



CENTERIS - International Conference on ENTERprise Information Systems / ProjMAN - International Conference on Project MANAGEMENT / HCist - International Conference on Health and Social Care Information Systems and Technologies 2021

Adoption and impact of management standards - position paper

Alexandra B. Tenera^{a,*}, João Varajão^b

^aUNIDEMI, DEMI, NOVA School of Science & Technology (FCT), Universidade NOVA de Lisboa, Campus de Caparica 2829-516, Portugal

^bALGORITMI Center, University of Minho, Campus de Azurém, Guimarães 4804-533, Portugal

Abstract

Standardization makes its contributions to many aspects of our lives, although often that contribution is unnoticed. For example, management standards, such as the ISO 9000 family, establish a common ground perspective that enlarges companies' markets and boosts its international reaching, technological development, and innovation while supporting continuous quality improvement in products and services both at a national and international level. Notwithstanding the recognized relevance of some management standards, especially the ones that have an associated certification system to support its knowledge (e.g., ISO 9000 family), little is known about the impact of the standards (e.g., ISO 21500 family) adoption in increasing organizations' performance regarding, for instance, quality, safety, efficiency, or interoperability. This hinders the standards' dissemination and potential use and unnecessarily delays its revision and further development. To help fill this gap, this position paper proposes a research project that includes the development of a model and an observatory focusing on the adoption of management standards. The expected contributions are: 1) at a theoretical level, a new conceptual model for the explanation and assessment of the adoption of management standards and related impacts; 2) at a practical level, a new information system (observatory) which is expected to be a tool for understanding the adoption of standards, as well as for monitoring and publicizing the results obtained from standardization practices.

© 2021 The Authors. Published by Elsevier B.V.

This is an open access article under the CC BY-NC-ND license (<https://creativecommons.org/licenses/by-nc-nd/4.0>)

Peer-review under responsibility of the scientific committee of the CENTERIS –International Conference on ENTERprise Information Systems / ProjMAN - International Conference on Project MANAGEMENT / HCist - International Conference on Health and Social Care Information Systems and Technologies 2021

Keywords: management systems; standardization; standards; ISO; adoption; success; impacts.

* Corresponding author. Tel.: +351-21 294 83 00 (ext.11241); fax: +351-21 294 85 46.

E-mail address: abt@fct.unl.pt

1. Introduction

Standardization is a strategic tool that influences several areas, such as industrial competitiveness, human health protection, and innovation. In fact, standardization has been supporting the European Union (EU)'s strategy towards smart, sustainable, and inclusive growth [1], as well as trade and investments negotiations [2]. The EU regulation no. 1025/2012 [3] provides the framework for all European standardization efforts.

This effort is established by standardization organizations such as CEN, CENELEC, or ETSI at a European level and by ISO [4] at an international level. The standardization initiatives are, at the national level, operationalized by National Standardization Bodies (NSB) such as IPQ – “Instituto Português da Qualidade” in the case of Portugal [5]. As defined by the Regulation (EU) no. 1025/2012, the NSB activity is currently subject to faster and increased inclusive action, delivering, among other, technical reports and standards that should be based on consolidated scientific results, technology, and experience, aiming to promote benefits for the relevant communities [6].

Some of these standards have been showing several benefits to organizations [7], enabling them to carry out their activities more efficiently and effectively [8][9], thus contributing to organizational and business success [10][11]. However, there is still limited scientific evidence and difficulties in the evaluation of the actual impact [12], especially the one that arises from the use of management standards that do not have associated certification (e.g., ISO 21500 [13]). For instance, there is minimal information on whether and how the standards are being used in practice and the difficulties and advantages of such use. This kind of information is very important for organizations to better decide on which standards to invest in; it is also required to support and develop well-informed and timely decisions to confirm, annul, revise, amend, or withdraw existing standards. Additionally, the dynamics of markets and the reduction of products and services lifecycle times are also pressuring for an acceleration of the standards' development phases, requiring faster and more advanced knowledge on their potential impacts and benefits.

To sum up, the absence of the information mentioned above is causing several problems. On the one hand, there is a lack of knowledge on the effective use of the standards, conditioning the decision regarding the scenarios to promote its creation, evolution (or withdrawal). On the other hand, it is difficult for organizations to perceive the real gains of efficiency and effectiveness that the adoption of each standard provides.

To help solve these issues, this position paper proposes the development of an in-depth study on the effective use of national and international standards and their impact on the success of organizations, as well as a new observatory to support its continuous monitoring.

The article proceeds as follows. In the next section, some technical insights on the standards development, revision, and withdrawal are presented. The third section describes the proposed research project and a preliminary version of the underlying theoretical model. The general framework of an observatory on the adoption of management standards is also presented. In the fourth and final section, the main expected contributions resulting from this proposal are identified and presented together with further research activities.

2. Standards development, revision, and withdraw

Global standards, seeking to ensure more responsible and regulated investment activities, have become an increasingly prominent EU treaty feature, helping to overcome international fragmentation [14]. Moreover, to achieve the Sustainable Development Goals of the UN 2030 Agenda [15], substantial investment will be required. The investment needs to be operationalized through projects and program implementations following management standards, from ISO/TC 258 and other International Technical committees (TCs), and are required to be frequently updated in order to stay up to speed with scientific, technological, and professional evolutions.

For ISO Standards, this involves a formal, systematically reviewed ballot [16], typically arranged every five years after their publication, by questioning the NSBs regarding whether each standard should be confirmed (kept as is), withdrawn, or changed (with revisions/amendments). The main options about the recommended action are: 1) Withdraw, 2) Revise/Amend; 3) Confirm; 4) Abstain due to lack of consensus; or 5) Abstain due to lack of access to national expertise.

Likewise, upon the decision of the associated Technical Committee (TC) in ISO or CEN by the Technical Boards (TB), national and European standardization bodies also carry out systematic reviews of the standards five years after publication at the latest. A request of a CEN National Member [17] can also prompt the revision. In the case of a European Normative (EN), there can also be a reduced five-month ballot, considering only the following decisions [18]: 1) Confirm EN, 2) Revise EN, 3) Amend EN, and 4) Withdraw EN, according to the impact and benefits of those in the community.

To objectively support this kind of decision, ISO has been using surveys and case studies reports [12], which are not without difficulties, such as: 1) Reports are based on monthly aggregate measures such as the number of certificates and number of sites; 2) Reports may show data fluctuations; 3) There are data adjustment difficulties on the number of sectors covered; and 4) There is a lack of participation of national certification bodies. Thus, stronger systematic review procedures are required, with a balanced stakeholders' engagement and increased regional representation.

From a literature search carried out mainly in the Scopus database, using as search strings "standard* review* process*" OR "Systematic* Process* review*," were found near 60 articles, dominantly from health care and social sciences (only a few are from Engineering (7), Business (3), or Environmental Sciences (3) areas). For instance, from the Engineering and Business perspectives, some references highlight the use of project management practices incorporated in lessons learned systems [19]. Taking as an example the ISO 21500 family can be found about a dozen references, such as [20-24], focusing on Success Management [20], education [21], integration of ISO 21500 with other guides and standards [22], risk assessment [23], or process implementation [24]. However, none of the reported studies address the adoption of the standards (except for [24]) or their impact on organizations. This information shortage also happens in the case of other standards families.

Considering the state-of-the-art and the decision-making requirements of standards development and maintenance, it is clear that there is a knowledge gap due to the current limited knowledge on the standards' adoption.

3. The research proposal

The knowledge gap and the need for addressing the lack of relevant and timely information regarding the adoption of management standards require further research. We propose a new project that aims to:

- Develop an in-depth study on the effective use of national and international (such as ISO) standards;
- Create a new observatory to monitor the standards' usage and impacts, supporting future adoption and development.

The research project is described in the next sections.

3.1. In-depth study on the effective use of national and international (ISO) standards

A preliminary theoretical model is shown in Figure 1, with three constructs: standards adoption; moderators (e.g., industry); and organizational impacts. Based on the theoretical model, we propose first to create a measurement scale grounded in current literature. The resulting scale can then be used to collect empirical data through a questionnaire-based survey (with closed and open questions). The goal is to collect and analyze empirical data in order to have evidence on the adoption of standards from the companies' point of view. Collected data can then be analyzed using qualitative and quantitative methods, including content analysis as well as descriptive and inferential statistics. The results will be discussed according to the insights gained on the adoption of the standards and respective impacts/benefits. The objective is to answer the questions: "Which standards are being used by organizations in practice, and what are the impacts of that use?"; "Are the impacts of the standards use influenced by variables such as the company size or industry?"

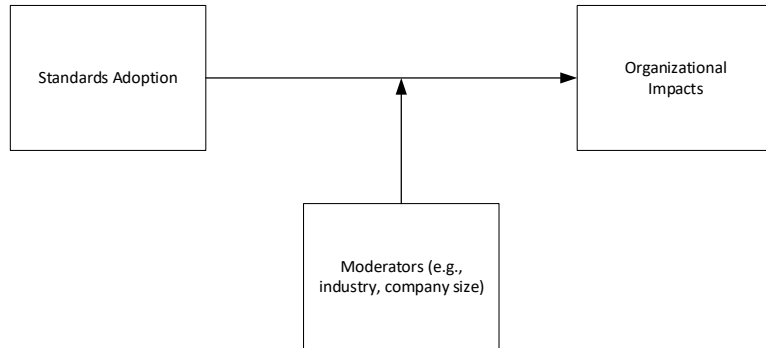


Fig. 1. Preliminary theoretical model.

3.2. Observatory of the management standards adoption and impact

In addition to the results described in the previous section, the project should also contribute to knowledge transfer. Organizations should be able to use the results from the research to support standards adoption, maintenance, and development. Thus, a significant expected contribution of this project is the creation of an observatory based on the theoretical model. This observatory was first envisioned in 2019 and formalized throughout a research plan submitted for funding purposes and is currently under development. The observatory is intended to be the frontend of a broader information system to collect, organize, and make available relevant information about the state and impact of the standards use. This aims to provide information to support decision-making about standards creation and maintenance and to set the basis for further research to follow the evolution and impact of standards adoption.

The observatory’s homepage is presented in Figure 2.

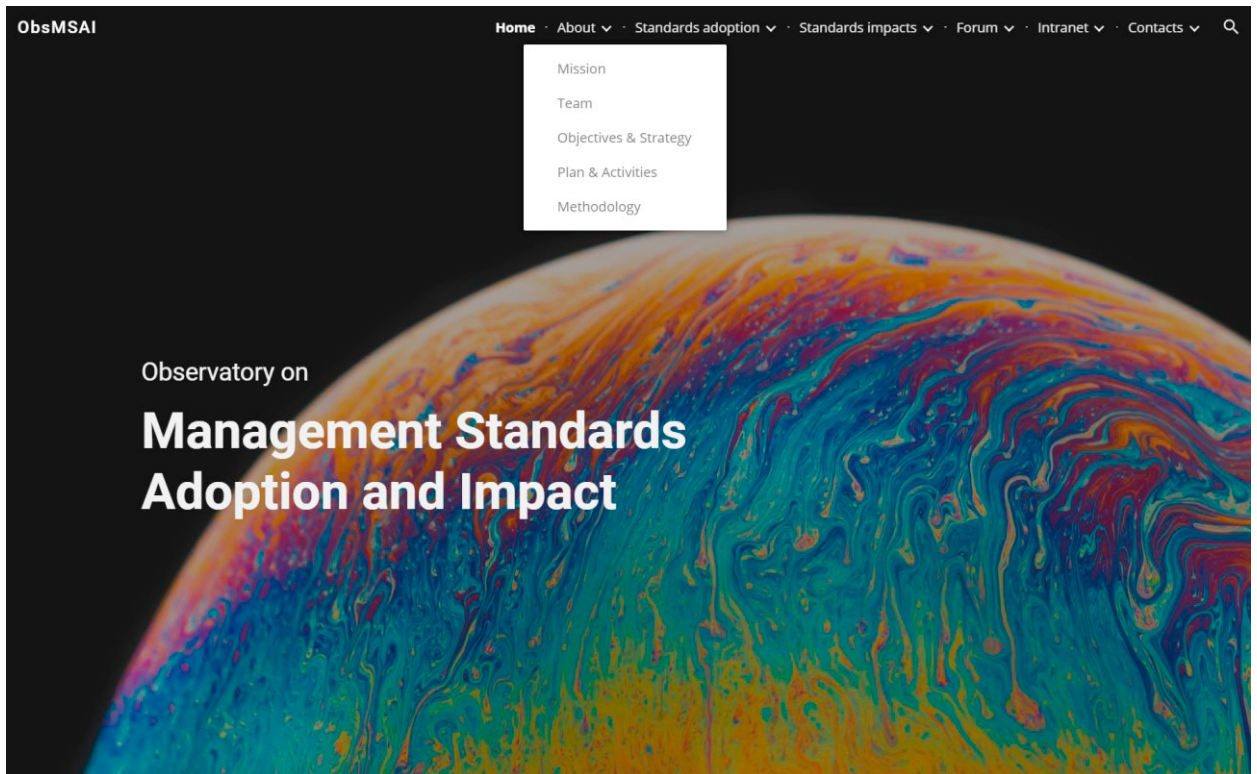


Fig. 2. Observatory’s homepage (mock-up).

To develop the observatory, the involved activities are mainly software development engineering activities, including requirements elicitation, design, programming, testing, and deployment. Following an agile approach based on Scrum [25], the observatory can be developed iteratively, starting from simple versions and progressing to a full-featured version.

4. Conclusion

Several types of contributions resulting from this proposal can be identified: 1) at a theoretical level, a new conceptual model for describing and explaining the impact of the adoption of management standards will be created; 2) at a practical level, a new information system (observatory) will be developed, providing a tool for the understanding of the adoption and impact of standards, as well as for the dissemination of the results from standardization practices.

The main activities defined for the project include:

- The creation and corroboration of the theoretical model;
- A survey of organizations that possess copies of standards, aiming at a comprehensive characterization of their adoption, use in practice, and resulting difficulties and obtained benefits;
- The creation and operation of the observatory to serve several purposes (a) the monitoring of performance and impacts of existing standards; b) the dissemination of information to be used in the development of new standards; c) to boost the adoption of standards by organizations.

ISO/TC 258 Strategic Plan [26] Clause 4.2. reveals that ISO/TC 258 2023's current objective is to set up a mechanism to maintain and track the existing project management standards until 2030, increase communication channels for their pros and cons, and establish key performance indicators for the project management standards use around the world, which can be measured by the ISO/TC 258 regulations. This proposal also contributes to these goals.

Acknowledgments

This work has been partially supported by Fundação para a Ciência e a Tecnologia (FCT - MCTES) for its financial support via the project UIDB/00667/2020 (UNIDEMI).

References

- [1] European Commission (2011) "A Strategic Vision for European Standards: Moving forward to enhance and accelerate the sustainable growth of the European Economy by 2020." *Communication from the European Commission to the European Parliament, the Council and the European Economic and Social Committee*, **EUR-Lex - 52011DC0311 – EN**: 1-22. <https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX:52011DC0311>
- [2] European Council (2014) "European Council 20/21 March 2014 Conclusions." *Directive Euco 7/1/14 Rev 1, St_7_2014_Rev_1_En*: 1-17. https://www.consilium.europa.eu/uedocs/cms_Data/docs/pressdata/en/ec/141749.pdf
- [3] Schulz, Martin, and Andreas D. Mavroyiannis (2012) "Regulation (EU) No 1025/2012 of the European Parliament and of the Council." *Official Journal of the European Union*, **L 316/12 (EUR-Lex - 32012R1025 - EN)**: 1-22. <https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2012:316:0012:0033:EN:PDF>
- [4] European Commission (2016) "Tapping the Potential of European Service Standards to Help Europe's Consumers and Businesses." *Resolution from the Commission to the European Parliament and of the Council, the European Economic and Social Committee and the Committee of the Regions European Standards for the 21st Century*. **EUR-Lex - 52016SC0186 – EN**: 1-12. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52016SC0186>
- [5] European Union (2012) "Publication of an update to the List Of National Standardisation Bodies Pursuant To Article 27 Of Regulation (EU) No 1025/2012 of the European Parliament and of The Council On European Standardization (2017/C 351/04)". *Official Journal of The European Union*, **L 316/12 (55)** (14.11.2012): 12-34. doi:10.3000/19770677.L_2012.316.eng [https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52017XC1019\(01\)&from=ET](https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52017XC1019(01)&from=ET)
- [6] International Organization for Standardization (2004) "ISO/IEC Guide 2:2004 Standardization and related activities — General Vocabulary", *ISO/TMBG Technical Management Board - Groups*: 1- 60. <https://www.iso.org/standard/39976.html>
- [7] Stokes, Fiona, Hugh Dixon, Amapola Generosa, and Ganesh Nana (2011) "The Economic Benefits of Standards to New Zealand." Report to: The Standards Council of New Zealand and the Building Research Association of New Zealand, Business and Economic Research (Berl) (Www.Bert.Co.Nz). <https://www.iso.org/standard/39976.html>

- [8] S. Tan, Song, Debraj De, Wen-Zhan Song, Junjie Yang, and Sajal K. Das (2017) “Survey Of Security Advances In Smart Grid: A Data Driven Approach.” *IEEE Communications Surveys & Tutorials*, **19**(1): 397-422.
- [9] Henning, Florian (2018) “A Theoretical Framework on the Determinants of Organisational Adoption of Interoperability Standards in Government Information Networks.” *Government Information Quarterly* **35**(4): S61-S67.
- [10] Varajão, João, Luis Magalhães, Luis Freitas, Pedro Ribeiro, and João Ramos (2018) “Implementing Success Management in an IT Project.” *Procedia Computer Science*, **138**: 891–898.
- [11] Saura, J., A. Palos-Sanchez & Grilo (2019) “Detecting Indicators for Startup Business Success: Sentiment Analysis Using Text Data Mining.” *Sustainability* **11**(3): 1-14. <https://doi.org/10.3390/su11030917>
- [12] International Organization for Standardization (2019) “ISO Survey 2019”. *ISO- International Organization for Standardization*. <https://www.iso.org/the-iso-survey.html>
- [13] International Organization for Standardization (2020) “Project, programme and portfolio management — Guidance on project management (ISO 21502:2020). *Technical Committee ISO/ TC 258: 1-52*. <https://www.iso.org/standard/74947.html>
- [14] United Nations (2019) “Recent developments in the international investment regime: Taking stock of phase 2 reform actions”. *UNCTAD- United Nations Conference United Nations on Trade and Development*, **TD/B/C.II/42**:1-18. https://unctad.org/system/files/official-document/ciid42_en.pdf
- [15] United Nations (2015) “Sustainable Agenda Transforming The World. The 2030 Agenda For Sustainable Development”. United Nations, *General Assembly Resolution*, 25 September 2015, **17(A/Res/70/1)**: 1-35. https://www.un.org/en/development/desa/population/migration/generalassembly/docs/globalcompact/A_RES_70_1_E.pdf
- [16] International Organization for Standardization (2019) “Guidance on Systematic Review Process in ISO.” *ISO-International Organization for Standardization*: 1-36. <https://www.iso.org/files/live/sites/isoorg/files/store/en/PUB100413.pdf>, 1-36.
- [17] Hatto, Peter (2020) “Standards and Standardisation: A Practical Guide for Researchers.” *European Commission Directorate-General for Research & Innovation*: 1-62. <https://op.europa.eu/en/publication-detail/-/publication/db289e47-140b-11eb-b57e-01aa75ed71a1>
- [18] European Committee for standardization (2016) “Review of European Standards.” CEN- European Committee for standardization. <https://boss.cen.eu/Maintenance/Reven/Pages/>
- [19] Soibelman Lucio, Liang Y. Jeffrey G. Liu, Kirby, E. William East, Carlos H. Caldas, and Ken Yu Lin (2003) “Design Review Checking System With Corporate Lessons Learned.” *Journal of Construction Engineering and Management*, **129** (5): 475-484.
- [20] Takagi, Nilton, and João Varajão (2021) “ISO 21500 and Success Management: An Integrated Model for Project Management.” *International Journal of Quality and Reliability Management*. <https://doi.org/10.1108/IJQRM-10-2020-0353>
- [21] Calderón, A., M. Ruiz, and R.V. O’Connor (2018) “A Serious Game to Support the Iso 21500 Standard Education in the Context of Software Project Management.” *Computer Standards and Interfaces*, **60**: 80-92.
- [22] Isacás-Ojeda, E., M. Intriago-Pazmiño, H. Ordoñez-Calero, E. Salazar-Jácome, and W. Sánchez-Ocaña (2018) "Integrated Framework for the Civil Construction Projects Management by Mean PMBOK, ISO 21500 and ITIL V3." in: *Advances in Intelligent Systems and Computing*. 996-1005.
- [23] Purwanggono, B., and A. Margarete (2017) “Risk Assessment of Underpass Infrastructure Project Based on ISO 31000 and ISO 21500 Using Fishbone Diagram and Rfmea (Project Risk Failure Mode and Effects Analysis) Method.” *IOP Conference Series: Materials Science and Engineering*.
- [24] Varajão, João, Ricardo Colomo-Palacios, and Hélio Silva (2017) “ISO 21500:2012 and PMBOK 5 Processes in Information Systems Project Management.” *Computer Standards and Interfaces*, **50**: 216-222.
- [25] Schwaber, Ken, and Jeff Sutherland (2020) “The Scrum Guide - The Definitive Guide to Scrum: The Rules of the Game.” Scrum.org. <https://scrumguides.org/docs/scrumguide/v2020/2020-Scrum-Guide-US.pdf>
- [26] International Organization for Standardization (2020) “TC258 Strategic Business Plan 2020 2030”. *ISO/TC 258*, **N573**:1-17.