. More than 20,000 standards have been set, covering everything from manufactured products and technology to food safety, agriculture, healthcare and information technology (jointly developed with IEC). Standards aid in the creation of products and services that are safe, reliable and of good quality. They enable products and services to be compared, thus facilitate companies in entering new markets and assist in the development of global trade on a fair basis. The standards also serve to safeguard consumers and the end-users of products and services, ensuring that certified products, services and organizations conform to the minimum standards set internationally (www.iso.org).

3.1 Standard development process

The aim of this section is to provide clarity on the development process of the ISO 18404:2015 as well as its relationship with the certification scheme. The ISO 18404:2015 was developed under the technical committee ISO/TC69 (Application of Statistical Methods). This committee was created in 1948 and is the oldest ISO committee. It comprises several sub-committees, among them SC7 (Applications of statistical and related techniques for the implementation of Six Sigma Methods), which itself contains four working groups, one of them is WG3 (Six Sigma methodology) where all the ISO 18404:2015 development took place. The sub-committee ISO/TC69/SC7 has so far published 13 standards (among the 118 published by the TC69 committee). ISO/TC69/SC7 counts 15 countries as Participants members (P-members) and 11 as Observing members (O-members). Countries nominate their experts and Head of Delegation and only P-members are entitled to vote on resolutions.

The experts' selection and nomination process is handled by the National standard body, more precisely by the mirroring committee or subcommittee. For example, in the UK, the British Standard Institute (BSI) is the National standard body and the mirroring committee of ISO/TC69/SC7 is BSI/MS006 (methodologies for business process improvement using statistical methods). BSI/MS006 follows a thorough process for selecting and nominating its experts, CVs are reviewed by the Committee Manager and Chair, applicants are interviewed and the decision whether to accept someone or not is made by BSI.

- 3 were definitely against ISO 18404:2015
- 1 was definitely in favour
- 7 were broadly supportive of such a standard but had some reservations
- 3 were "middle of the road" or unclear.

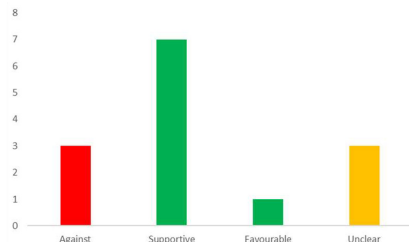


Figure 1. Results of [Antony et al. \(2021\)](#), experts interviews re; 18404:2015

[Antony et al. \(2021\)](#) show a fundamental misunderstanding of the ISO standard development process. The paper wrongly attributed the authoring of the standard to Professor Anthony Bendell. Whilst Professor Anthony Bendell is Chair of the BSI/MS006 and also a nominated UK expert, he was not the author and not even the Project Leader for the development of this standard. The ISO process and practices insist that the wording “author” is not used for any document or even a part of the document. Proposals and comments can be made individually by experts or by a national standards body. They are reviewed, scrubbed and generally go under multiple iterations to be integrated in the draft and final document. The ISO 18404:2015 was indeed proposed as a new work item by the UK national standard body and followed the ISO standards development process.

Each ISO deliverable is assigned to a standards development track and follows defined stages. This track determines the timeframe of the project ([18, 24, or 36 months](#)) as it passes through the various stages to publication. The ISO 18404:2015 followed a 36-month track. The stages, the main resources required at each stage and how they have been applied to ISO 18404:2015 are depicted in [Figure 2](#).

The stages of the standards development process, as per the flowchart, are described below. The numbers in brackets correspond to the ISO stage numbering system.

- (1) **PROPOSAL STAGE (10):** This first step is to confirm that a new International Standard in the subject area is really needed. A new work item proposal (NP) is submitted to the committee for vote using a predefined form called Form 4. The person being nominated as project leader is named on the Form. The objective of the form is to build the business case for the NP as well as assess possible complications around copyright, patents or conformity. The form is then voted by the P-members using the electronic balloting portal. This stage can be skipped for revisions and amendments to ISO standards that are already published (as long as the scope does not change).
- (2) **PREPARATORY STAGE (20):** Usually a working group (WG) is set up by the parent committee to prepare the working draft (WD). The WG is made up of experts and a Convenor (usually the Project leader). During this stage, experts continue to look out for issues around copyright, patents and conformity assessment. Successive WDs can be circulated until the experts are satisfied that they have developed the best solution they can. The draft is then forwarded to the WG’s parent committee who will decide which stage to go to next (Committee stage or Enquiry stage). The ISO/TC platform is used for sharing the various draft versions and associated documents at this stage and throughout the standard development process.
- (3) **COMMITTEE STAGE (30):** This stage is optional if the standard is deemed of high quality and consensus is reached. A full guidance on the criteria and when it can be skipped are provided by [Annex SS of the ISO/IEC Directives Part 1 \(ISO/, 2021\)](#). During this stage the draft from the working group is shared with the members of the parent committee. If the committee uses this stage, the committee draft (CD) is circulated to the members of the committee who then comment and vote using the Electronic Balloting Portal. Successive CDs can be circulated until consensus is reached on the technical content. This stage was not skipped for the ISO18404:2015.
- (4) **ENQUIRY STAGE (40):** The Draft International Standard (DIS) is submitted to ISO Central Secretariat by the Committee Manager. It is then circulated to all ISO members who then have 12 weeks to vote and comment on it. The DIS is approved if a two-thirds majority of the P-members of the TC/SC are in favour and not more than one-quarter of the total number of votes cast are negative. If the DIS is approved and

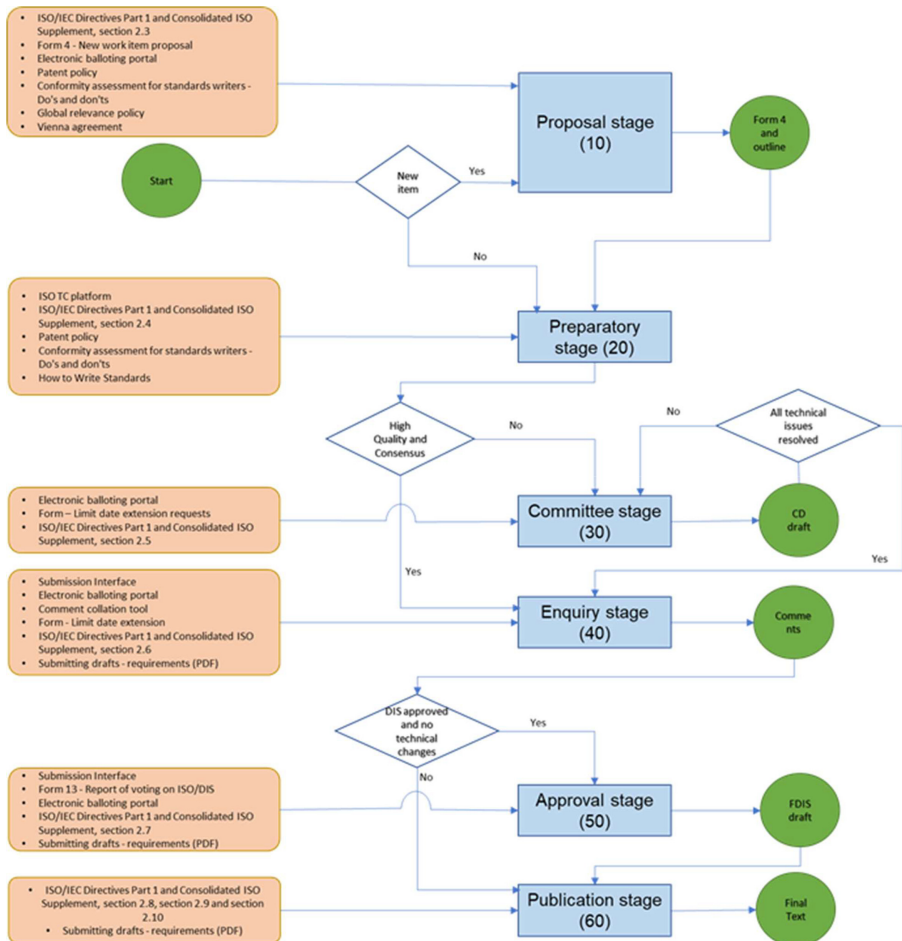


Figure 2.
ISO standard
development process

no technical changes are introduced in the draft, the project goes straight to publication. However, if technical changes are introduced, the Final Draft International Standard (FDIS) stage is mandatory. Again, the ISO/IEC Directives Part 1, 2.6.3 and 4 provide detailed information on the DIS stage. Regarding ISO 18404:2015 the document did not go straight to publication as it received a large number of constructive technical comments from the P-members and these comments were integrated in the successive draft as appropriate and went again through and FDIS (see Stage 50 below).

- (5) **APPROVAL STAGE (50):** This stage will be automatically skipped if the DIS has been approved and no technical changes are introduced. However, if the draft incorporates technical changes following comments at the DIS stage (even if the DIS has been approved) the FDIS stage becomes mandatory. If this stage is used, the FDIS is submitted to ISO/Central Secretariat (ISO/CS) by the Committee Manager. The FDIS is then circulated to all ISO members for an 8-week vote. The standard is

approved if a two-thirds majority of the P-members of the TC/SC is in favour and not more than one-quarter of the total number of votes cast are negative.

- (6) **PUBLICATION STAGE (60):** At this stage the secretary submits the final document for publication through the Submission Interface. But if the standard has passed through the Approval stage, the manager may submit the project leader's responses to member body comments on the FDIS. Only editorial corrections are made to the final text. It is published by the ISO Central Secretariat as an International Standard. Committee Managers and project leaders get a two-week sign off period before the standard is published.

The DIS voting results for 18404:2015 approved the standard. P-Members voting: 9 in favour out of 11 = 82% (requirement $\geq 66.66\%$). P-Members having abstained are not counted in this vote. Member bodies voting: 2 negative votes out of 13 = 15% (requirement $\leq 25\%$).

Figure 2 presents the types of comments received for the FDIS stage (50):

- (1) 195 comments received, 164 were integrated in the final document
- (2) 149 editorial, 148 integrated in the final document
- (3) 37 technical, 12 integrated in the final document
- (4) 9 general, 4 integrated in the final document

In addition, out of the 195 comments, 5 were originally misclassified (3 general, 1 technical and 1 blank) and were classified as editorial. All the comments, their reclassification and response for actions were discussed during the TC69/SC7/WG3 working group sessions and minuted (Figure 3).

3.2 Future improvements

Most standards during their lifecycle follow a series of iterations and continuous improvement activities, which is by itself a sign of the acceptance of the standard by its users and practitioners. The decision regarding the process improvement follows a formal voting process with the same rules as for developing a new standard: two-thirds majority of the P-members of the TC/SC is in favour and not more than one-quarter of the total number of votes cast are negative.

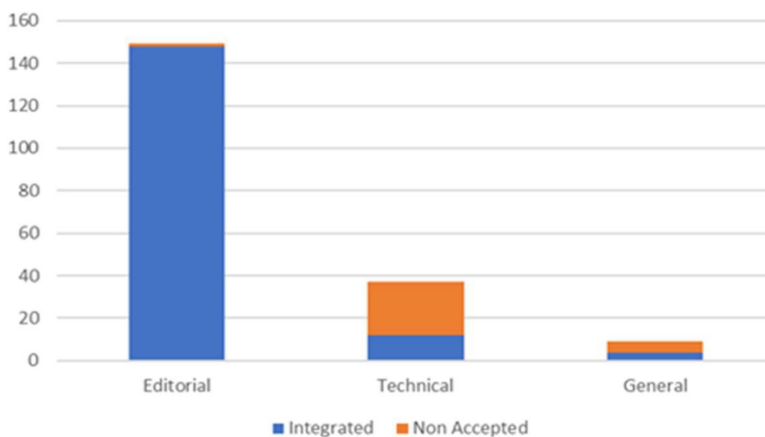


Figure 3.
Comments received by
type for FDIS

As a routine part of the standard life cycle, ISO 18404 has now been voted to have a new revision; a new project for improvement was initiated in June 2021 for a period of 36 months and a new Project Manager (Simon White) has been nominated. A survey has been sent to the ISO 18404:2015 users for collecting their requirements and prioritizing the areas of improvements.

The survey contained 10 questions including 2 open-ended questions for collecting requirements on the relationship with ISO 13053 and more general suggestions, which were classified in 4 buckets for prioritization. 41 participants responded to the survey.

The eight directed questions proposed different areas of improvements and used an ordinal scale:

- (1) Yes – highly important change
- (2) Yes – mid-level important change
- (3) Yes – low priority change
- (4) No
- (5) Not answered

The survey showed an overwhelming Yes for the proposed changes:

- (1) 83.99% of Yes, where
 - 42.99% are highly important
 - 31.18% are mid important
 - 16.16% are low important
- (2) 7.93% of No
- (3) 2.93% not answered (precisely, no more than 3 respondents for questions Q5, Q6, Q7 and Q8)

The results of the eight questions are portrayed as bar charts in [Figure 4](#):

There were other useful suggestions for improvement in the two open questions from the international team of experts.

3.3 RSS 18404 sector scheme

ISO 18404:2015 is a management system for Six Sigma and Lean. It can broadly be interpreted as being the same as ISO 9001, but with the word “quality” deleted and replaced with “Six Sigma and Lean”. All requirements must be demonstrated as appropriate to Six Sigma and Lean; however, organisations can overlay ISO18404:2015 onto their quality management system (QMS) and use it in conjunction with ISO 9001:2015.

The ISO 18404:2015 standard outlines competence requirements for people delivering Six Sigma projects and Lean improvement, and the requirements for organisations managing these. The standard defines nine distinct roles of individuals; Six Sigma or Lean and Six Sigma Green Belts, Black Belts and Master Black Belts; and Lean Practitioners, Lean Leaders and Lean Experts.

The requirements on the individuals are defined and have suggested evidence criteria. The requirements on the organisation are about establishing and maintaining a management system for Six Sigma and/or Lean implementation, including how the organisation manages the competence of the people. As such, ISO 18404:2015 is suitable for conformity assessment by accredited Certification Bodies meeting ISO/IEC 17021-1:2015 Conformity assessment – Requirements for bodies providing audit and certification



Figure 4.
Results of the survey
for collecting
requirements for ISO
18404 improvements

of management systems. There is consistency of terminology and approach with the ISO high level structure (for management systems standard) and Plan-Do-Check-Act (PDCA) principles. Figure 5 shows the requirements on the organisation, i.e. the clauses of ISO 18404:2015 and their relationships.

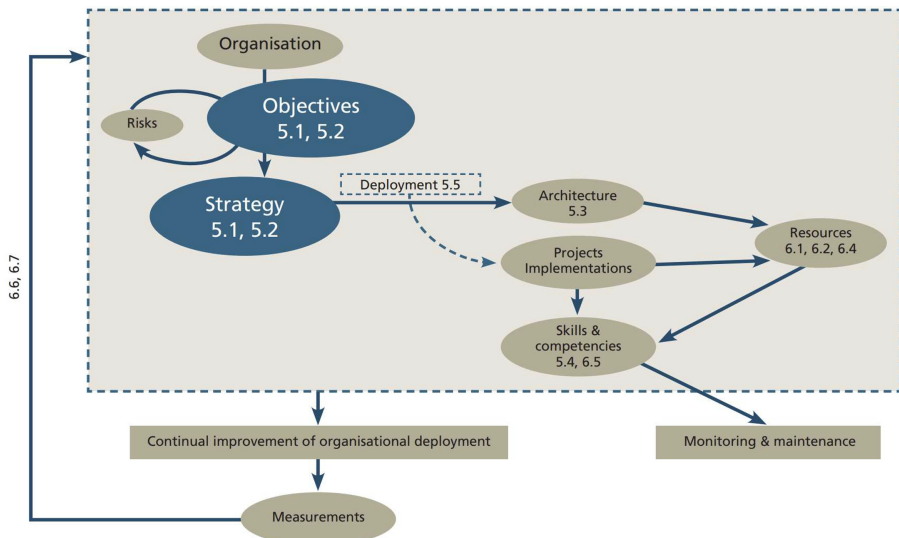


Figure 5. Diagram from the RSS scheme by representing the organisation requirements (i.e. clauses of ISO 18404:2015) and their relationships

The role of a sector scheme is to enhance interpretability of a standard and thus provide the required assurance and integrity for certifications. This is particularly important for Six Sigma and Lean as it is a large, lucrative and growing process improvement, training and recognition market. The Royal Statistical Society (RSS) is the owner of the Sector Scheme RSS 18404 (RSS, 2017). Prior to developing the sector scheme, the RSS discussed with global and smaller organisations in manufacturing, utilities, communications, banking, broader service sector and public their appetite in certification bodies as well as with a number of UK Certification bodies and international standardisation bodies, including delegation to discuss the Sector Scheme from Japan.

The RSS is responsible for the overall Sector Scheme's operations, maintenance and the qualification and monitoring of the participating Certification Bodies. Organisations seeking certification under this Sector Scheme should ensure that they engage a Certification Body approved by RSS under the scheme. The RSS 18404 sector scheme defines:

- (1) The overall RSS role in the scheme, including the maintenance of a register of Key Personnel, recognised Certification Bodies and Assessors.
- (2) The acceptable mechanisms of assessments and certifications of individuals, organisations and training.
- (3) Content and requirements of the assessment by a Certification Body.
- (4) The Certification cycle and Certification validity.
- (5) The Certification Body Approval in terms of requirements, assessor competence and RSS Oversight of Certification Bodies.
- (6) Approval of Courses and Assessment Centres.
- (7) Self-assessment tools and guidelines (e.g. number of recommended key personnel, assessment duration based on the number of employees in scope).
- (8) Governance of the Sector Scheme.

4. The need for the ISO 18404:2015 international standard

Companies and other organizations, in the private and public sectors, are continuously facing questions of effectiveness and the need for efficiencies. Be it the customer, shareholder, stakeholder, government or citizen, all expect value for money or a return on investment. This is the essence of what most management improvement methodologies/philosophies in the marketplace aim to create, and Six Sigma and Lean have become approaches of choice that can deliver. This was discussed by Antony *et al.* in relation to public sector organisations in 2016 (Antony *et al.*, 2016).

Any organization wanting to follow the Six Sigma and/or Lean route and visiting the vendor marketplace will find a spectrum of Six Sigma and Lean offerings. Whilst varied offerings, such as “Six Sigma Master Black Belt in 15 days with exam”, may nominally appear identical, under the cover they can be quite different. In fact this market place has become a lucrative environment as more leaders and managers come shopping. Why send a team of 6 away for 15 days face-to-face training, when another provider offers the same qualification within 5 days and online?

Of course, this is the buyers’ prerogative and they will be responsible for the consequences of their decision. Nevertheless, many purchasing organisations do not yet have the competencies to judge, and these variations in Six Sigma and Lean offerings create down-stream problems; and there is a pressing need for standardisation, as the ISO community recognised in creating ISO 18404:2015. In doing so, it addressed the key questions such as “What should an industry standard “Six Sigma Master Black Belt” look like?” and “What should a competent individual or organization in this field be able to do?”

In fact, it could be argued that there was already a lot of commonality. Many of the offerings have good provenance with origins back to Toyota Production System for Lean, or to Motorola for Six Sigma, and many offer the core elements that most other sellers would agree with. However, the development of an international standard in the field provides the opportunity to define the minimum scope and depth of knowledge and practice experience and create clear competency requirements for skilled individuals moving between organisations and sectors as well as for basic development of learning in the academic environment. At the same time, there is an opportunity to bring qualification in this field up to date, moving it on from a historic conventional “Body of Knowledge” approach, to a more modern “Competency” based one, in which what you can show you can do matters much more than what you can show you know.

This is one of the reasons why ISO 18404 was developed to provide a standard benchmark/backstop behind the spectrum of offerings and the variations that exist within these offerings; to give organisations and individuals’ confidence in the quality of their preferred flavour of approach and consultancy; and provide the basis for an independent quality control to those providing services. Another reason is that many organisations lose their way with pursuing Six Sigma and/or Lean, when key personnel move on or management focus shifts. Having a management system for your improvement programme, as ISO 18404:2015 provides, protects the programme and helps sustain it.

Standards are long recognised as essential to guide and govern professions. Adoption of ISO 18404:2015 is voluntary; therefore, it is up to the professionals, bodies and consultancies to show leadership in its utilisation, and arguably a more ethical approach. Also, standards are there for the consumers, the purchaser/procurer, to use to ensure the tenderers meet an independent set of standards outside their own domains.

Another purpose of ISO 18404:2015 is to encourage buyers/commissioners to adopt an international independent standard to ensure appropriate ongoing improvement in their supply chains. This consumer-led approach should seed wider adoption by suppliers, similar to that with other management systems, such as quality or environmental management.

Furthermore, good ethics can be big business. Six Sigma and Lean originates from, and should be based around, ethical roots or “purpose”; the way Japanese businesses operate, looking after people, giving them a sense of purpose, making sure that the growth path of the business is also thinking about the growth path of the individual. The Six Sigma and Lean profession needs to justify trust in the offerings, or will continue to fail its own origins, and ISO 18404 helps assure such trust.

5. Addressing misconceptions

It is clear when reading [Antony *et al.*'s \(2021\)](#) paper that there are misunderstandings surrounding the ISO 18404 standard, particularly related to its practical deployment. This section seeks to provide some clarification and practical guidance born from actual deployment experience of the standard in industry.

5.1 The role of training in relation to ISO 18404:2015

For individuals, there is actually no requirement at all to attend any training course. The requirement is to have knowledge but more importantly to be able to demonstrate competence.

The standard does not care how the knowledge is acquired. Whether this is self-study, one-to-one coaching or attendance at a training course carries little weight. For the majority of competencies, the assessment of knowledge is implied by performance. This means that a candidate seeking certification must build a portfolio of evidence sufficient to convince a panel that they have applied the competencies within the most recent three-year period. They must then sit a written exam and attend an interview to ensure that they are “real”. In other words the ISO 18404:2015 certification carries a high level of rigour. This is in direct contrast to £50 online blackbelt courses that are available.

It may well be the case that a candidate could indeed benefit from attending a training course and the Royal Statistical Society in the UK can provide this and can also approve other third party training provider courses if they pass the scrutiny of matching the competencies in the standard. For clarity no candidate can achieve certification to the standard by attendance at *any* training course. The knowledge must be applied in the workplace and evidence captured and presented of doing so.

For organisations it is helpful to develop an internal body of knowledge that both matches the required competencies in the standard and is contextualised to the particular industry sector.

At Lean Leader level there are competency requirements to train others and this would best be delivered from a standardised set of teaching materials, properly made relevant to the particular organisation.

5.2 Review of comments by interviewees

Many misconceptions were made evident within the interview transcriptions and an attempt is made here to clarify these. The contributions from each of the respondents in [Antony *et al.* \(2021\)](#) are now discussed in the order they appear in that paper.

Dr Christoph Rosser “*ISO 18404 is trying to measure ‘lean-ness’ – this is impossible*”

It does not try to do this and nobody else claims it does. At an organisational level ISO 18404:2015 checks to see if an organisation’s approach is joined up by examining whether the practical deployment of Six Sigma and/or Lean is aligned to the overall business strategy. It then looks to evidence that this strategy is being followed, suitable resources are in place, the intended results are actually being achieved and that internal certified individuals (known as key personnel) are actively applying lean principles within their work aligned to the business

strategy. Dr Rosser also states that he finds it impossible to audit for competencies such as motivating others, customer focus and leadership development.

Actually all the required competencies are of a vocational nature as opposed to academic. Space does not permit a discussion on all these points. However, as an example let us take the first point about motivation. If a candidate knows motivational basics derived from say Maslow, Herzburg, Kohn etc. and can provide practical examples, then for example following Herzburg, the top three motivators are a sense of achievement, recognition and the satisfaction of the work itself. An effective Lean Practitioner will know how to use visual management techniques and if these show levels of achievement, recognition and getting the work done this is entirely consistent with sound motivation theory applied and one possible approach to practical deployment that can be easily evidenced – there may be many others.

In the UK there are a wide range of National Vocational Qualifications (NVQs) that follow a similar path with many competence requirements, there exists clear guidance for assessors on what constitutes acceptable evidence and what does not. It's just not that difficult. Customer focus may easily be displayed by use of KPIs, specific surveys, House of Quality, etc.

Dr Pauline Found

Dr Found asserts that ISO 9001 is sufficient and ISO 18404:2015 is superfluous. Dr Found raises a good point here. ISO 9001 does require performance improvement. It also specifically requires measurement of customer satisfaction (customer focus again). However, whilst laudably requiring improvement it provides little practical guidance in terms of how much? By when? By what methods? By whom specifically in your organisation? It is the case that ISO 18404 marries very well with ISO 9001 and fills this void, enabling organisations to think much more seriously and specifically about how they will deploy their improvement efforts.

Dr TM Kubiak states that the use of Bloom's taxonomy is essential. Bloom's taxonomy is aimed at education and training, learning etc. However, the focus of 18404:2015 is vocational and actually there is no requirement for training. Dr Kubiak makes constructive observations about missing Yellow belts and this will likely be high on the agenda for the review and improvement of ISO 18404:2015 in addition to other helpful observations from respondents.

Dr Alessandro Laureani wants an integrated approach; this has been mentioned by others and will likely be a key subject of ongoing review and improvement of the standard. Dr Laureani is also unsure how some of the competencies can be practically assessed. The answer is that it is not "an assessment based test" but rather the presentation of evidence of actual work done. So for example a Lean practitioner might evidence customer focus by an analysis (that they did themselves) of customer satisfaction data leading to practical process improvement.

Mr Arvind Srivastava believes it is a good effort but there is an overkill focus on competencies in the implementing organisation. Actually ISO 18404:2015 does not do this and this subject is dealt with in a response to Pedro Martinez Jurado. Mr Srivastava goes on to provide some constructive suggestions for improvement that include integrating Six Sigma and Lean as one, adding additional roles of sponsor, process owner and champion. He observes that some of the competencies are not unique to Six Sigma and/or Lean and that is correct. In fact it could be argued that very few are, if the historic development of the individual tools and techniques and concepts are taken into account. However, the set of competencies were those that an expert international panel felt would be required by an effective exponent.

Mr Srivastava states he is confused by the competency word in Section 4.1 of the standard. For clarity this section simply states that key personnel responsible for Six Sigma and/or Lean in the applicant organisation "shall be competent". In practice this means that the key personnel must be certified *as individuals* to ISO 18404:2015 in order for the organisation to progress its certification process. Finally he expresses concern over the ability of small

companies to follow it. It has in fact been successfully deployed in a small company with less than £25 million turnover.

Mr Jonathan Hunt Also believes a combined Lean Six Sigma approach would be beneficial. He believes that a failure of yearly review of a practitioner's portfolio would lead to an individual losing their certification status. This is understandable but not quite correct. The standard states that Practitioner and Leader portfolios will normally be reviewed annually internally and at Leader and Expert levels every three years by an "appropriate authority". To satisfy the current certification status a certified person's portfolio of application evidence must be kept up to date. Up to date means that no piece of evidence should be older than three years. This is to avoid someone claiming to be a master Blackbelt but has not actually practised for a long time, maybe over 10 years! In practice this means the review should check that everything is within the three year timeframe. If there are a few competencies that have expired then the person would be asked to fix this as soon as practicably possible. If the portfolio was generally out of date at the three year point the person would be given a reasonable time to correct this. If failing to do so in a reasonable time frame (say three months) then the practitioner would indeed lose certification status. The advantages to this approach are that it encourages continuous professional development and is similar to the Chartered Status of many professional bodies, where to retain professional standing, the member must demonstrate currency of practice.

Dr Udo Milkau is supportive but points out that the standard could be improved and yes of course it could - and will be. ISO 18404:2015 is certainly not perfect. However, it offers stability of process which is a key enabler of successful continuous improvement. W.E. Deming (1986) taught us long ago that without stability no improvement is possible. Stability does not mean perfection. However ISO 18404:2015 will be improved over time.

Dr Gabriele Arcidiacono provides a very balanced and useful critique that ought to be fully considered during the next review process. Dr Arcidiacono raises a question relating to other existing ISO standards in Six Sigma such as ISO 13053 (ISO 13053-1, 2011; ISO 13053-2, 2011). Does ISO 18404:2015 supersede this? ISO 18404 is a Management Standard and can be used for certification purposes. ISO 13053 is a guidance/technical document that clarifies many aspects of Six Sigma but one cannot officially get certified to this standard (although some training organisations erroneously offer this!). They serve different purposes. Therefore, ISO18404 utilises the work already done within ISO 13053. The two are complementary.

In addition, Dr Arcidiacono recommends the use of criteria to score a candidate in level of application. In practice, ISO 18404:2015 examiners look for demonstrable application of the competency in focus. It is not scored but is currently a binary yes/no – has presented suitable application evidence/has not. Also relating to the currency of certification, this is dealt with above in response to Jonathan Hunt.

Dr Ayon Chakraborty provides a balanced critique that needs full consideration during next review and makes useful observations re service vs manufacturing. In practice the two organisations that are certified in the UK are both from the construction sector. Construction is an almost equal mix of manufacture and service. It also suffers greatly from a lack of useful performance data due to the bespoke nature and general unstable demand. Whilst Dr Chakraborty's concerns are completely valid, it has been possible to successfully use the standard in the construction sector, with experienced auditors understanding the need for some contextualisation and flexibility. This level of flexibility to make it more appropriate to the service sector is certainly a key focus area for future improvement of the standard.

Pedro Martinez Jurado is generally supportive of the principle of ISO 18404:2015 but has concerns about standardising Lean competencies for organisations. This in practice is not the case. The standardisation of competencies relates to individuals not organisations. The way this works in practice is that it is expected that an individual certified to the

standard will be well rounded in terms of their Lean competencies and should be able to demonstrate all of these at certification. However, at an organisational level it may well be the case that a smaller selection of focused, business critical tools & techniques is applied across the business. For example, within Highways work at Balfour Beatty in the UK, it is critical that staff know how to apply Lean collaborative planning techniques whilst delivering projects. Within these collaborative planning techniques that are totally relevant and business focused, one can find good examples of data analysis, visual management, problem-solving, soft skills and so on that can be used to reference against competencies in the standard. Certification at an organisational level is not primarily about competencies. At an organisational level ISO 18404:2015 checks to see if the organisation's approach is joined up by examining whether the practical deployment of Six Sigma and/or Lean is aligned to the overall business strategy. It then looks to evidence that this strategy is being followed, suitable resources are in place, the intended results are actually being achieved and that internal certified individuals (known as key personnel) are actively applying lean principles within their work aligned to the business strategy.

Dr Jurado is also concerned with the ability to audit within a supply chain. Following the above approach, if a supplier can articulate their strategy for the deployment of Lean within their business, and then show that they are indeed following this strategy and providing the necessary resources. It should provide a good level of comfort to a customer that they are serious about continuous improvement.

Subjectiveness of assessment is raised as a concern, and yes this will always be a risk in any vocational examination process that requires thought, rather than numeric exam results. This risk has been minimised in the UK by ensuring that examiners are suitably trained and experienced.

Dr Jurado asks why some columns in the annexes are marked as "non-applicable". This is because there are four broad areas with these tables: Knowledge, Application, Managing and Training. It is the case that as an individual progresses from Practitioner to Leader to Expert, then more managing and training competencies come into play. Therefore, not every competency is required at every level and this was a simple way to deal with this. In addition there are separate standards for environmental performance etc. It is not unusual for a company to develop "an integrated management system" which is one management system that incorporates standards for quality management, environmental management, Health & Safety, Collaboration and now Six Sigma and Lean.

Professor Murat Caner Testik is supportive but questions, again, the audit/evaluation methods etc. This seems to be a common misunderstanding and has been dealt with above at some length. Professor Testik also highlights some vague terms such as "appropriate authority". In the UK the appropriate authority for governance of the scheme is the Royal Statistical Society. Their role is to provide clear governance with regard to certification of individuals. For certification of organisations, appropriate authority means properly licensed auditing bodies such as the British Standards Institute.

Professor Sung Park agrees that a standard should exist. He points out a couple of minor grammatical issues and thinks DFSS (Design for Six Sigma) needs adding in the competencies. He possibly misunderstands section 6.5 which must be read in conjunction with the tables of competencies in the annexes. An improvement suggestion is to list the differences in the competencies between levels.

In response we note that the scope of ISO 18404, ISO 13053-1 and 13053-2 explicitly exclude DFSS and are focused on improvement processes only. In fact, a DFSS standardisation project has been initiated within ISO/TC69/SC7/WG3 comprising the development of a set of technical reports as well as a standard and these are under development.

Dr Gregory H. Watson also believes a combined Lean Six Sigma should be adopted and disputes the validity of the standard because it does not acknowledge the ASQ body of knowledge.

He observes that the respective ISO committees of the USA and Japan voted against the standard. Nevertheless, Japan actually launched ISO 18404:2015 in 2017 at which experts members who participated in the standard drafting, from UK, China and Japan were invited to speak. Japan also participated in the review of the Sector Scheme (RSS, 2017) and recently Japan has reaffirmed support for the standard and wishes to see it further developed, as well communicated on the ISO 18404:2015 standard and the RSS 18404 Sector Scheme in the Japan Statistics Society Monthly Magazine (Ishiyama, 2020).

Professor T. N. Goh is again concerned over audit and evaluation methodologies that have been addressed above.

5.3 What ISO 18404:2015 implies for an individual

One of the key fundamentals of ISO 18404:2015 is to shift from Body-of-Knowledge-based examination to Competency-based assessment as well as shifting from the perception of Six Sigma and Lean as collections of tools/techniques to a Management System. Competency acquisition as well as knowledge acquisition do not rely solely on courses and training but can be obtained through vocational education, apprenticeship and experience. The Chinese tradition often refers to these two quotes that argue for the value of learning by doing:

"I hear and I forget, I see and I learn, I do and I understand", often attributed to Confucius, or
不闻不若闻之，闻之不若见之，见之不若知之，知之不若行之；学至于行之而止矣。

attributed to Xunzi, who was a big Confucian. A rough translation is: *"Not hearing is not as good as hearing, hearing is not as good as seeing, seeing is not as good as knowing, knowing is not as good as acting: true learning continues until it is put into action"*.

An individual wanting to learn and develop Six Sigma and Lean skills can be left confused, even misled, with the plethora of courses available, which some claim to have an international accreditation. A simple Internet search will reveal thousands of courses. However, ISO 18404:2015 was designed to support individuals at various levels to achieve certification. An individual who has experience/training, but is not covered by an accredited organisation, or is new to Six Sigma and Lean has three routes to ISO18404:2015 certification:

- (1) Direct assessment: This is designed for professionals/experts that have a large body of practice and evidence for each competence. Individuals can submit an evidence portfolio to an approved assessor/scheme owner.
- (2) Assessment centre: This is designed for professionals that have good knowledge and skills, but need to be assessed against the competencies. RSS provides a virtual assessment centre where these competencies can be tested. An approved course provider may forward individuals or provide their own approved assessment centre.
- (3) Training course: This is designed for individuals needing to build knowledge and skills to support certification and develop the competencies. Most initial and high-level training courses will link to an approved course provider and assessment centre.

The process of certification often starts with the candidate submitting their portfolio to an appropriate body for examination. The body may vary according to country but in the UK this is either the Royal Statistical Society (RSS) or a training provider who has been quality assured by the RSS to deliver ISO 18404:2015. Two weeks after submission the candidate is required to attend an interview with two assessors and take a test. At the interview they are

required to give a short presentation on their experience with Six Sigma and/or Lean. The assessors will have previously viewed the submitted portfolio and will question the candidate to clarify any items that are unclear or perhaps need to be explained in context.

At the end of the interview both assessors must agree whether the candidate has passed. It is common for candidates to pass pending submission of corrections or omissions to their portfolios providing these are of a minor nature. For an experienced exponent the route is the same, but it is likely that they will have much of the required portfolio evidence already to hand.

5.4 What ISO 18404:2015 does for an organisation

The need for a Six Sigma and Lean management system is discussed in detail in [Whitehouse and Bendell \(2021\)](#).

The path of implementation once again depends largely on the level of maturity of the organisation. As stated in the response to Dr Rosser, it does not try to measure degrees of leanness (nor the “sigmaness”); however, it does seek to confirm that an organisation is properly and verifiably “on the Six Sigma and/or Lean journey?”.

So it is helpful to conduct a gap analysis of the organisation which will look at the current business plan, resources, Six Sigma and/or Lean strategy and capability. The RSS sector scheme ([RSS, 2017](#)) provides in its Appendix 2 an organisational self-assessment tool (questionnaire) that covers:

- (1) Purpose of pursuing Six Sigma and/or Lean and strategy
- (2) Organisational architecture and resources adequacy
- (3) Measurement of adequacy, improvement and how is it used
- (4) Fact based improvement
- (5) Competencies of key personnel
- (6) Body of knowledge and training

Whilst it is not a specific requirement it is most helpful to construct a “Six Sigma and/or Lean Manual” for the business that describes the structure, strategy, resources and approach to managing and maintaining the system. The British Standards Institute can carry out a pre-audit gap analysis that will inform the specific path or actions required in order to achieve certification.

Based on this analysis, it is a case of either confirming that all is in place for a mature organisation or starting to put the jigsaw together for a beginning organisation. One of the key strengths of ISO 18404:2015 in relation to business transformations is that it provides an effective roadmap or structural approach that has hitherto been lacking ([Ward and Caklais, 2019](#)).

Two businesses in the UK were very similar to these examples. One was virtually starting from scratch and the other already had a relatively mature Lean strategy and deployment in place. The first had to do a lot more work concerning upskilling key personnel and building a suitable business infrastructure. Whereas with the second organisation it was more a case of refinement and improvement of the existing approach to fully align with the ISO 18404:2015 standard.

6. Voice of the practitioners

We now include considerations from practitioners. In addition, some informative contributions were showcased in the Royal Statistical Society session entitled “Using Six Sigma for Improvement - Experiences with ISO 18404” and are contained in the recording ([RSS, 2021](#)).

Title/	<i>Master Black Belt (Australian Organization for Quality, 2007). Lean Practitioner (PPG Industries Pty Ltd, 2002). Doctor of Business administration</i>
Certification	<i>23 years Lean Six Sigma and Lean experience</i>
Experience	<i>Education Management applying projects and learning across all Industry Sectors</i>
Sector	<i>Australia</i>
Geography	

ISO 18404:2015 covers two critical gaps in the Six Sigma and Lean profession. It presents individual competencies on which individuals can be assessed against and content that provides a roadmap for an organization to achieve company-wide certification.

The ISO 18404 has been the first standard for company-wide certification.

The individual competencies within ISO 18404:2015 are a reasonable initial set. They include hard and soft skills and are consistent with [Hilton and Sohal \(2012\)](#) where a culture of sustainable continuous improvement requires five key factors:

- (1) Leadership at all levels in the organization
- (2) A culture of acceptance to change
- (3) Use of a project framework like DMAIC
- (4) Competent people
- (5) Data Quality and availability

They are also consistent with a set of competencies registered and published under Exemplar Global in 2007 for Green and Black Belts which included both Six Sigma and Lean. Exemplar Global was formed in 2004 in the merger of a US based registered auditor board and the Australian Society for Quality. Exemplar Global is a part of ASQ.

The Lean Practitioner set of individual competencies is close to those of the Yellow belt registered under Exemplar Global.

The separate certifications for Six Sigma and Lean are reasonable given the different frameworks used across industries in Australia. Essentially many organizations focus more on the application of Lean competencies and less on statistical competencies covering the Six Sigma concepts generally because Lean is easier to integrate into a business. There has not been a logical reason for this, although many of these industries shy away from sophisticated data analysis.

There are gaps in the 2015 version of ISO 18404:2015 and that is not unusual given that 5 years is the normal time at which a review of the standard is completed. Some useful considerations to be included in the next version are as follows:

- (1) Include the roles of other Six Sigma and Lean personnel, for example, sponsor, deployment champion
- (2) Leaving Six Sigma and Lean separate as it applies to different industries but add something for an integrated Lean Six Sigma
- (3) Referring to Strategic intent, culture change and personal consciousness in the overview
- (4) Add more definition of terms
- (5) Include project requirements for individual competencies
- (6) Separate technical and soft/tacit competencies

-
- (7) Include a typical Six Sigma and/or Lean organizational structure as an appendix
 - (8) Consider integration of other frameworks – Agile and Human-Centred Design

The benefits for a company certifying to ISO18404 certainly need to be established. The standard needs to be marketed across countries.

One of the principles of ISO9001 is to demonstrate continuous improvement but this standard does not describe the competencies of the staff involved in leading or applying the continuous improvement so the argument that ISO9001 is sufficient to describe how to apply continuous improvement does not make sense.

Jayeshkumar Patel

Title/Certification	<i>MBA in TQM Bradford 1994</i>
Experience	<i>25 years Lean Six Sigma and Lean experience</i>
Sector	<i>Vertically integrated utility company</i>
Geography	<i>Dubai/Middle East</i>

ISO 18404:2015 provides a uniquely simple way to combine both the competencies and technical aspects in a relatively straightforward way. My personal experience stems back to the mid-1980s when as a teenager many expensive mistakes were made when not using the correct tools when restoring and race-preparing VW Beetles. The interest evolved over time starting with BS5750, the DTI roadshows and TQM the late 1980s.

My first experiences of Six Sigma were with the implementation of average weights legislation and food safety act 1990 where simple block diagrams and examination of processes helped many operatives in the biscuit factory learn about processes and focus on issues rather than learning about flowcharting – consider the average qualification of food factory operatives tends to be school leavers. Most of the studies tended to focus on engineering and process industries where operatives tend to have higher qualifications. These were far too complicated and difficult for the operatives involved.

The way in which the BS5750 standards in my experience were implemented and used resulted in the users being slaves beholden to the system rather than being the master.

Lean ISO 18404 focuses on value addition of the process and eliminates waste whilst combining the technical, behavioural and management aspects.

The training of the practitioners and leaders was beneficial in that all those trained could relate to aspects in terms of competencies on the technical side, the value stream map and capacity resourcing. The key learning point was on many occasions highlighted during the training sessions when portfolios were assembled the following were examples that were highlighted.

- (1) Similar tasks and activities were duplicated.
- (2) Duplication of efforts results in sub-optimisation of resources.
- (3) Conflicts of interest within departments and personally affected the division and outcomes due to reduced agility.
- (4) Effectiveness of the working organisation is achieved with compromised productivity and efficiency.

The training also enabled a healthy team spirit and was particularly motivational especially the team composition and creativity analysis.

The standard may not be perfect but does combine technical and management behavioural competencies with a standard that allows individual's work to be highlighted in a standardised framework allowing individuality to shine in a framework.

The potential of the standard and its future is it combines recognition of both the individual's and the achievements of the Business and thereby aligning both.

Mark Hayman

Title/Certification	<i>Sigma Master Black Belt and Lean Expert (ISO 18404)</i>
Experience	<i>10 years Six Sigma and Lean experience</i>
Sector	<i>Financial Services, Digital Marketing, Professional Services and Retail (Food)</i>
Geography	<i>UK (with experience in India and USA)</i>

Prior to the formation of ISO 18404:2015, it seemed odd that amongst Six Sigma and Lean practitioners advocating reduction in variability in processes, that there was such high variability in Six Sigma and/or Lean qualification and certification provision across a high number of providers. For leaders in organisations commissioning Six Sigma and Lean improvement activity and projects, not having a standard qualification obtained through a universally and consistently applied assessment process made the significance of any qualification or certification less relevant. From the perspective of Six Sigma and Lean practitioners, this created the perception of an ambivalence, amongst leaders commissioning improvement activity, about our Six Sigma and Lean qualifications which undermined the effort which went into achieving them.

In deciding to complete Six Sigma and Lean certifications, several providers were considered and much research was carried out to determine how comprehensive the syllabus offered by each one was. ISO 18404 stood out because it requires those completing certification to have delivered tangible results previously and have evidence of competence as well as knowledge on an extensive range of technical and behavioural skills. The ongoing assessment incorporated into ISO 18404:2015 certification was also important as was assessment by the RSS, a recognised and respected organisation.

The mix of technical and behavioural skills required for certification under ISO 18404:2015 is both broad and deep. ISO 18404:2015 accurately acknowledges and reflects the skills and expertise necessary to complete sustainable process improvement activity to a high standard and build capability in others. The requirement under ISO 18404:2015 for evidence of understanding, application, management and training of competencies has, in practical terms, enhanced the quality and effectiveness of Lean Six Sigma activity, including training and coaching of others, delivered post-certification.

The ongoing assessment and recent evidence required under ISO 18404:2015 ensures that practitioners keep their skills constantly refreshed. As ISO 18404:2015 embeds, from a Six Sigma and Lean practitioner perspective, having ongoing assessment from a universally recognised organisation will differentiate us from those without ISO 18404:2015 certifications and give those leaders hiring Six Sigma and Lean practitioners to complete process improvement activity confidence that they have the skills and competence to deliver what their qualification says they can.

Dr Shirley Coleman

Title/Certification	<i>Experienced academic and chartered statistical practitioner Chair of Quality Improvement Section of RSS</i>
Experience	<i>20 years as Trainer Lean Six Sigma and Lean experience</i>
Sector	<i>All sectors</i>
Geography	<i>UK and elsewhere in Europe</i>

International Standards are a valuable institution both as a touch point for agreeing common ground and as evidence of the authenticity of a methodology. In this case ISO 18404:2015 reinforces the importance and value of Six Sigma and Lean, and provides a respectable, structured way for people wishing to avail themselves of the valuable methodology.

As a statistician I am keen to explore and utilise the power of statistical thinking and data analytics in all the diverse areas of science and life. One reason for the success of statistical contributions sometimes being disappointing is that statisticians have a passion for their subject and tend to rush into action before clarifying exactly what the problem is and what is needed. Similarly, at the end of a project they tend to move on to the next task without considering how the gains from their work will be maintained. So the DMAIC structure of Six Sigma with emphasis on problem definition (D) and Control immediately appealed to me; Measurement, Analysis and Improvement clearly being fundamental to statistics.

At Newcastle University, we were successful in winning multi million euro funding from the EU to work with SMEs to help them share in the fabulous potential for quality improvement afforded by statistics and data analysis in a project promoting Six Sigma. The results from these projects confirmed our confidence in the value of Six Sigma.

Part of problem recognition and analysis is to identify places where processes are wasteful or poorly thought out and the ideas of Lean resonate with statistical thinkers and perfectly complement the Six Sigma approach. Hence my interest in the ISO standard for Six Sigma and Lean is that it provides a way to realise the power of statistics and data analysis in all practical applications.

ISO 18404:2015 has enormous potential for quality improvement in providing a structure for people new to the field to get started. Referring to the ISO 18404:2015 standard in training courses gives a tangible and respectable recognised introduction and a starting point to build hands-on practice. Achieving the ISO 18404:2015 standard is the start of a continuous journey of discovery and development of practitioner skills.

Mustafa Al-Balushi

Title/Certification	<i>Lean Six Sigma Black Belt, Six Sigma Master Black Belt, Certified TPM Facilitator</i>
Experience	<i>10 years Six Sigma and Lean experience</i>
Sector	<i>Manufacturing</i>
Geography	<i>Middle East - Oman</i>

ISO18404:2015 brings a structured approach in building confident competencies of Six Sigma and Lean Practitioners that increases the success of change and end results. Moreover, it provides a standard platform for benchmarking between organisations as well as individuals in the field of Six Sigma and Lean. It offers a clear path for the development, for both individuals and organisations, that is maturity based. It standardizes the criteria for all practitioners at all levels.

It provides a clear path for gaining the knowledge and building required competencies for all levels. Moreover, it has a comprehensive approach, covering both soft and hard set of skills that strengthen the practitioner's capabilities. All these competencies included in the standard are having similar importance that makes them all necessary to obtain. In addition to that, it eliminates the current ambiguity of the practitioners that came from various development schemes.

ISO 18404:2015 has a holistic coverage of the important and critical skill set and elements that qualify for successful change agents. Moreover, it is competence-based, ensuring theory and ability of application. Also, the evidencing aspect is new compared with other

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certification requirements, which means it is not limited to the project delivery, as it may be for other certifications.

ISO 18404:2015 would be the future for a Six Sigma and Lean world that governs and guarantees the assurance of credible and solid implementers. Furthermore, it builds a standard path for the practitioners to move from one level to another. It brings all practitioners to a standard basis for the development and gaining the competencies. It sets clear direction for the evolution in Six Sigma and Lean.

23 competencies covered by ISO 18404:2015 have a wide use in driving continuous improvement initiatives, mainly in managing the change with a multi-functional and diverse working environment. They cover the soft and hard skills, from managing stakeholders to process improvement, and technical implementation of the Lean and Six Sigma tools and techniques. All these competencies are needed and highly applicable during continuous improvement programs, at different stages.

The training is designed to guide for the development according to the competencies included in ISO 18404:2015, with a focus to evidence them throughout the training scheme, and simulate the accreditation process that examines the practitioners. It is designed to help the candidates develop their competencies with sufficient theory, and to guide for covering other competencies. Also, it provides a clear approach and guide on the evidencing element of the development.

Sabet Chamie

Title/Certification
Experience
Sector
Geography

Lean Six Sigma Green Belt
7 years using Six Sigma and Lean
Government, Built Environment and Healthcare
Middle East and Africa

ISO 18404:2015 provides the required assurance/integrity for organizations that would like to demonstrate high level of competency in Six Sigma and/or Lean methodology, The ISO 18404 standard outlines competence requirements for people delivering Six Sigma projects and Lean improvement, and the requirements for organizations managing these, it helps to implement a Six Sigma and/or Lean management system framework rather than being just a tool.

Most importantly ISO 18404:2015 increased confidence in the ability of people claiming to be skilled in Six Sigma or Lean. In the RSS-18404-Sector-Scheme, the competence of people will be established through "assessment centres" which will be in part an interview process and test and in part a review of evidence of applying, managing and training the competencies.

Eng Osama Melhem

Title/
Certification
Experience
Sector
Geography

Lead and technical auditor with the Emirates National Accreditation System and the Gulf Accreditation Center for ISO/IEC 17020, 17025, 17065 & ISO 15189 ISO 18404 assessor and auditor
15 years Six Sigma and Lean experience
Abu Dhabi Quality & Conformity Council (QCC)
UAE

I started my journey with Six Sigma in 2004. It took me many years to understand the elements and the tools of Six Sigma and Lean; due to the lack of international harmonisation

of the concept of Six Sigma and Lean, and its tools. I spent two years studying statistics, which was a nightmare task, because many of the published resources on these subjects are misleading and represent Six Sigma as pure statistics.

ISO 18404:2015, published in December 2015, regarding the Quantitative methods in process improvement – Six Sigma – and the competencies for key personnel and their organizations in relation to Six Sigma and Lean implementation, came as a gift for me to clearly identify the competencies for both the personnel and the organizations interested in this field. The standard has 23 competencies for Six Sigma and 18 competencies for Lean.

ISO 18404:2015, as an international standard, forged the way for the personnel and the organizations to be internationally recognized once they are certified by accredited certification bodies, according to ISO/IEC 17024 for personnel certification, and to ISO/IEC 17021 and ISO 18404 for system certification.

Of course, at the beginning, I faced some difficulties to align my understanding from the previous resources with ISO 18404:2015, such as the lack of yellow belt in ISO 18404:2015, and having different grading titles for the Six Sigma belt holders (Green belt, Black Belt & Master Black Belt), and the Lean belt holders (Lean practitioner, Lean leaders & Lean expert), and the Six Sigma and Lean belt holders (Lean Green Belt, Lean Black Belt & Lean Master Black Belt). This was not a big issue for me, as I prefer to follow a good international standard, which will be continually and regularly improved, rather than a very good reference that is not internationally recognized, and I have no influence to improve it.

ISO 18404:2015 is an excellence complementary standard to ISO 9001, where ISO 9001 main aim is to improve the effectiveness and the efficiency of the quality management system, as a whole, while the goal of ISO 18404:2015 is to improve the processes of the system. ISO 9001 tackled the continual improvement as a topic among many topics, while the focus of ISO 18404:2015 is the continual improvement of the processes one by one. ISO 18404:2015 offers a wide range of tools for the personnel and the organizations to adopt through their journey to achieve excellence.

ISO 18404:2015 offers good assessment criteria for the compliance of personnel and organizations with the requirements of the standards. As some of the assessment criteria are generic and subjective, especially for the soft skills, this can be seen as a deficiency in the standard, while I can see it as a flexibility of the standard to be implemented in different sizes of organization, regardless of its complexity. Flexibility of the standard is a positive point, especially at the first edition.

Although ISO 18404:2015 was published in 2015, but unfortunately it is not widely adopted, this issue can be interpreted in different ways, positive and negative.

For me, I cannot directly correlate the acceptance of the international community for this standard with its value, as we have already seen many examples of the international community rejection to many excellent innovative ideas, such as the international system of measurement units (SI), which was initially invented in 1799 by the French, until it was internationally approved in 1875 by 17 countries.

As a lead auditor for ISO 18404:2015 and many other management systems, I still see a great future for this standard, especially if we can all work together to continually improve it. Approved training material could help and encourage the training organizations to market this system. Accreditation bodies should also take the initiative to establish a scheme for the accreditation of certification bodies according to ISO 18404:2015. As six years passed since the date of publication of ISO 18404:2015, this could be the right time for it to be reviewed and updated, but with no doubt, having an international standard for Six Sigma and Lean is an indispensable choice these days.

Stuart Anwyl (Balfour Beatty)

Title/Certification	<i>Lean Expert (ISO 18404)</i>
Experience	<i>25 years Six Sigma and Lean experience</i>
Sector	<i>Across sectors, including Construction, Automotive, Aviation and Marine</i>
Geography	<i>Lancashire UK (with experience in Manila, Philippines and USA)</i>

During the past 27 years I have gained Six Sigma and Lean experience across a number of different sectors including construction, automotive, aviation, aerospace and marine. Although Lean Sigma was being applied in each, there was clearly a variation in approach and competency.

I came across ISO 18404:2015 in 2019 and approved of the step process in how Six Sigma and Lean capabilities are developed; starting with the ability to understand and ending with the capability to teach and coach others. None of the previous Lean Sigma training programmes I had been involved in, had included such a strong framework that required an understanding and requirement to manage or train the Six Sigma and Lean competencies in others.

Balfour Beatty already had a relatively mature Lean Sigma culture which I felt could be further enhanced by aligning ourselves with the ISO 18404:2015 Standard and received sponsorship from the Highways Board of directors. To be market leading, you need to lead the market! Assessing our existing CI competencies against ISO 18404:2015 highlighted a few gaps which have been successfully addressed. In February 2021, Balfour Beatty became the first company globally to achieve the ISO 18404:2015 organisation accreditation since the pilot company Gilbert & Goode. It has enhanced the existing maturity of continuous improvement within Balfour Beatty.

We now have several people who have gone through and are going through the individual accreditations through ISO 18404. In addition, we have also now been asked to coach and mentor the Highways England lean team through their own ISO 18404:2015 accreditation and have begun to push it further into our supply chain and delivery partners.

Our ISO 18404:2015 accreditation will help when submitting bids for future work, specifically to evidence how we are working to deliver continuous Improvement, increase our Lean Culture and Capability to provide confidence for our clients when it comes to contributing towards efficiency targets. I can see ISO 18404 being the next big thing when it comes to Six Sigma and Lean within the construction industry simply because it provides a structure to learning, systems and delivery which is independently assessed and accredited unlike any of the other courses which in the main are self-accredited and lack a framework for delivery.

That all said, when the standard is due to be reviewed and updated, I believe it would be enhanced with an entry level to include those people who are just beginning their Lean Sigma journey.

Dr Steven Ward FCIQB

Title/ Certification	<i>Managing Director Lean Construct Ltd, Fellow of The Chartered Institute of Building, Lean Expert (RSS 18404) Member of British Standards Institute Technical Committee MS6</i>
Experience	<i>21 years Six Sigma and Lean experience</i>
Sector	<i>Construction sector and associated manufacturing supply chain</i>
Geography	<i>Bristol UK</i>

My Lean Journey and observations regarding ISO 18404:

I started to self-study and immediately apply lean principles to construction projects whilst working for a UK main contractor over 20 years ago resulting in project lead time improvements of up to 30%. This led into a wide range of more formal training including direct coaching in the Toyota production system by SMMT Industry Forum process improvement engineers and ultimately completing a PhD in the subject of Lean Construction with the University of Dundee. During this time I also became very interested in formal lean vocational qualifications and trained several hundred people in the Business Improvement Techniques National Vocational Qualifications (NVQs) and also qualified as an NVQ assessor to enable assessment of vocational competence.

My journey with ISO 18404:2015 began in early 2016 when a company I was helping expressed an interest in the standard. I approached Prof T. Bendell for advice and one of the first recommendations was that I should seek to achieve Lean Expert certification under the standard myself. Initially I thought “*for heaven’s sake, how many more qualifications do I need?*” However, the principle of learning by doing is a sound one and totally consistent with a lean approach so I made the effort and became certified as an ISO18404 Lean Expert by The Royal Statistical Society in December 2016.

This did indeed enable me to provide practical help to others seeking certification. I adopted the NVQ assessor general approach to assessment of the ISO 18404:2015 competencies as the vocational nature of the competence framework is very similar to those used in NVQ assessment and there is a well-trodden path here in terms of methodology, fairness and rigour.

Having understood the individual competency approach to the standard I then started to apply the same learning by doing logic to the organisational side. I project managed the successful certification to ISO18404 of two businesses in the UK.

The ISO 18404:2015 standard is not perfect and I guess no standard is or is indeed intended to be. From a lean perspective the creation of a standard seeks to outline “the best *currently* known way” but automatically assumes that there is always a better way and the standard is only temporary as it will be improved. However it provides stability to a very unstable process, and no one can be sure of the quality of a person’s credentials in the field of Lean Sigma when £50 Blackbelt certifications are readily available. I like the fact that certification is not based on an exam or on a single project review but on practical application of a wide range of competencies in the workplace. This is again entirely consistent with a lean approach. The principle of Gemba is fully deployed here. Now that a standard exists it will be possible to improve it.

In terms of organisational certification, it is certainly the case in the construction sector that many companies are claiming to be “lean” or use lean techniques when they respond to tenders. Construction clients are presented with all the fine buzzwords and tend to account for these in their selection processes. Unfortunately experience has shown that many companies “know the words but can’t hold the tune” and the reality of operational performance ends up very far away from what was promised at the tender stage.

I really like the organisational approach to certification that ISO 18404:2015 offers because it absolutely requires a business

- (1) to think about and articulate their strategy for Lean and/or Six Sigma;
- (2) to fully integrate their deployment of this strategy with their main business plan;
- (3) to evidence how they will support this in the long term;
- (4) to measure the success or otherwise of the efforts and take appropriate action.

In other words they need to be able to “hold the tune”.

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Whilst organisational certification does not mean that every action the company takes is perfect or provides a “measure of leanness”, it does provide good assurance to a client that they are very serious about their operational performance and have a well-developed system in place to maintain and improve this in the long term that is based on lean principles.

It is a shame that the uptake of the standard has been slow, although reportedly from BSI this is not unusual with new standards. It is also the case that other organisations that work in the field of Lean Sigma have their own certification and training schemes, which contribute to their income. Therefore there is little surprise that the standard is suffering from “not invented here” syndrome. Wouldn't it be great if instead of competing with each other, certification schemes that have differing approaches to assessment and levels of rigour could align behind one global standard that everyone can have confidence in. Maybe they'll say “as long as its *our* standard” ha ha.

Peter Whitehouse

Title/ Certification	Senior Business Analyst at Nottingham City Council, a core city of the UK and regional centre to the East Midlands. Deputy Chair of the Continuous Improvement (CI) Exchange Forum (Midlands); Lead facilitator for the Local Government Association Lean & CI portal; and committee member of the BSI TC MS6
Experience	25 years working in local government on transformation programmes to modernise public services with digital technologies. Last 15 years focused on process improvement training and projects adopting and using Lean Six Sigma and CI methodologies
Sector	Public sector: local government, small and large authorities, and national and regional partnerships
Geography	East Midlands and, UK based

My experience with local government transformation programmes and improvement projects has, I believe, revealed a lack of a consistent approach to improvement and sustainment of benefits. Working on national process improvement projects and networks has provided evidence to justify this point of view, with each authority using a different approach or modified methodology. Some authorities would adopt a methodology led by a commissioned consultancy, others would create their own adapted version. Although there are exemplary authorities and excellent pockets of transformation, there is little standardisation across the sector with transferable skills. Likewise, knowledge was trapped with the consultants involved, even licensed, or was never independently verified. Furthermore, there was, and still is, a major gap in Quality Management Systems with local government and public sector improvements. Therefore, I believe, ISO 18404:2015 provides an opportunity for local governments to address these problems and deliver more efficient and effective services, in wider public sector partnerships.

Moreover, public sector and local government has explored and experimented with Lean Six Sigma for over 20 years. It is time for this period to mature and a step change towards a standardisation, as project management did over this period. This will be essential to provide a firm base to the unprecedented challenges ahead.

Professor Tony Bendell

Title/ Certification	Former Rolls-Royce funded Professor of Quality & Reliability Management at The University of Leicester UK. Chair BSI TC MS6, FSS & member of Oversight Committee for RSS 18404
Experience	Over 45 years in Quality, Lean & Six Sigma improvement, education, training and consultancy
Sector	All manufacturing, service, voluntary, government & public sector
Geography	UK based, but also works extensively in the UAE and globally

I believe strongly in this standard. Having worked closely with the first two organisations successfully certified against ISO 18404:2015, trained Lead Auditors for the standard and been involved in helping to prepare Lean Experts and Six Sigma Master Black Belts & lower grades for certification under the standard, I believe that ISO 18404 provides very important advantages for individuals and organisations, including:

- (1) Belt/practitioner certification based on evidence of competency to do the job, and what you have actually done, rather than on what you can “evidence you know”
- (2) Certification for Six Sigma belts based on the people and management competencies needed to deliver successful Six Sigma projects, as well as the statistical ones, so that rather than “tool heads” or “statistical nerds” belts are genuine improvement professionals
- (3) Freedom from dependency on a specific, often historic, body of knowledge that takes no account of modern developments in statistical practice nor technology, such as data visualisation
- (4) A management system that provides the embedding, links to corporate objectives, minimum standards and resourcing needed to ensure the sustainability of the organisational improvement programmes
- (5) A basis for both the democratisation of Lean and Six Sigma, and the establishment and retention of minimum standards of both individual and organisational practice.

Organisations and individuals involved with this standard have found preparing for it demanding, but very rewarding. It is, of course, far from perfect and it will improve further through the usual ISO standards regular ongoing review and improvement cycles. Whilst it can, of course, be criticised, this should be on an academically and professionally sound basis. But, it does give improvement professionals and organisations wanting to imbed fact-based improvement much more than was available *a priori*. So, it should always be considered as a real practical option for Lean and/or Six Sigma.

Dr Radouane Oudrhiri

Title/ Certification	Convenor ISO/TC69/WG3 Six Sigma, Convenor ISO/TC69/WG12 Big Data Analysis, Liaison Officer between ISO/TC69 and ISO/IEC/JTC1/SC42 Artificial Intelligence, Vice Chair BSI TC MS006, member of the Oversight Committee for RSS 18404 CTO at Eagle Genomics
Experience	32 years in System/Software (Quality) Engineering, including Six Sigma, Lean, DFSS and CMMI
Sector	All - manufacturing/electronics/hardware, service, particular application of Six Sigma and DFSS to Software/System Engineering and Telecom
Geography	UK based, but also works extensively in Europe, USA, Asia and Middle East

My journey with Six Sigma started in the 1990s, when I had to apply Six Sigma to software engineering and development. I quickly realised that Six Sigma for Software engineering is not just a mere application and/or training on the Six Sigma tools/techniques, but will require an in-depth adaptation. Six Sigma and later on Lean would require to integrate and to cohabit with existing software engineering methods and frameworks such as SDLC (software development life cycle), capability maturity-based models, and more recently the Agile approaches. Such adaptation and integration will require understanding the fundamental principles underpinning the tools and techniques and how they apply to abstract artefacts, consistent with [Oudrhiri and Pellizzetti \(2011\)](#) and [Pellizzetti and Oudrhiri \(2011\)](#).

I believe that ISO 18404:2015 is the first standard that shifts the paradigm from considering Six Sigma and Lean as a collection of tools and techniques to a coherent Management System,

and from a certification via Body of Knowledge-based examination to a competency-based assessment. In that sense, certification against ISO 18404:2015 focuses on the fulfilment of fundamental competencies, where the practitioners can demonstrate such fulfilment by applying diverse tools and techniques. Based on the level of certification, they need to demonstrate understanding, performance, management or training of these competencies therefore they need to justify if the tools and techniques are appropriate to the problem and context at hand. I participated in a number of Six Sigma and Lean individual certification at various levels Master Black Belt, Black Belt, Green Belt as well as Lean Experts and practitioners. The assessments were conducted thoroughly and presented an extra opportunity of learning.

7. Concluding Remarks

The ISO 18404:2015 has many enthusiastic supporters as demonstrated by the contributions of the practitioners in this paper. Amongst the debate about the standard, negative overtones were expressed in a paper by [Antony *et al.* \(2021\)](#). In this paper we have clarified and addressed these criticisms, adding constructively to the debate.

This paper emphasises, in particular, the importance of

- (1) knowledge and integrity of the ISO development process;
- (2) appreciation of the value of competency based assessment vs body of knowledge examination;
- (3) correct references to literature.

In addition, we have taken the opportunity to discuss

- (1) the need for a management system for Six Sigma and Lean;
- (2) relevancy and necessity of the standard;
- (3) the valuable experiences of ISO 18404:2015 users.

The main motivation of practitioners in the field of Six Sigma and Lean is to improve the quality, performance and delivery of processes, products and services. ISO 18404:2015 aims to provide a framework for both newcomers and experienced practitioners to achieve this. Like many new standards, the speed of uptake could be improved and no doubt the standard will benefit from revisions made following the scheduled post launch review.

Criticism of the standard based on unreliable interpretation from a biased selected sample of commentators is not helpful. ISO 18404:2015 was created for a purpose, and that purpose is valid. This paper commends the use of ISO 18404:2015 in the cause of helping to lead the business world into a less wasteful and more sustainable future.

Our research shows that despite some minor misunderstanding in the literature, there is a clear appetite by the International community to make use of ISO 18404:2015 and to continue the systematic improvement activities of the standard routinely encompassed by the ISO process.

ISO 18404:2015 is one of the first standards for management systems that enables certification of organisations and individuals. The standard is competency based rather than being purely based on a body of knowledge.

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Corresponding author

Radouane Oudrhiri can be contacted at: radouane@systonomy.com

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