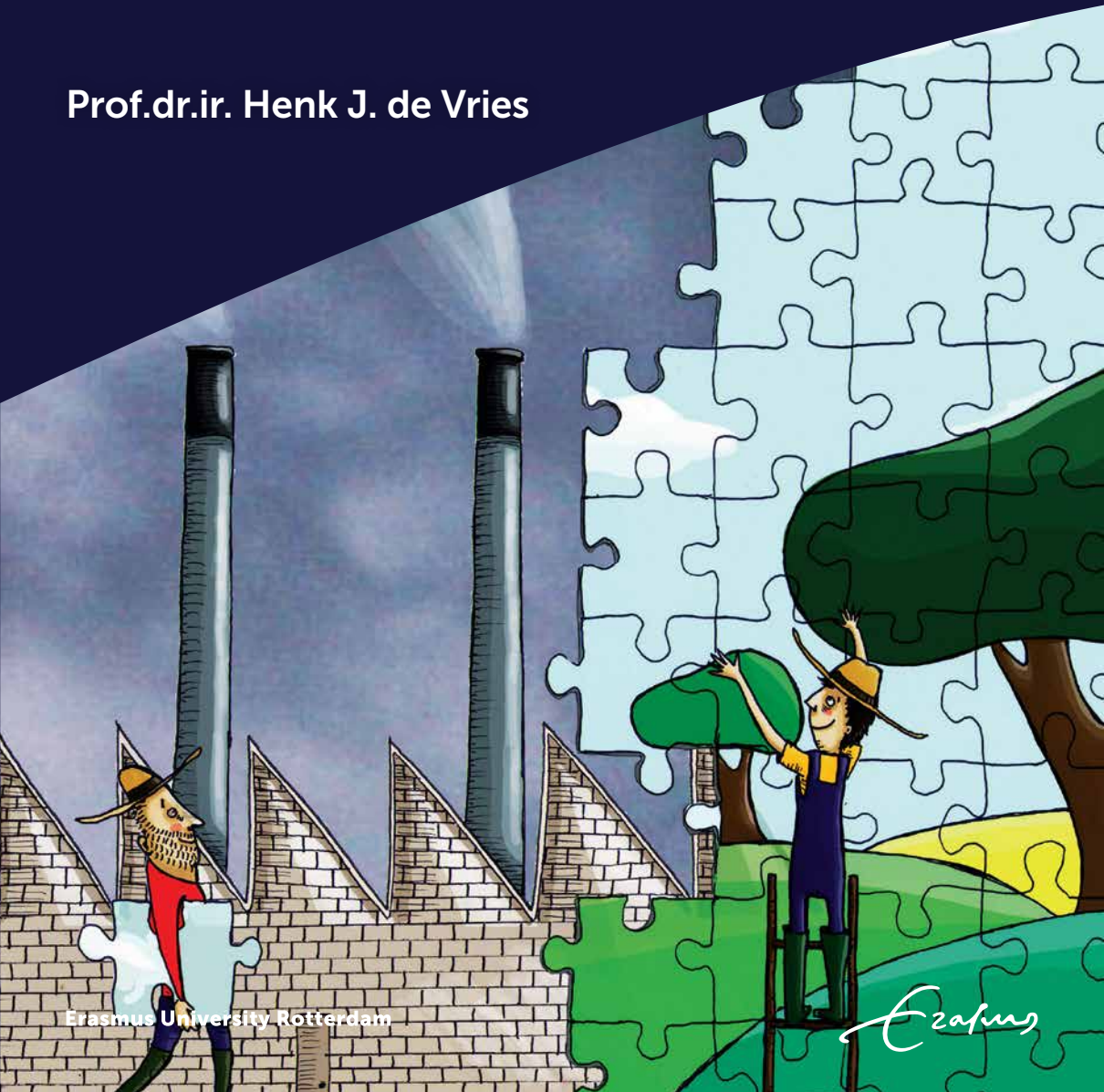


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Standardisation Management

Prof.dr.ir. Henk J. de Vries



Standardisation Management

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Standardisation Management

Prof.dr.ir. Henk J. de Vries

Address delivered at the occasion of accepting the appointment as Professor of Standardisation Management, Erasmus University Rotterdam, at the Rotterdam School of Management, Erasmus University Rotterdam on Friday October 4, 2019.

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Standardisation Management

Abstract

Standards are essential for the success of products and services in the market, and for the well-functioning of processes and organisations. Trends such as globalisation, integration of ICT and electrotechnology in almost every sector, and the increased attention for sustainability, have made standards even more important. Unfortunately, little research is available to provide a better understanding of this phenomenon. In my inaugural lecture I first give an overview of the research I have conducted on the processes of standardisation. I discuss standards development, dissemination, market acceptance, implementation and use, and impact of standards and standardisation on business and society. In future research, my research agenda will focus on three levels of standardisation management: (1) within companies, (2) in complex projects involving many stakeholders, and (3) at local, national, regional and global level. I illustrate the societal relevance of my research with some examples about animals.

Standardisation Management

Samenvatting

(Technische) normen zijn essentieel voor marktsucces van producten en diensten en voor het functioneren van organisaties. Trends zoals globalisering, de integratie van informatie- en communicatietechnologie in bijna elke sector en de toegenomen aandacht voor duurzaamheid hebben normen nog belangrijker gemaakt. Helaas is er nog weinig wetenschappelijk onderzoek gedaan om dit belangrijke fenomeen beter te begrijpen. In mijn inaugurele rede geef ik eerst een overzicht van mijn normalisatie-onderzoek. Ik bespreek normontwikkeling, verspreiding van normen, marktacceptatie, invoering en gebruik, en effecten op bedrijven en de maatschappij. In toekomstig onderzoek wil ik de nadruk leggen op het management van normalisatie: (1) binnen bedrijven, (2) in complexe normalisatieprojecten waarin veel partijen samenwerken, en (3) op nationaal, supranationaal of mondiaal niveau. Het maatschappelijke belang van mijn onderzoek illustreer ik met enkele voorbeelden over dieren.

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**Nemo magis obedit
quam qui hausto Christi spiritu liber esse coeperit.**

[Nobody obeys more
than he who has drunk in the Spirit of Christ and starts getting free.]



Desiderius Erasmus*

* Desiderius Erasmus in a letter to Paulus Voltz, 1518-08-14, introductory to *Enchiridion militis christiani*. English version in: P. S. Allen (ed.) (1992) *Opus Epistolarum Des. Erasmi Roterodami: Volume Iii: 1517-1519*. Oxford, UK: Clarendon Press, pp. 471-472. Cited by Weiler, Anton G. (1997). *De spiritualiteit van Erasmus – Christen-humanist*. Nijmegen: Titus Brandsma Instituut / Valkhof Pers.

1. Introduction

**Dear Rector Magnificus of Erasmus University,
Dear Deans of the Rotterdam School of Management, Erasmus University,
Dear Board Members of the Vereniging Trustfonds, and of the Stichting Bijzondere
Leerstoel Standaardisatie en Normalisatie,
Dear colleagues and students,
Dear family and friends,
Dear distinguished guests,**

Today is a special day. Do you know why? It is World Animal Day. The mission of World Animal Day is to raise the status of animals to improve animal welfare standards around the globe.¹ This mission connects the focus of my chair, standards, from the world of technology and business to the world of animals. World Animal Day is on 4 October, which is the feast day of Saint Francis of Assisi, patron saint of the environment and of animals. Francis preached that people have a duty to protect and enjoy nature as both the stewards of God's creation and as creatures themselves, as described in the first pages of the Bible, Genesis Chapters 1 and 2. Genesis 2 verse 19 then assigns man to give names to the animals:

Now the Lord God had formed out of the ground all the wild animals and all the birds in the sky. He brought them to the man to see what he would name them; and whatever the man called each living creature, that was its name.²

What's in a name? Well, in the period that this was written down, a name was a characterisation. So in order to give proper names, man would have had to deepen his knowledge about these animals. In this sense, we can see this activity as a precursor of scientific research. The Swedish researcher Linnaeus would be the first to give names to minerals, plants and animals in a thorough and systematic way.³ Linnaeus' work shows that giving names is a form of classification.

-
- 1 Nature Watch Foundation (2018) **World Animal Day October 4**. Cheltenham, UK: Naturewatch Foundation. <https://www.worldanimalday.org.uk/> (Accessed 2019-08-22).
 - 2 Biblica (2011) **Holy Bible**, New International Version. Grand Rapids, MI: Zondervan / London: Hodder & Stoughton.
 - 3 Blunt, Wilfrid (2001). **Linnaeus: the compleat naturalist**. London: Frances Lincoln.

Linnaeus, Carl (1735) **Systema naturae sive regna tria Naturae systematice proposita per classes, ordines, genera, & species**. Leiden: apud Theodorum Haak, Lugduni Batavorum.

Stafleu, Frans A. (1971). **Linnaeus and the Linnaeans: the Spreading of their Ideas in Systematic Botany, 1735-1789**. Utrecht: International Association for Plant Taxonomy.

In their book *Sorting things out – Classification and its consequences*, Bowker and Star delved into this topic of classification.⁴ One of the cases they study is apartheid in South Africa – the distinction between European/white, Bantu/black, Asian and coloured (mixed race) was used to impose a system of discrimination. They provide business examples as well and show that classifications are often hidden behind the scenes but are instruments of power. Let's take the example of Vodka. The traditional ingredients are grain, potatoes or molasses. However, following a lobby, the European Parliament approved a definition that includes more ingredients, such as waste from wine production. This definition gave wine producing countries such as France, Italy and Hungary a share in the Vodka market at the cost of traditional producers such as Sweden, the Baltic countries, Poland and Russia.⁵

This Vodka classification was laid down in a standard. Most standards provide more than just terms, definitions and classifications; they provide requirements. Requirements can address quality, safety, interoperability and many more. Each standard valorises some point of view and then necessarily silences another. This may be beneficial for some stakeholders but detrimental to others. Let's take the example of the barcode, visible on the packaging of any product. In 1976, Mr. Albert Heijn, CEO and owner of the biggest chain of supermarkets in The Netherlands, introduced this American invention in The Netherlands and became its global promoter. We cannot imagine retail and supply chains without such universal product codes anymore. Scanning barcodes allows the physical flow of products to interconnect with the information flow automatically and facilitates all kinds of process improvements such as automatic ordering and self-scan checkouts. It decreases handling costs enormously.⁶ However, the benefits are not equally distributed. Bigger retailers have relatively more advantages than small ones. So in this case, standardisation provides a competitive advantage to the big retailers at the cost of the small ones, despite the efficiency gains they all have. So it was for good reasons that Albert Heijn stimulated this standard.

Standards are instruments of power. The choices made in standards may cause the difference between creating or losing jobs, or regions that benefit at the expense of others. Standards shape technology, business and to an increasing extent also society⁷, and this makes the shaping of standards and their impact a topic of utmost importance. However, we have limited knowledge about this hidden and powerful instrument of standardisation. Scientific research is limited, and most colleagues focus on certain

4 Bowker, Geoffrey C. & Susan Leigh Star (1999). *Sorting things out – Classification and its consequences*. Cambridge, MA: The MIT press.

5 Fomin, Wlad & Henk J. de Vries (2008). *Vodka war: a teaching case in standardization*. In: Kai Jakobs & Eva Söderström (Eds) *Proceedings 13th EURAS Workshop on Standardisation*. Aachener Beiträge zur Informatik, Band 40, Aachen: Wissenschaftsverlag Mainz in Aachen, pp. 137-145.

6 Gorter De Vries, Hein (2012). *De barcode: moeder van alle standaarden*. In: Forum Standaardisatie and ECP Platform (Eds) *Standaardwerken – Het belang van verbinden*. The Hague: ECP / Forum Standaardisatie.

7 Egyedi, Tineke (1996). *Shaping Standardization – A study of standards processes and standards policies in the field of telematics services*. Delft: Delft University Press.

aspects rather than on the phenomenon as a whole.

In their inaugural speech, new-appointed professors normally outline their research agenda for the coming years, based on what they have researched so far. So first I will give an overview of what I have done during the past 25 years including some of the findings. Next I will present my plans for the future. Then I intend to come back to World Animal Day by illustrating the relevance of this field of research by discussing some cases and showing how standards can have an impact on animals. Finally there will be some words of thanks.

2. Overview of research

2.1 Fundamentals of standardisation

If names, classifications and standards are essential in shaping the world then this applies to the research field itself as well. My very first academic paper was aimed at defining standardisation. As we saw, there is power in definitions. An official definition of the field was already available, but it was laid down in a standard issued by the International Organization for Standardization ISO and limited the scope of standardisation to the activities of official standardisation organisations.⁸ However, in practice the concept was and is used in a broader sense. I developed my definition by investigating existing ones and exploring how the term is used in business practice. This led to the following definition:⁹

Standardisation is the activity of establishing and recording a limited set of solutions to actual or potential **matching problems**, directed at benefits for the party or parties involved, balancing their needs, and intending and expecting that these solutions will be repeatedly or continuously used, during a certain period, by a substantial number of the parties for whom they are meant.

In this definition,

a **matching problem** is a problem of interrelated **entities** that do not harmonise with each other. Solving it means determining one or more features of these entities in a way that they harmonize with one other or determining one or more features of an entity because of its relationship(s) with one or more other entities.

An **entity** is any concrete or abstract thing that exists, did exist or might exist, including associations among these things. Example: A person, object, event, idea, process, etc.

This definition is lengthy but covers the field. This paper was published in a terminology journal and it is my most cited academic paper. The research field also lacked a coherent classification of categories of standards and forms of standardisation – the topic of my second scientific paper.¹⁰ As we have seen, classification is the starting point for scientific research.

8 ISO & IEC (2004). *ISO/IEC Guide 2:2004 Standardization and related Activities – General vocabulary*. Geneva: International Organization for Standardization and International Electrotechnical Committee.

9 De Vries, Henk J. (1997). Standardization – What's in a name? *Terminology – International Journal of Theoretical and Applied Issues in Specialized Communication*, 4, 1, 55-83 (Rectification in 4, 2, 198).

10 De Vries, Henk J. (1998). The Classification of Standards. *Knowledge Organization*, 25, 3, 79-89.

More papers followed, in which I aimed to lay the foundation for the field of research. Many of my other research projects are related to the processes of standardisation (see Figure 1).

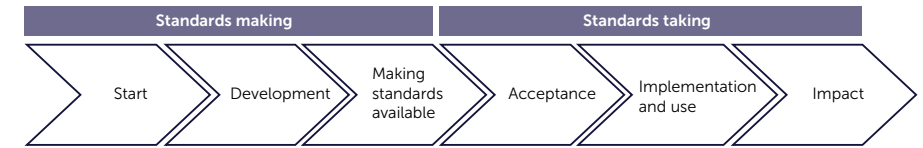


Figure 1. Standardisation process model

Standardisation projects can be conducted within a single organisation or in cooperation with several different organisations. In any case, it starts with an idea to develop a standard. The development process includes both designing and approving the standard. It is then made available to designated target groups. It is not self-evident that these indeed become aware of the standard and/or accept it. If they do, then the next step is to implement the standard. Once implemented, the standard is used and has an impact – for the organisation itself and for other stakeholders. This may be a direct impact or an impact via the signalling effect of conformity assessment. The picture suggests a clear sequence, but in practice certain steps may be taken in parallel and there are feedback loops. My research has addressed all these steps, and I will now discuss each of these.

2.2 Start

Standardisation projects start with an idea, and thus the role of individuals is important. But exploring a need for standardisation can be done systematically as well. In my previous jobs at the Netherlands Standardization Institute, I was involved in exploring market needs for new areas of standardisation¹¹ such as services,¹² medical disposables¹³ and railways.¹⁴ The approach developed there was later used by several of my students to explore the need for standards and standardisation in other areas, such as multi-modal transportation¹⁵ and pension services.¹⁶

11 De Vries, Henk J. (1995). *Involvement of economic partners with the standards development process of national standards bodies*. Phare Programme EC-EFTA, Regional Programme on Quality Assurance PRAQ91, Action *3.2.6, Brussels: Comité Européen de Normalisation.

12 De Vries, H.J. & H.W. Schipper (1997). *Normalisatie in dienstverlenende sectoren - strategische verkenning*. Delft: Nederlands Normalisatie-instituut.

De Vries, Henk (1998). Standardization needs in service sectors. *DIN-Mitteilungen*, 77, 11, 828-833.

13 Van der Feen, E.J. & H.J. de Vries (1992). *Medische disposables & Normalisatie – Een strategische verkenning*. Delft: Nederlands Normalisatie-instituut.

14 De Vries, H.J. (1996). *Normalisatie voor NS Railinfrabeheer*. Delft: TRAIL Research School.

15 Gharehgozli, Amir, Henk J. de Vries & Stephan Decrauw (2019). The Role of Standardisation in European Intermodal Transportation. *Maritime Business Review*, 4, 2, 151-168.

16 Den Engelsman, Jesper (2008) *Can standardization contribute to the reinforcement of a national pension sector? – An examination of standardization in the Dutch pension sector*. Master thesis. Rotterdam: Erasmus University Rotterdam, Rotterdam School of Management.

2.3 Standard development

In the next stage, development and approval, my research has focused on formal standardisation organisations. These are the most important in terms of numbers of standards. One of these, the Netherlands Standardization Institute (NEN) is my former employer and the main sponsor of this chair. My dissertation addresses the role, structure and functions of national standards bodies, and I have published papers on this topic as well.¹⁷ A core topic of ongoing research is the involvement of stakeholders in standardisation through participation or in other ways. The challenge is to have balanced stakeholder representation. I developed a method to trace and classify stakeholders.¹⁸ These stakeholders face the challenge to design standards

17 De Vries, Henk (1999). **Standards for the Nation – Analysis of National Standardization Organizations**. Ph.D. thesis. Rotterdam: Erasmus University Rotterdam, Rotterdam School of Management / Faculteit Bedrijfskunde.

De Vries, Henk J. (1999). **Standardization – A Business Approach to the Role of National Standardization Organizations**. Boston / Dordrecht / London: Kluwer Academic Publishers.

De Vries, Henk (1999). Certification and Accreditation Performed by National Standards Organizations. *ASTM Standardization News*, 27, 11, 26-27.

Verheul, Hugo & Henk de Vries (2003). **Verbetering formele normalisatieproces**. Delft / Rotterdam: Centre for Process Management and Simulation.

De Vries, Henk J. (2014). **Well-being: European standardisation**. In Sander Luitwieler (Ed.), *A community of peoples - Europe's values and public justice in the EU*. Eastborne, UK: Seismos Press, pp. 136-138.

De Vries, Henk J. (2015). **Governance of electrotechnical standardisation in Europe**. Rotterdam: Rotterdam School of Management, Erasmus University

18 De Vries, Henk, Knut Blind, Axel Mangelsdorf, Hugo Verheul, Jappe van der Zwan (2009). **SME Access to European Standardization - Enabling small and medium-sized enterprises to achieve greater benefit from standards and from involvement in standardization**. Brussels: CEN and CENELEC

Van der Zwan, Jappe, Henk de Vries, Rutger Zoetmulder & Kevin Finch (2010). **Open normalisatie – Acties om de betrokkenheid van de zwakke marktpartijen bij normalisatie te vergroten – Eindrapport**. Delft: NEN.

Wakke, Paul, Knut Blind & Henk J. de Vries (2015). Driving factors for service providers to participate in standardization: Insights from the Netherlands. *Industry & Innovation*, 22, 4, 299-320.

Willemse, H., H.J. de Vries & J. Dul (2006). Balancing Stakeholder Representation: **An Example of Stakeholder Involvement in Ergonomics Standardization**. In: Waldemar Karwowski (Ed.) *Handbook of Standards and Guidelines in Ergonomics and Human Factors*. Nawwah, NJ: Lawrence Erlbaum Associates, Inc., pp. 149-156.

systematically¹⁹ and to achieve consensus, two other topics of research.²⁰

In addition to these studies on formal standardisation, I have also been involved in research on standards development in industry consortia,²¹ in open source communities,²² and in companies.²³ These studies have in common that they highlight the importance of proper governance and management of standards and standardisation. The challenge is not only to manage standards-making, but to also prepare for standards-taking.

19 De Vries, Henk (1999). **Opportunities for Better Management Systems Standards**. In: Manfred J. Holler & Esko Niskanen (Eds.) *EURAS Yearbook of Standardization*, Vol. 2. Special issue of *Homo Oeconomicus*, 15, 3, 381-402.

De Vries, Henk J. (1999). **Standardization – A Business Approach to the Role of National Standardization Organizations**. Boston / Dordrecht / London: Kluwer Academic Publishers.

ISO (2001). **ISO Guide 72 'Guidelines for the justification and development of management system standards'**. Geneva: International Organization for Standardization.

ISO/IEC (2008). **ISO/IEC Guide 76 'Development of service standards – Recommendations for addressing consumer issues'**. Geneva: International Organization for Standardization & International Electrotechnical Commission.

De Vries, Henk J. & Paul Wiegmann (2017). **Impact of service standardization on service innovation**. In: Richard Hawkins, Knut Blind & Robert Page (Eds) (2017) *Handbook of Standards and Innovation*. Cheltenham, UK / Northampton, MA: Edward Elgar, pp. 187-211..

20 De Vries, Henk J., Beke Winter & Harmen Willemse (2017). Achieving Consensus Despite Opposing Stakes – A Case of National Input for an ISO Standard on Sustainable Wood. *International Journal of Standardization Research*, 15, 1, 29-47.

21 Kamps, Xavier, Henk J. de Vries & Geerten van de Kaa (2017). Exploring standards consortium survival in high tech industries: The effects of commitment and internal competition. *Computer Standards & Interfaces*, 52, 105-113.

22 Oshri, Ilan, Henk de Vries & Huibert de Vries (2010). The rise of Firefox in the web browser industry: The role of open source in setting standards. *Business History*, 52, 5, 834-856.

23 Biesheuvel, J., J. Verkuyl & H.J. de Vries (1993). Normalisatie in de metalektro, van beroeps- naar taakgericht werken. 's-Hertogenbosch: Nehem.

De Vries, Henk J. (2006). Best Practice in Company Standardization. *International Journal of IT Standards and Standardization Research*, 4, 1, 62-85.

Haverkamp, Ries & Henk J. de Vries (2019). **Managing In-Company Standardization While Avoiding Resistance: A Philosophical-Empirical Approach**. In: Kai Jakobs (Ed.) *Corporate Standardization Management and Innovation*. Hershey, PA: IGI Global, pp. 92-125.

Van Wessel, Robert M. & Henk J. de Vries (2019). **Company IT Standardization: Anticipated Agile Benefits**. In: Kai Jakobs (Ed.) *Corporate Standardization Management and Innovation*. Hershey, PA: IGI Global, pp. 68-91.

Zeng, Guojun, Henk J. de Vries & Frank Go (2019). **Restaurant Chains in China - The Dilemma of Standardisation versus Authenticity**. Singapore: Palgrave.

2.4 Making standard available

Surprisingly little research has been conducted²⁴ on making standards available and so far, I have also paid relatively little attention to it. My main finding is that this phase needs to be prepared in parallel to the development of standards²⁵.

2.5 Acceptance

The topic of market acceptance of standards has received more attention in academic journals than other standardisation-related topics. The literature tends to focus on battles between competing standards: which standard should be chosen? Together with students and former PhD students, Geerten van de Kaa and Simon den Uijl, I studied many of these battles. Examples include the e-purse battle between Chipper and Chipknip,²⁶ Blu-ray versus HD-DVD,²⁷ flash memory cards,²⁸ and operating systems for smart phones.²⁹ We identified several new factors that contribute to standard dominance and found that the importance of these factors is case-dependent, though some patterns can be observed. Moreover, we related these factors to phases of technology development and addressed the fact that multiple standards continue to

co-exist.³⁰ This makes our research extremely relevant to practice. Moreover, the topic of market acceptance of standards includes much more, for instance how to trace relevant standards among the thousands of standards available. I developed a method

24 Scholte, Myrthe (2014). **A new business model for a standards publisher? Business model innovation at NEN**. Master thesis. Rotterdam: Rotterdam School of Management, Erasmus University.

25 (Ongoing research, not published yet).

26 De Vries, Henk J. (2006). Competing E-Purse Systems: A Standards Battle. *Journal of Cases on Information Technology*, 8, 1, 1-15. <https://dx.doi.org/10.4018/jcit.2006010101>.

De Vries, Henk J. (2001). Banking Chipcards in the Netherlands – One or two systems? *Knowledge Technology & Policy*, 14, 2, 78-87.

De Vries, Henk J. & George W.J. Hendrikse (2001). The Dutch Banking Chipcard Game – Understanding a battle between two standards. *International Studies of Management and Organization*, 31, 1, 106-125.

27 Den Uijl, Simon & Henk J. de Vries (2013). Pushing technological progress by strategic manoeuvring: The triumph of Blu-ray over HD-DVD. *Business History*, 55, 8, 1361-1384.

28 De Vries, H.J., Joost P.M. de Ruijter & Najim Argam (2011). Dominant design or multiple designs: The flash memory card case. *Technology Analysis & Strategic Management*, 23, 3, 249-262.

29 Riegman, Tim & Henk J. de Vries (2013). **Establishing a dynamic model for factors favouring multiple designs**. In: Branimir Sandalski, Milka Vicheva & Reneta Dimitrova (Eds) *Proceedings 10th Anniversary International Conference Standardization and Related Activities – A means of international and Balkan collaboration*. Sofia: Publishing House of Technical University of Sofia, pp. 39-49.

30 Den Uijl, Simon (2014). **The Emergence of De-facto Standards**. (ERIM PhD Series Research in Management 328). Rotterdam: Erasmus Research Institute of Management – ERIM.

Van de Kaa, Geerten, Henk J. de Vries & Jan van den Ende (2015). Strategies in network industries: the importance of inter-organizational networks, complementary goods, and commitment. *Technology Analysis & Strategic Management*, 27, 1, 73-86.

Van de Kaa, Geerten, Eric van Heck, Jan van den Ende, Henk J. de Vries & Jafar Rezaei (2014). Supporting Decision-Making in Technology Standards Battles Based on the Fuzzy Analytical Hierarchy Process. *IEEE Transactions on Engineering Management*, 61, 2, 336-348.

Van de Kaa, Geerten & Henk J. de Vries (2014). Factors for winning format battles: A comparative case study. *Technological Forecasting and Social Change*, 91, 222-235.

Van de Kaa, Geerten, Henk J. de Vries & Jafar Rezaei (2014). Platform Selection for Complex Systems: Building Automation Systems. *Journal of Systems Science and Systems Engineering*, 23, 4, pp 415-438.

Den Uijl, Simon, Rudi Bekkers & Henk J. de Vries (2013). Managing Intellectual Property Using Patent Pools: Lessons from Three Generations of Pools in the Optical Disc Industry. *California Management Review*, 55, 4, 31-50.

Den Uijl, Simon, Henk J. de Vries & Deniz Bayramoglu (2013). The Rise of MP3 as the Market Standard: How Compressed Audio Files Became the Dominant Music Format. *International Journal of IT Standards & Standardization Research*, 11, 1, 1-26.

Van den Ende, Jan, Geerten van de Kaa, Simon den Uijl & Henk J. de Vries (2012). The Paradox of Standard Flexibility: The Effects of Co-evolution between Standard and Interorganizational Network. *Organization Studies*, 33, 5-6, 705-736.

Van de Kaa, Geerten, Jan van den Ende, Henk J. de Vries & Eric van Heck (2011). Factors for winning interface format battles: A review and synthesis of the literature. *Technological Forecasting & Social Change*, 78, 8, 1397-1411.

Oshri, Ilan, Henk de Vries & Huibert de Vries (2010). The rise of Firefox in the web browser industry: The role of open source in setting standards. *Business History*, 52, 5, 834-856.

Van de Kaa, Geerten (2009). **Standards Battles for Complex Systems – Empirical Research on the Home Network** (ERIM PhD Series Research in Management 166). Rotterdam: Erasmus Research Institute of Management – ERIM.

Fomin, Vladislav, Mogens Pedersen & Henk de Vries (2008). Open standards and government policy: results of a Delphi study. *Communications of the Association for Information Systems*, 22, 25, 459-484.

De Vries, Henk J. (2006). Competing E-Purse Systems: A Standards Battle. *Journal of Cases on Information Technology*, 8, 1, 1-15.

De Vries, Henk J. (2001). Banking Chipcards in the Netherlands – One or two systems? *Knowledge Technology & Policy*, 14, 2, 78-87.

De Vries, Henk J. & George W.J. Hendrikse (2001). The Dutch Banking Chipcard Game – Understanding a battle between two standards. *International Studies of Management and Organization*, 31, 1, 106-125.

to do this systematically.³¹ And I studied the barriers companies may face to benefit from standards and developed a toolbox with solutions to mitigate these barriers.³²

2.6 Implementation and use

Research on the implementation and use of standards includes the use of standards in technical design activities,³³ or more generally in innovation management,³⁴ and the governance and management of standards within a company.³⁵ A special topic is

31 De Vries, Henk J. & Jappe van der Zwan (2008). **What standards do I need for my product or service?** NEN: Netherlands Standardization Institute. file:///C:/Users/18191hdv/Downloads/standards.pdf.

De Vries, Henk J., Harmen Willemse & Jappe van der Zwan (2008). **Standards for lifts.** NEN: Netherlands Standardization Institute. file:///C:/Users/18191hdv/Downloads/metis_105767.pdf.

32 De Vries, Henk, Knut Blind, Axel Mangelsdorf, Hugo Verheul & Jappe van der Zwan (2009). **SME Access to European Standardization - Enabling small and medium-sized enterprises to achieve greater benefit from standards and from involvement in standardization.** Brussels: CEN and CENELEC.

33 Van Mourik, Pieter, Henk van der Hoek & Henk de Vries (2012). **Standardization and nomenclature.** In: Pieter van Mourik, Jaap van Dam & Stepen Picken (Eds) **Materials Science in Design and Engineering.** Delft: VSSD, pp. 425-434.

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Gundlach, H.C.W., C.A.J. Simons & H.J. de Vries (2001). **Standaardisatie en Normalisatie. Deel 2: Certificatie en accreditatie; methodiek van normalisatie.** Engineering Dossiers. The Hague: Ten Hagen & Stam b.v.

Simons, C.A.J. & H.J. de Vries (2002). **Standaardisatie en Normalisatie. Deel 3: Innovatie en bedrijfsnormalisatie.** Engineering Dossiers. The Hague: Ten Hagen & Stam b.v.

De Vries, Henk J. & Jappe van der Zwan (2008). **What standards do I need for my product or service?** NEN: Netherlands Standardization Institute. file:///C:/Users/18191hdv/Downloads/standards.pdf.

34 Zhang, Joanne (2016). **The role of standardization in high-technology start-ups: How standards help and hinder innovation commercialization.** Master thesis. Rotterdam: Rotterdam School of management, Erasmus University.

Galesloot, Suzanne (2018). **The timing of standards in an innovation process – Focussed on additive manufacturing.** Master thesis. Rotterdam: Rotterdam School of Management, Erasmus University.

35 Van Wessel, Robert M. & Henk J. de Vries (2019). **Company IT Standardization: Anticipated Agile Benefits.** In: Kai Jakobs (Ed.) **Corporate Standardization Management and Innovation.** Hershey, PA: IGI Global, pp. 68-91.

Van Wessel, Robert, Xu Yang & Henk J. de Vries (2011). Implementing international standards for Information Security Management in China and Europe: a comparative multi-case study. **Technology Analysis & Strategic Management**, 23, 8, 865-879.

Van Wessel, Robert (2010). **Toward Corporate IT Standardization Management: Frameworks and Solutions.** Hershey, PA: IGI.

resistance against standards. Research findings show ways to overcome such resistance.³⁶

2.7 Impact

Thousands of academic studies on the impact of standards and standardisation are available. Most suggest a positive business impact. Maybe too positive, as most of these studies suffer from biases.³⁷ An opposite bias applies as well: Several case studies report enormous benefits. Some of these findings are confidential – publishing them might have served as a wake-up call for customers, competitors or suppliers that might want to have a share in the success.³⁸

As this chair is part of the innovation management section, my main research focus will be on the impact of standards and standardisation on innovation. By nature, there is a tension between the two concepts because innovation is always about something new, whereas standards freeze a solution to a matching problem. However, change needs to be balanced with the stability provided by standards, so a combination of the two concepts would be best. Findings show that standards and company participation in the development of standards may have a positive effect in making innovation a market success. It also may lead to positive effects at the level of sectors and the national economy, and lead to substantial societal benefits. However, if not well managed, the opposite may be the case as well. Research reveals how standardisation can be

36 Haverkamp, Ries & Henk J. de Vries (2019). **Managing In-Company Standardization While Avoiding Resistance: A Philosophical-Empirical Approach.** In: Kai Jakobs (Ed.) **Corporate Standardization Management and Innovation.** Hershey, PA: IGI Global, pp. 92-125.

De Vries, Henk J. & Andries Haverkamp (2015). Overcoming resistance against quality control – A philosophical-empirical approach. **International Journal of Quality and Reliability Management**, 32, 1, 18-48.

Van Kemenade, Everard A., Teun W. Hardjono & Henk J. de Vries (2011). The willingness of professionals to contribute to their organisation's certification. **International Journal of Quality and Reliability Management**, 28, 1, 27-42.

De Vries, Henk (1999). **Kwaliteitszorg zonder onbehagen – Praktische analyse van ISO 9000-kwaliteitszorg uit christelijk-filosofisch perspectief.** Amsterdam: Buijten & Schipperheijn / Rotterdam: KDI.

37 De Vries, Henk J. & Fouad El Osrouti (2019). **Impact studies on standards and standardisation – Looking back and moving forward.** In: Kai Jakobs & Piergiuseppe Morone (Eds.) **Proceedings 24th EURAS Annual Standardisation Conference – Standards for a Bio-Based Economy.** Aachen: Wissenschaftsverlag Mainz, pp. 131-142.

Manders, Basak (2015). **Implementation and Impact of ISO 9001** (ERIM Ph.D. Series Research in Management EPS-2014-337-LIS). Rotterdam: Erasmus Research Institute of Management.

38 De la Fuente, Manolo & Henk de Vries (1995). **Normen, normalisatie en het MKB.** Zoetermeer: Economisch Instituut Midden- en Kleinbedrijf / Delft: Nederlands Normalisatie-instituut.

integrated in innovation management³⁹ and to what extent the innovation process itself can benefit from standardisation.⁴⁰

Most standards are related to products, services or processes, but management system standards impact entire organisations. I have been involved in several studies on the business impact of international standards for quality management,⁴¹ environmental management,⁴² information security management⁴³ and business continuity management.⁴⁴

39 Wiegmann, Paul Moritz (2019). **Setting the Stage for Innovation: Balancing Diverse Interests Through Standardisation**. (ERIM PhD Series Research in Management 473. Rotterdam: Erasmus Research Institute of Management – ERIM).

Wiegmann, Paul Moritz (2019). **Managing Innovation and Standards: A Case in the European Heating Industry**. Cham, Switzerland: Palgrave Macmillan.

De Vries, Henk J., Paul Wiegmann (2017). **Impact of service standardization on service innovation**. In Richard Hawkins, Knut Blind & Robert Page (Eds) (2017) **Handbook of Standards and Innovation**. Cheltenham, UK: Edward Elgar, pp. 187-211.

Zoo, Hanah, Henk J. de Vries & Heejin Lee (2017). Interplay of Innovation and Standardization: Exploring the relevance in developing countries. **Technological Forecasting & Social Change**, 118, 334-348.

De Vries, Henk & Robert van Wessel (2014). Internet Architecture and Innovation' (Barbara von Schewick, 2010, Cambridge, MA: The MIT Press). *Business History*, 56, 3-4, 683-685. (Book review).

De Vries, Henk J. de (2006). The paradox of standardization and innovation. *ISO Focus*, 3, 2, 40-43.

De Vries, Henk J. (2005). Normung in vier Generationen FuE-Management. *DIN Mitteilungen*, 84, 4, 25-33.

De Vries, ir. H.J. (1996). Normalisatie: schakel tussen R&D en de markt. **Research & Results – vakblad voor vernieuwend ondernemen**, 4, 5, 22-23.

40 Van Stein, Mike (2011). **Innovation of the product innovation process: The role and effect of administrative innovation**. Master thesis. Rotterdam: Rotterdam School of Management, Erasmus University.

41 Manders, Basak, Henk J. de Vries & Knut Blind (2016). ISO 9000 and product innovation: A literature review and conceptual model. **Technovation**, 48-49, 41-55.

Manders, Basak (2015). **Implementation and Impact of ISO 9001** (ERIM Ph.D. Series Research in Management EPS-2014-337-LIS). Rotterdam: Erasmus Research Institute of Management.

De Jong, Annemarie, Henk J. de Vries & Ton Wentink (2001). **ISO 9000 in de praktijk – Onderzoek naar toepassing van de ISO 9000:1994-normen in Nederland**. Delft: Nederlands Normalisatie-instituut.

42 De Vries, Henk J., Dennis K. Bayramoglu & Ton van der Wiele (2012). Business and environmental impact of ISO 14001. **International Journal of Quality & Reliability Management**, 29, 4, 425-435.

43 Van Wessel, Robert M. & Henk J. de Vries (2013). Business Impacts of International Standards for Information Security Management. Lessons from Case Companies. **Journal of ICT Standardization**, 1, 1, 25-40.

44 Van de Crommenacker, Erik & Henk J. de Vries (2013). Business Continuity Management conform ISO 22301. **KAMNieuwsbrief**, 2013-4, 28-32.

Together with former colleague Johan van Rekom, I studied the impact of product certification seals (based on standards) on consumer behaviour.⁴⁵ Our findings have policy implications as well – for instance, they show that the decision to terminate the Dutch healthy food logo **Het Vinkje** was wrong.⁴⁶

Standardisation is an important enabler of globalisation but may result in homogenisation or, in terms of Ritzer, McDonaldisation.⁴⁷ Authenticity is receiving increasingly more attention as a counter movement against globalisation. Together with students, with my former colleague Frank Go and with my Chinese colleague Guojun Zeng from the Sun-Yat Sen University in Gangzhou, I studied standardisation in relation to authenticity, mainly in the hospitality industry, and examined the business impact.⁴⁸

45 Van Rekom, Johan, Henk J. de Vries, Ilona de Hooge, Suzanne Nakhla & Tarik Amrhar (2013). **Certification logos: what message do they convey to consumers?** In: **Proceedings 8th Global Brand Conference, Special Interest Group on Brand, Identity and Corporate Reputation of the Academy of Marketing**. Porto: Catholic University of Portugal.

Van Gent, Jurriaan, Henk de Vries & Johan van Rekom (2011). **Front of pack nutrition labels – When do consumers use them and does this influence purchase intentions?** In: Vladislav V. Fomin & Kai Jakobs (Eds) **EURAS Proceedings 2011 – Services for Development**. Aachen: Wissenschaftsverlag Mainz, pp. 331-349.

46 De Vries, Henk (2016). **Het Vinkje verdwijnt ten onrechte**. Blog. Amsterdam: ESB. <https://esb.nu/blog/20021103/het-vinkje-verdwijnt-ten-onrechte>.

47 Ritzer, George (2013). **The McDonaldization of Society**. Ed. 20. Thousand Oaks, CA / London / New Delhi / Singapore: Sage.

48 Zeng, Guojun, Henk J. de Vries & Frank Go (2019). **Restaurant chains in China – The dilemma of standardization versus authenticity**. Singapore: Palgrave.

De Vries, Henk de Frank Go & Sophie Alpe (2018). **The necessity for a local level of gastronomic tourism standardization – The case of Torino's city branding**. In Tina Melo Dias (Ed.) **Modelling Innovation Sustainability and Technologies**. Cham, Switzerland: Springer, 205-221.

De Vries, Henk J. & Frank M. Go (2017). Developing a Common Standard for Authentic Restaurants. **The Service Industries Journal**, 37, 15-16, 1008-1028.

Maas, Laurens J.A. & Henk J. de Vries (2015). **Standardisation in the French Wine Industry and the Effect on Authenticity**. In: Katrine Bergh Skriver, Kai Jakobs & Jesper Jerlang (Eds) **EURAS Proceedings 2015 – The Role of Standards in Transatlantic Trade and Regulation**. Aachen: Wissenschaftsverlag Mainz, pp. 253-270.

Zeng, Guojun, Frank Go & Henk de Vries (2012). Paradox of Authenticity versus Standardization: Expansion Strategies of Restaurant Groups in China. **International Journal of Hospitality Management**, 31, 4, 1090-1100.

The impact of participation in standardisation also deserves attention.⁴⁹ I developed a method to calculate the financial impact of participation in standardisation.⁵⁰ The findings show that the more substantial benefits relate to increased market share rather than reduced cost, and the key to return on the investment is that the company is expected to have real influence in the committee. This is in particular the case if its position among the other participating stakeholders allow the company to tip the balance between a favourable and a less favourable outcome.

Standards may relate to regulation. A way to do this is to lay down essential requirements in legislation, and more detailed requirements and testing methods for specific product groups in voluntary standards. Meeting the standards then gives a presumption of conformity to the legal requirements. This makes the legal system flexible and stimulates innovation. This is the strength of the European system for technical regulation, standards and conformity assessment compared to all other systems in the world. Because of this strength, policymakers see standardisation as an important instrument to support their policies. However, embracing it too strongly may be detrimental. The growing influence of the European Commission in European standards setting seems to have become counterproductive in the sense that it weakens rather than strengthens the European system that also suffers from internal inertia. Some recent court cases have exacerbated the situation by suggesting that standards referred to in legislation become part of that legislation. These developments undermine the superiority of the current European system. This is not a core topic of

standardisation research at RSM, but it is discussed in several studies.⁵¹

2.8 Management of standards and standardisation

The management of standards and standardisation deserves special attention at the Rotterdam School of Management. It is interwoven in the research I already mentioned. Together with our first professor of standardisation, Jan Simons, I wrote the first and only management book on standardisation in the world.⁵² I am currently preparing another book on standardisation management, to be published by Emerald.

2.9 Education about standardisation

The predecessors of our first book were synopses of readings on standardisation. This brings me to the last topic of what has been accomplished: education. The International Organization for Standardization ISO has awarded my teaching programme as the best in the world. The programme is based on the combination of my practical experience and my academic research. I designed the curriculum based on the systematic approach developed by Van de Lagemaat who used the philosophy of

49 Blind, K., H.J. de Vries & A. Mangelsdorf, (2012). **External knowledge sourcing and involvement in standardization - Evidence from the community innovation survey**. In: **Technology Management Conference (ITMC)**, 2012 IEEE International. New York: IEEE, pp. 1-9.

De Vries, Henk J. (2006). **Standards for Business – How companies can profit from participation in international standards setting**. In: **Standardization as a strategic tool**. Geneva: IEC.

Simons, C.A.Jan & Henk J. de Vries (2006). Effectiveness of Participation in Standardisation. **Synthesis Journal**, 2006, 15-20.

Schaap, Arjan & Henk de Vries (2004). **Evaluatie van normalisatie-investeringen – Hoe MKB-bedrijven kunnen profiteren van deelname aan normalisatie**. Zoetermeer: FME-CWM.

50 De Vries, Henk J. & Joey Veurink (2017). Cost-benefit Analysis of Participation in Standardization – Developing a Calculation Tool. **International Journal of Standardization Research**, 15, 1, 1-15.

51 Wiegmann, Paul Moritz (2019). **Setting the Stage for Innovation: Balancing Diverse Interests Through Standardisation** ERIM PhD Series Research in Management 473. Rotterdam: Erasmus Research Institute of Management – ERIM.

Wiegmann, Paul Moritz (2019). **Managing Innovation and Standards: A Case in the European Heating Industry**. Cham: Palgrave Macmillan.

De Vries, Henk J., Bert Nagtegaal & Stijn Veenstra (2017). Business Need and Opportunities for Transatlantic Harmonization of Standards and Conformity Assessment. **Standards Engineering**, 69, 2, 1-12.

De Vries, Henk J., Bert Nagtegaal & Stijn Veenstra (2017). Harmonisation transatlantique des normes et de l'évaluation de la conformité. **Enjeux**, 378, 65-70.

De Vries, Henk J., Bert Nagtegaal & Stijn Veenstra (2017). **Transatlantic Harmonisation of Standards and Conformity Assessment – A Business Perspective**. In: Kai Jakobs & Knut Blind (Eds) **EURAS Proceedings 2017 – Digitisation: Challenge and Opportunity for Standardisation**. Aachen: Wissenschaftsverlag Mainz, pp. T39-T58.

De Vries, Henk J. (2015). **Governance of electrotechnical standardisation in Europe**. Rotterdam: Rotterdam School of Management, Erasmus University.

De Vries, Henk, Albert Feilzer, Harry Gundlach & Jan Simons (2010). **Conformity Assessment**. In: Hesser, W., A.J. Feilzer & H.J. de Vries (Eds) **Standardisation in Companies and Markets**. Ed. 3. Hamburg: Helmut Schmidt University Hamburg, pp. 871-904.

52 Simons, C.A.J. & H.J. de Vries (2002). **Standaard of maatwerk – Bedrijfskeuzes tussen uniformiteit en verscheidenheid**. Schoonhoven: Academic Service.

Dooyeweerd.⁵³ I have described this curriculum design in scientific papers.⁵⁴

I also stimulated education about standardisation outside RSM – in the Netherlands, in Europa and globally. I will not describe these efforts today because I now want to focus on research. But the activities in stimulating education have also led to several research

53 Dooyeweerd, H. (1955). **A new critique of theoretical thought 2: The general theory of the modal spheres**. Amsterdam, the Netherlands: Uitgeverij H. J. Paris / Philadelphia, PA: The Presbyterian Reformed Publishing Company.

Dooyeweerd, H. (1957). **A new critique of theoretical thought 3: The structures of individuality of temporal reality**. Amsterdam, the Netherlands: Uitgeverij H. J. Paris / Philadelphia, PA: The Presbyterian Reformed Publishing Company.

Van de Lagemaat, D. (1986). **Onderwijzen in ondernemen**. Culemborg, The Netherlands: Educaboek.

54 De Vries, Henk J. (2005). **Standardization Education**. In: Manfred J. Holler & Esko Niskanen (Eds.) **EURAS Yearbook of Standardization**, Vol. 5. Special issue of *Homo Oeconomicus*, 22, 1, 71-91.

De Vries, Henk J. (2019). **Addressing Sustainability in Education about Standardization – Lessons from the Rotterdam School of Management, Erasmus University**. In: Samuel O Idowu, Henk J. de Vries, Ivana Mijatovic & Donggeun Choi (Eds) **Sustainable Development: Knowledge and Education about Standardization**. Cham, Switzerland: Springer. (Forthcoming).

papers about education in this field.⁵⁵

55 Idowu, Samuel O., Henk J. de Vries, Ivana Mijatovic & Donggeun Choi (Eds) (2019). **Sustainable Development: Knowledge and Education about Standardization**. Cham, Switzerland: Springer. (Forthcoming).

De Vries, Henk J., Basak Manders & Joey Veurink (2014). **Cooperation between National Standards Bodies and Universities**. Rotterdam: Rotterdam School of Management, Erasmus University.

De Vries, H.J. (2014). **How to implement standardization education in a country?** In: K. Jakobs (Ed.) **Modern Trends Surrounding Information Technology Standards and Standardization within Organizations**. Hershey, PA: IGI Global, pp. 262-275.

Choi, Dong Geun & Henk J. de Vries (2013). Integrating standardization into engineering education – The case of forerunner Korea. **International Journal of Technology and Design Education**, 23, 4, 1111-1126.

De Vries, Henk J., Basak Manders & Joey Veurink (2012). **Materials for academic teaching on standardisation**. In: Marta Orviska & Kai Jakobs (Eds) **EURAS Proceedings 2012 – Standards and Innovation**. Aachen: Wissenschaftsverlag Mainz, pp. 77-94.

De Vries, Henk J. (2011). Implementing standardization education at the national level. **International Journal of IT Standards and Standardization Research**, 9, 2, 72-83.

Choi, Dong Geun & Henk J. de Vries (2011). Standardization as emerging content in technology education at all levels of education. **International Journal of Technology and Design Education**, 21, 1, 111-135.

Hesser, Wilfried & Henk J. de Vries (2011). **White Paper Academic Standardisation education in Europe**. Hamburg / Rotterdam: European Academy for Standardisation.

De Vries, Henk J. & Tineke Egyedi (2010). **Standardization Education: Developments and Progress**. In: Kai Jakobs (Ed.) **New Applications in IT Standards – Developments and Progress**. Hershey, PA: Information Science Reference, 2, pp. 204-214.

Choi, Donggeun, Henk J. de Vries & Danbee Kim (2009). Standards Education Policy Development: Observations based on APEC Research. **International Journal of IT Standards and Standardization Research**, 7, 2, 23-42.

De Vries, Henk J. (2007). 'Special Issue on Standardization Education – Guest Editorial.' **International Journal of IT Standards and Standardization Research**, 5, 2, i-ii.

De Vries, Henk J. & Tineke M. Egyedi (2007). Education about Standardization – Recent Findings. **International Journal of IT Standards and Standardization Research**, 5, 2, 1-16.

3. Future research

3.1 Global research agenda

Holding one of the few chairs on standardisation in the world also brings a responsibility to set the scene for future research. As President of the European Academy for Standardisation (EURAS) I already do this in an organisational sense. I have written several papers in which I map the field of research, identify the gaps in the literature, and suggest further research.⁵⁶

My future research fits in this broader plan. From the outset, the Endowed Chair on Standardisation has focused on the management of standards and standardisation, but my research and education includes more than only the managerial side. However, I would like to emphasise the management of standards and standardisation even more and focus on three main themes of research:

1. Companies' management of standardisation.
2. Management of complex standardisation projects in which several companies and other stakeholders cooperate to develop standards and get these accepted in the market, implemented in such a way that the intended impacts are achieved.
3. Management of the standardisation system at the local, national, regional and global levels.

At each of these levels, special attention will be given to the relationship with innovation management. Standardisation is shifting to increasingly complex systems such as those needed for smart cities and this makes the relationship with innovation even more important. Sustainability aspects need to be addressed as well. Standards are not only essential in mitigating negative externalities, they may be also instrumental when taking societal issues as the starting point for business activities.

56 De Vries, Henk J. (2002). Standardization – Mapping A Field Of Research. In: Sherrie Bolin (Ed.) *The Standards Edge*. Bollen Communications, Ann Arbor, Michigan, pp. 99-121.

De Vries, Henk J. (2015). *Standardisation - A developing field of research*. In P. Delimatsis (Ed.) *The law, economics and politics of international standardisation* (Cambridge International Trade and Economics Law). Cambridge, UK: Cambridge University Press, pp. 19-41.

De Vries, Henk J., Kai Jakobs, Tineke Egyedi, Manabu Eto, Stephan Fertig, Louise Klintner, Claudia Koch, Ivana Mijatovic, Mona Mirtsch, Piergiuseppe Morone, Marta Orviska, Ollia Kanevskaia, Cesare Riillo & Gianluca Scaramuzzino (2018). Standardization – Towards an Agenda for Research. *International Journal of Standardization Research*, 16, 1, 52-58.

De Vries, Henk J. & Fouad El Osrouti (2019). *Impact studies on standards and standardisation – Looking back and moving forward*. In: Kai Jakobs & Piergiuseppe Morone (Eds.) *Proceedings 24th EURAS Annual Standardisation Conference – Standards for a Bio-Based Economy*. Aachen: Wissenschaftsverlag Mainz, pp. 131-142.

3.2 Company level management of standardisation

Companies develop own standards and implement external standards. Additionally, they may participate in external standardisation. Despite its importance, standardisation issues are not a common topic on the agenda of companies. Standards and standardisation are not managed systematically in most companies and integrating standardisation in innovation projects tends to be operational rather than strategic and is sometimes absent. Lack of awareness, understanding and vision are important reasons.⁵⁷ Bridging the gap between academic insights and business practice may contribute to addressing these issues. I intend to continue writing management books on standardisation and related strategy papers and hope to be able to communicate the findings in the near future.

Because of this lack of professional standardisation management, empirical studies that aim to distinguish between poor, good and better management practice are hardly feasible although some best practice case studies are possible.⁵⁸ Such research could be the basis for follow-up action research: developing improvement actions within single companies or groups of similar companies and measuring impacts. Cooperation with trade associations would be beneficial for such research, but also cooperation at local level: How can a combination of local, national, regional and international levels of standardisation be beneficial to the local company, village, city or province? Here also the local level of standardisation, to support authenticity and sustainability, deserves attention. Another extension will be to cooperate with NGOs to support them to use standardisation in a better way to reach their goals.

3.3 Management of inter-organisational standardisation projects

Another research field is the management of standardisation projects. These projects may bring benefits to certain stakeholders but disadvantage others. Only a few academic studies on the impact of standards and standardisation address the inter-organisational project level.⁵⁹ Impact studies are needed per standard or per set of interrelated standards and related to different stakeholders in different countries to enhance our understanding. This should include multi-method research in an international research team. Findings on impacts should then be related to stakeholders

57 De Vries, Henk, Knut Blind, Axel Mangelsdorf, Hugo Verheul & Jappe van der Zwan (2009). *SME Access to European Standardization - Enabling small and medium-sized enterprises to achieve greater benefit from standards and from involvement in standardization*. Brussels: CEN and CENELEC.

58 De Vries, Henk J. (2006). Best Practice in Company Standardization. *International Journal of Standards and Standardization Research*, 4, 1, 62-85.

ISO (2011). *Economic benefits of standards. Volume 1*. Geneva: International Organization for Standardization ISO.

ISO (2012). *Economic benefits of standards. Volume 2*. Geneva: International Organization for Standardization ISO.

59 De Vries, Henk J. & Fouad El Osrouti (2019). *Impact studies on standards and standardisation – Looking back and moving forward*. In: Kai Jakobs & Piergiuseppe Morone (Eds.) *Proceedings 24th EURAS Annual Standardisation Conference – Standards for a Bio-Based Economy*. Aachen: Wissenschaftsverlag Mainz, pp. 131-142.

participating in standardisation at the global, regional and at the national level, to the way this process is managed at these levels, and to innovation in the applicable fields. Such research is challenging but essential to collect evidence about the current functioning of standardisation, as a starting point for improvements. For these improvements, action research could be used, at the level of project management, in close cooperation with a standards body, and combined with impact assessment.

A complementary approach is to start at the innovation side, as done by former PhD student Paul Wiegmann, using the case of micro-combined heat and power, a radical innovation in the heating industry.⁶⁰ Due to the large variety in categories of standards and categories of innovation, many case studies are needed to develop better theory on the interrelation of standardisation and innovation.⁶¹ This variety in categories of innovation can be illustrated by findings from a study on the impact of energy performance standards for houses on innovation. Our findings show that a combination of two standards led to innovation of products, entire houses, the design process and organisations, both incremental and systemic, and both at the level of individual houses and of groups of houses.⁶²

	Level			
	Individual house		Groups of houses	
	Incremental	Systemic	Incremental	Systemic
Innovation of product or system	Thicker insulation material	Solar energy system	Thicker insulation material	Standard houses
Innovation of whole house	NatMech ventilation	MechMechHR ventilation	Standard houses	Houses with common energy generation and storage
Innovation of design process	Software to calculate energy performance	Integration of energy performance calculation in design software	Software to calculate energy performance	Integration of energy performance calculation in design software
Innovation of organisation(s)	Cooperation between suppliers of heating systems and ventilation systems	Construction team & Design and construct	System integrator	Construction team & Design and Construct & Outsourcing

Figure 2: Examples of innovations caused by the tightening of energy performance standards in the Netherlands (De Vries & Verhagen, 2016, Table 5).

3.4 Management of standardisation systems

The last topic of research is the management of standardisation systems. For just a simple product like eggs, consumers in this small country can rely on ten different seals of conformity to requirements for the environment and for animal welfare.⁶³ This is confusing for consumers, retailers and farmers. These requirements are laid down in standards from eight different organisations. For complex technological areas like the Internet of Things, hundreds of standard developing organisations are available all over the world and the new Chinese law on standardisation⁶⁴ leads to a further increase.

60 Wiegmann, Paul Moritz (2019). *Managing Innovation and Standards: A Case in the European Heating Industry*. Cham, Switzerland: Palgrave Macmillan.

61 De Vries, Henk J. & Paul Wiegmann (2017). *Impact of service standardization on service innovation*. In: Richard Hawkins, Knut Blind & Robert Page (Eds) (2017) *Handbook of Standards and Innovation*. Cheltenham, UK / Northampton, MA: Edward Elgar, pp. 187-211.

62 De Vries, Henk J. & W. Pieter Verhagen. (2016). Impact of changes in regulatory performance standards on innovation: A case of energy performance standards for newly-built houses. *Technovation*, 48-49, 56-68.

63 Milieucentraal (2019). *Keurmerkenwijzer – eieren*. Utrecht: Milieu Centraal. <https://keurmerkenwijzer.nl/overzicht/eieren/> (Accessed 2019-08-22).

64 SESEC Team (2017). *Standardization Law of People's Republic of China (Issued on 4 November 2017)*. – SESEC III Translated Document. Beijing: Seconded European Standardization Expert in China (SESEC).

It is just a mess and even multinationals with a dedicated and knowledgeable standardisation department like Philips and Microsoft are unable to get an overall view and choose the best form of involvement. How can we improve this situation? My idea is to start bottom-up by analysing standardisation projects. Then a cross-case analysis may reveal patterns in current project management that relate to the processes and governance of standardisation – at the global, regional and national levels, and related not only to standards bodies but also to trade associations, non-governmental organisations and governments. A better understanding of processes and governance may form the basis for improvement initiatives followed by impact assessment and measurement.⁶⁵

65 De Vries, Henk J. (2015). **Governance of electrotechnical standardisation in Europe**. Rotterdam: Rotterdam School of Management, Erasmus University.

De Vries, Henk, Knut Blind, Axel Mangelsdorf, Hugo Verheul & Jappe van der Zwan (2009). **SME Access to European Standardization - Enabling small and medium-sized enterprises to achieve greater benefit from standards and from involvement in standardization**. Brussels: CEN and CENELEC.

4 Standardisation relevance to animals

Now back to World Animal Day. Would this research be relevant to animals? I will show four examples – two related to United Nations Sustainable Development Goal 14 **Life below water** and two related to Goal 15 **Life on land**. Let's start with life below water.

4.1 Case 1: Anti-fouling paint⁶⁶

Life in water may suffer from poison in paints used for ships. To prevent gennet growth at the under-water part of the skin of ships, anti-fouling paint may be used. Gens increase resistance and because of them, the ship needs more energy. A disadvantage of antifouling paint, however, is that it contains the biocide tributyltin (TBT) which disturbs the hormone level of fishes and other water organisms. Therefore, in 1999, certain types of biocide use were forbidden, and paint producers developed alternative paints. Copper-based biocides were one of these alternatives. For the acceptance of anti-fouling paints in the market, producers needed to provide calculations of the leak rate of the biocides in the paint. We investigated the case of the international standard ISO 15181-2, developed to provide a standardised method and calculation model for measuring the speed of dissolving copper-based paint biocides in water. We discovered that the calculation method was inaccurate. This allowed the paint industry to continue producing polluting paints. So here we conclude that having a common standard is crucial, but this standard misled the authorities as in the Dieseltgate scandal. The standard's contents does not take animal interests into account. In our research, we relate this to stakeholder involvement in standardisation. In this case, the standardisation committees were dominated by big paint producers. My research aims at better understanding stakeholder representation, which should form the basis for a more inclusive standardisation practice.

4.2 Case 2: Plastic soup

The first case evaluated an existing standard, our second case is about the need for new standards. Here the issue is the increasing amount of plastic in oceans: the plastic soup, which is harmful to animals. The Port Authority of Rotterdam wanted to clean its harbour to ensure that no plastic would enter the North Sea. A group of students I supervised was asked to look for innovative solutions⁶⁷. They found that it was first necessary to measure plastic pollution to assess the need for cleaning and later to

66 Gottlieb, Amir, Hugo Verheul & Henk de Vries (2003). **Project Verbetering formele normalisatieproces – Case ISO 15181: Paints and varnishes – Determination of release rate of biocides in antifouling paints**. Delft / Rotterdam: Centre for Process Management and Simulation.

International Organization for Standardization (2000). **ISO 15181 'Paints and varnishes – Determination of release rate of biocides in antifouling paints'**. Geneva: International Organization for Standardization

67 Vis, Anna, Talitha Kalidien, Emiel Stöver, Nelson Johnson, Niklas Zeller & Henk Middelkoop (2015). **Port Waste Catch. (Unpublished report for LDE Minor Responsible Innovation)**.

check whether cleaning was successful. Research institutes use different research methods. In order to get comparable results, standardisation is needed. This standardisation would not only address the way to measure plastics in a sample of water, but also how to gather such a sample. This is not easy because the concentration of plastics differs per place and time. Computer simulation models have been developed to measure the concentration of sediments. Similar models would be needed for plastics. Having a standard with a dynamic model would be innovative as such. Anyhow, standardisation is one of the instruments to tackle the issue of the plastic soup, for the benefit of sea life.

4.3 Case 3: Light pollution

Light pollution can be detrimental for certain animals. In ancient times, nights were dark, except for some light provided by moon and stars. Now, there is a lot of artificial light during night-time. This may confuse the navigation of birds and bats, may change predator-prey relations, and may cause physiological harm. The main producer of lamps and lighting systems recognised this issue, started talks with environmental NGOs, and they are now providing solutions that reduce light pollution. I initiated this move 14 years ago, when I supervised a student who was writing his master thesis on how this company could deal with societal impact in a standard about business excellence, the EFQM model.⁶⁸ Until then, the company's societal contribution mainly consisted of employees reading stories to school children at a nearby primary school once a week during their lunch break. Now the company relates societal impact to their core business. By the way, this discussion with the student 14 years ago also initiated the European ban on light bulbs.

4.4 Case 4: Sustainable tourism⁶⁹

The last case is about sustainable tourism. In this project I cooperated with the Waddenvereniging, an environmental society focused on protecting the wetland area in the North of the Netherlands, Waddengebied. One of my students investigated whether it would be feasible to reduce the negative impact of tourism on nature and the environment on one of the islands, Texel, via a certification seal for sustainable tourism. She developed the possible contents of a standard by benchmarking it with a standard for sustainable tourism for the Great Barrier Reef in Australia, and by investigating the specific features on Texel. The standard would have to be combined with a certification programme to ensure that requirements for accommodation or tourist activities are met. This would even allow an increase in the number of tourists while at the same time reducing the impact on nature. The island has a cap on the number of tourists and therefore owners of accommodation are not allowed to expand. She suggested that the island could grant permission to owners to grow slightly if they adhered to the standard. This would improve both economic and ecological performance.

68 Melis, Dirk (2005). *Excellence and society – Een onderzoek naar de ontwikkeling van een model voor effectief excelleren met betrekking tot de society van Philips Lighting Benelux*. Eindhoven: Philips Lighting Benelux

69 Hickendorff, Lisanne (2014). *Keurmerk voor duurzaam toerisme in Waddengebied – Draagvlak bij Texelse ondernemers*. (Unpublished master thesis).

Entrepreneurs on the island were positive. However, so far there has been no project follow-up. From a standardisation theory perspective, this win-win situation between economic and ecological performance is interesting, as is the local level of standardisation in a global context.

I could give you many more examples related to any of the sustainable development goals, or I could have taken more commercial company cases. I hope I have shown you the relevance of standardisation for both business and society, and the need to increase our understanding of this phenomenon, including the managerial side at the level of companies, projects and the standardisation infrastructure. I look forward to continuing cooperation with many of you.

5 Thanks

I would like to end this inaugural address by thanking the people that paved the way to this milestone. I would like to start by thanking the Executive Board, President and Vereniging Trustfonds of the Erasmus University Rotterdam, the members of the appointment and advisory committees, and the Dean and the Dean of Faculty of the Rotterdam School of Management for my appointment as the Endowed Professor of Standardisation Management.

The chair on standardisation was established by a special foundation: Stichting Bijzondere Leerstoel Standaardisatie en Normalisatie. I would like to thank the Board members of this foundation and their predecessors for their confidence and ongoing support. I would also like to thank the current and former Directors of the Netherlands Standardization Institute and the Board of the Stichting Nederlands Normalisatie-instituut for their financial support since 1994.

Since 2019, the company ZIB Investments Crowdfunding is the second sponsor of the chair. I cordially thank Henk van Koeveringe for his confidence and support and I look forward to a fruitful cooperation.

It is almost 35 years ago that I entered the wonderful world of standardisation and so many people played a role in getting me where I am now. I'm afraid it is impossible to mention all the people and organisations that have played a role.

First, I would like to thank my parents for their love and education. My mother stimulated me to enter the academic world, my father emphasized modesty.

The critical thinking needed for proper research for me started secondary school, de Christelijke Scholengemeenschap in Assen, in particular by my teachers Knol (mathematics), Kok (history) and Stellingwerf (geography), and at Delft University of Technology by people like Baarda, Van der Schans and Schuurman. I broadened my vision through my involvement in the Christian student association CSR, the International Christian Study-centre ICS (now ForumC) and Christian Philosophy. Dear friends: you are an ongoing source of inspiration.

An uncle of mine, Aad Hemelaar, participated in one of the standardisation committees of the Netherlands Standardization Institute, representing the Dutch Banking Association (Nederlandse Vereniging van Banken). He mentioned that the secretary was due to retire and encouraged me to apply for this position. And so I entered the world of standardisation in 1984.

I became secretary of standardisation committees. Being an engineer, I was assumed to be able to do this. A strange assumption – when we go to the dentist, we hope that he or she has had a proper education, but apparently this did not apply to standardisation.

And this was and still is seen as normal, with just a few exceptions of people who really understand that standardisation is a profession for which professional knowledge is needed underpinned by scientific research.⁷⁰ A colleague within the institute pointed me at this issue: Wubbo Winter, who was in charge of supporting companies in standardisation. He had tried to develop theories about standardisation himself, together with his assistant Jacob Bouma.⁷¹ But Bouma left, and I became his successor in 1998. It was great to cooperate with Wubbo and with the many colleagues at the Netherlands Standardization Institute. In particular, I would like to mention Dick Hortensius, Robert Huigen, Annemarie de Jong, Herman Schippers, Harmen Willemse and Jappe van der Zwan for the pleasant cooperation lasting many years.

From then, the idea of writing a PhD thesis on standardisation haunted me. When the chair on standardisation was established in 1994, I got the opportunity to do this, but the first professor, Jan Simons, and I started with education. His experiences as Director Corporate Standardisation at Philips International were complementary to mine, so I learnt a lot from him. His successors, Albert Feilzer and Knut Blind, did the work at RSM next to an academic position at another university. I thank them for giving me the freedom to build the chair in the way I thought was important. In this period, I worked together intensively with Teun Hardjono. Teun: thank you very much.

Since I started at RSM in 1994, it has developed into the research-based top-ranked business school it currently is. Recently the focus on being a force for positive change in the world has been added. During all these years, I had pleasant contacts with colleagues, and I learnt a lot from them – thanks to all of you. For a soccer player, joining a team that plays in the Champions League is demanding but great – and so is it for me to team up with my colleagues, in particular in the section Innovation

70 Brady, Robert A. (1929). *Industrial Standardization*. New York: National Industrial Conference Board, Inc.

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71 Bouma, J.J. & W. Winter (1982). *Standardization fundamentals*. Delft: Nederlands Normalisatie-instituut.

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Management:⁷² thank you very much. Thank you, Carmen, Cheryl, Ingrid and Lianne for your support! Also, a word of thanks to all support staff outside the department. And I should mention Bert Balk, Jan Dul, Frank Go, Tony Hak, René de Koster, Johan van Rekom and Rob van Tulder for their cooperation and support in different ways.

I really appreciate the cooperation with current and former PhD students Fouad El Osrouti, Basak Manders, Geerten van de Kaa and Paul Wiegmann, and with external PhD students and other research colleagues Muhammad Asif, Abdel Alshadafan, Donggeun Choi, Simon den Uijl, Tineke Egyedi, Stephan Fertig, Barbara Flügge, Ries Haverkamp, Kai Jakobs, Heejin Lee, Piet Ribbers, Paul Schröder, Hans Teichmann, Everard van Kemenade, Hugo Verheul, Robert van Wessel, Reinhard Weissinger, Guojun Zeng, and Hanah Zoo. Together we have increased our knowledge of the standardisation phenomenon. I would like to thank Sandy van der Meer-Lieftinck for her linguistic support.

Students learn from teachers, but the Jewish tradition emphasizes that teachers learn from students as well. I learnt a lot from the thousands of participants in my courses and even more from the 400 students I have supervised over the years. I enjoyed doing this, with less than a handful exceptions. And some of you supported me in the role of student assistant – another positive experience.

I also would like to thank my colleagues and friends in professional and scientific communities such as the European Academy for Standardisation EURAS, the International Cooperation for Education about Standardization ICES, the International Federation of Standards Users IFAN, and the Dutch Academy for Quality DAQ.

I had the pleasure to cooperate with many standards bodies at the global level (ISO, IEC, ITU, ASTM, Ecma International) and at the regional level (CEN, CENELEC, ETSI, GSO), and with national standards bodies – primarily in The Netherlands but also in Norway, Sweden, Finland, Estonia, Latvia, Denmark, Irish Republic, UK, Belgium, Luxembourg, France, Switzerland, Austria, Croatia, Romania, Moldova, China, South-Korea, Japan, Singapore, Indonesia and Canada. Other cooperation partners were national governments of China, Japan and The Netherlands, the European Commission, the Asia Pacific Economic Cooperation, the United Nations Economic Commission for Europe, and hundreds of companies, trade associations, research institutes and non-governmental organisations in the Netherlands, in Europe, and elsewhere in the world – too many to list. The global and diverse contacts have enriched my perspectives.

For spiritual support, I would like to mention the PrayEUR colleagues and the church community in Delft, Binnenstad-Vrijenban. I thank family and friends for their understanding that the time invested in professional life comes at the cost of the time spent with you.

72 Recently our Masters Programme **Management of Innovation** was ranked as best in Western Europe (http://dev.best-masters.com/html2pdf/pdf/diplome_ecole/889/7493_Top_200_889_c2019.pdf).

In particular, I thank my children Roelf-Jan, Juriëna, Maria, and Jan-Lieuwe for love, understanding, involvement and sometimes also practical support. I would like to welcome Francis, Iris and Lev as new family members.

My beloved life companion Anneke: how should I thank you? You received royal recognition for the way you support so many people in many ways. But in the reasoning for this distinction the support you provide for me was forgotten. Without you I could not do what I do.

Finally, I would like to cite the 11th century philosopher, theologian and Benedictine monk Anselmus:

I acknowledge, Lord, and I give thanks that You have created your image in me, so that I may remember You, think of You, love You. But this image is so affected and worn away by vice, so darkened by the smoke of sin, that it cannot do what it was made to unless You renew it, and reform it. I do not try, Lord, to attain Your lofty heights, because my understanding is in no way equal to it. But I do desire to understand Your truth a little, that truth that my heart believes and loves. For I do not seek to understand so that I may believe; but I believe so that I may understand. For I believe this also, that 'unless I believe, I shall not understand' [Isa 7:9].⁷³

Ik heb gezegd.

73 Anselmus of Canterbury (1998). **The Major Works, including Monologion, Poslogion and Why God became man**. Oxford's World Classics. Oxford: Oxford University Press, p. 87 (Suggested by: Van Helden, Jan (2018) Pray first and ask questions later. *Inspirare - Tijdschrift voor Evangelische & Charismatische Theologie*, 1, 1, pp. 39-49).

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