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Corporate Standardization Management

A Case Study of the Automotive Industry

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2017

Document Version:
Publisher's PDF, also known as Version of record

Link to publication

Citation for published version (APA):
Foukaki, A. (2017). *Corporate Standardization Management: A Case Study of the Automotive Industry*. [Doctoral Thesis (monograph), Department of Business Administration].

Total number of authors:
1

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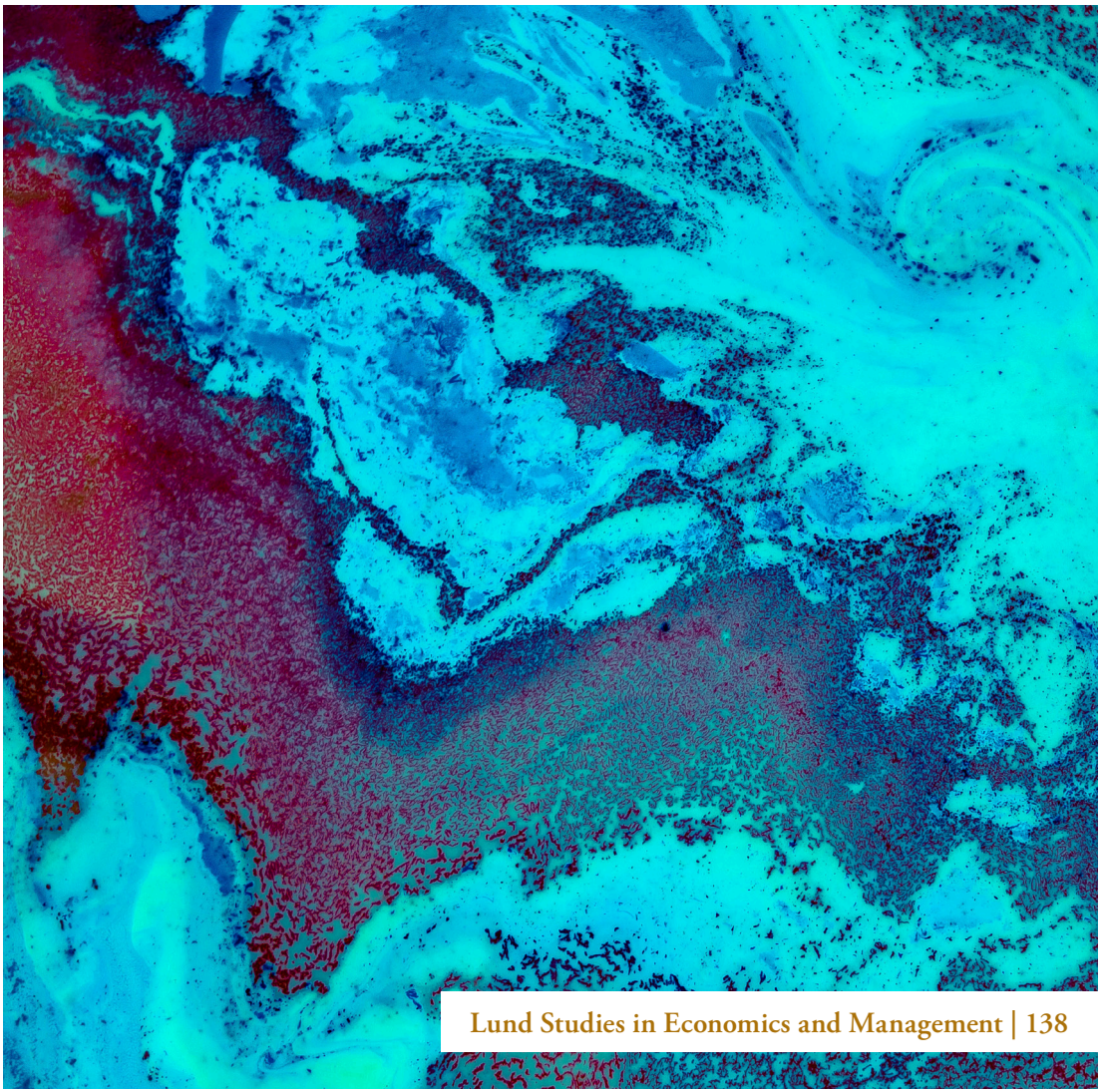
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Corporate Standardization Management

A Case Study of the Automotive Industry

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Lund Studies in Economics and Management | 138

Corporate Standardization Management

A Case Study of the Automotive Industry

Amalia Foukaki



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DOCTORAL DISSERTATION
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To be defended at Holger Craaford Ekonomicentrum EC3:207.
Date 31st March 2017 and time 13.00.

Faculty opponent
Associate Professor Søren Henning Jensen

Organization LUND UNIVERSITY	Document name Doctoral Dissertation
School of Economics and Management	Date of issue 31st March 2017
Author: Amalia Foukaki	Sponsoring organization

Title and subtitle

Corporate Standardization Management: A Case Study of the Automotive Industry

Abstract

In modern business, standards are too important to be ignored. But what is the rationale for active engagement in long and costly standardization processes when most of those standards will be openly available for a much lower price once they are finalized? What are the strategic motives for engaging in such processes? And even when the motives are clear, how is corporate standardization managed, both inside and outside of the organization? Prior standardization and strategic management literatures have not explored these inquiries, leading to a limited understanding of corporate standardization management and its drivers, complexities, and potential.

An in-depth comparative case study of two heavy-truck manufacturers, Scania AB and Volvo Group, provides insights into organizations' varied choices, rationales and desired outcomes in regard to corporate standardization management. Depending on the organizations' corporate strategies and particular needs, different standardization approaches may serve them most effectively. The findings from this qualitative study provide empirical evidence for at least two standardization approaches emerging in the context of voluntary consensus-driven standardization settings, namely the assertive approach and the vigilant one. The choice of standardization approach should comprise a deliberate and informed managerial decision, while the findings indicate that active engagement in standardization work could function as an effective way for managing organizations' resource dependence and environmental uncertainties and hence shall be catalogued as such, advancing Resource Dependence theory.

Finally, this study highlights corporate standardization management from a co-opetitive angle, which to some degree appears to resolve inter-organizational tensions within standardization settings, by demonstrating the possibilities of "win-win strategies". In other words, this thesis manifests the theoretical relevance of co-opetitive stances in the contemporary, increasingly complex business environments, where old-school competitive viewpoints might prove insufficient for success or even survival.

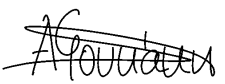
Key words

Standardization management, interorganizational relations, resource dependence, coopetition, corporate strategy

Classification system and/or index terms (if any)

Supplementary bibliographical information		Language: English
ISSN and key title 138		ISBN 978-91-7753-169-2 (print) 978-91-7753-170-8 (pdf)
Recipient's notes	Number of pages 321	Price
	Security classification	

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A Case Study of the Automotive Industry

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Department of Business Administration

ISBN 978-91-7753-169-2 (print)
ISBN 978-91-7753-170-8 (pdf)
ISSN 138

Printed in Sweden by Media-Tryck, Lund University
Lund 2017









To mom and dad (of course!)

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Acknowledgements

I will never forget what my supervisor Matts Kärreman told me during one of the very first struggles of my PhD journey: "The real outcome of the process is not the thesis itself, it's the researcher … it's the person". The person who submitted this thesis is not the same as the person who started this project four years earlier. Going through the PhD process has helped me develop, see "reality" with different eyes, look for hidden perspectives, actively search further even when answers seem obvious, and even understand the world differently: less black-and-white and much more nuance in between.

During this journey, a number of people played an immense role and have forever left a mark on the new person that emerged from the process. First of all, I wish to thank my supervisors, Thomas Kalling and Matts Kärreman. Thomas, thank you for getting things done (sometimes) and pushing me to exceed myself (no matter how long this might take, other times). Through the struggle, I have learned that there is always a way and this is probably the most valuable gift I received from you and this PhD journey – yes, even more precious than the title of "Dr." Matts, you have done so much more than I would have expected you to. You have been an inspiring supervisor, a real mentor both with regard to professional and personal life, and a good friend. There are only few people in the world whom I enjoy having discussions with as much as I do with you, and even fewer who can teach me so many things, on so many levels, as you have done those past years. You are the one I always come to with questions and requests for advice. I hope I can still do this even after today.

To Sveriges Standardiseringsförbund, who generously funded the Standardisation Research Centre and to whom we owe this project, among others, thank you for opening up new horizons and empowering interesting and useful research. Without your generous donation, it would not have been possible.

To the managers and employees at Volvo and Scania who so eagerly assisted me with this project, thank you for sharing your working lives and experiences with me. Without the material you provided me with, this project would not have been materialized. You made my fieldwork useful and stimulating.

To the discussants during my various seminars, from the first year to the mid and final seminars, you have provided me with sharp questions and comments, but also with additional excitement and confidence because "the opponents got what I'm trying to say!" Thank you Martin B., Magnus J., Anna B., Anna T. and Lars B. Furthermore,

thank you Magnus J. for being a great colleague from the very start of my project and a valuable research mentor, and thank you Anna T. and Martin B. for being such great co-teachers.

Thank you to my colleagues at the Institute (which is no longer called that, but I will always think of it as "the Institute") and my fellow PhD students at Lund University: Barbara, Tomas H., Niklas, Sanne, Viky, Markus W., Louise, Natta, Nukki, Wen, Yaqian, Linn, Lena, Kaj, Christian, Ana-Paula, Jayne, Erik, Leila, Maria M., Maria B., Carys, Olgerta, and Sinan. Thank you for the breaks and the late lunches/dinners, where we would complain about "how cold and empty this place is again". It gave me a feeling of belonging, despite the occasional emptiness of the building.

My friends in Athens (Yota, Tsil, Themi, Dimitri F., Dimitri S., Pano, Panagioti, and Lila), you have been and will always be part of the best periods of my life. The precious memories will be with me forever, no matter where I call home. To my family in Crete, I miss you every day and thank you for always being there and giving me a warm hometown to return to. No matter how often and how long I visit, I never feel I've had enough time with you.

My dear Jairo, you have seen all of it: the good, the bad and the ugly, the self-questioning, the desperation, the moments of triumph and enthusiasm. Thank you for sticking with me all along. I am not so sure I always deserved it. You can always count on me too; I will be there for you when it's payback time. For all your patience and support, te amo muchísimo.

And finally, the people whose love and support has raised me and shaped me. No matter what life brings in the future, I will never be as lucky again as I have been for having you in my life. Your unconditional love and support has always been the light to discover more, to do more. Mom, Dad, Lefteri, I love you more than I can tell you.

Αφιερώνω αυτό το βιβλίο στους ανθρώπους που η αγάπη και η υποστήριξη τους με έχουν διαμορφώσει, και μου έχουν δώσει τα φώτα να ανακαλύψω περισσότερα, να κάνω περισσότερα. Δεν θα μπορούσατε να μου έχετε δώσει τίποτα παραπάνω. Μαμά, Μπαμπά, Λευτέρη, σας αγαπώ περισσότερο απ'όσο μπορώ να σας εκφράσω.

Lund, January 2017
Amalia

1 Introduction

The average modern laptop computer encompasses at least 251 technical interoperability standards, while the total number of standards relevant to such a device is in fact much higher (Jakobs, 2014). Ethernet is an example of a standard, published as far back as three decades ago and officially named IEEE 802.3. Likewise, 3G is just a set of standards, as is Wi-Fi family standards (IEEE 802.11). The list could go on to fill a whole thesis, but the bottom line is simple: take standards away, and the world would not be the same as we know it; it would simply not function the way it does. Business would not be the same either. As de Casanove and Lambert (2015, p.1) stated: "because standards frame our daily life, because standards make the world safer and more interoperable, because standards try to solve babel tower issues, they impact business"—immensely so.

Due to the importance of standards, it comes as no surprise that they have attracted plenty of research attention in the past three decades. A number of scholars have engaged in, and focused attention on, the role and effects of standards (to name a few very influential studies on the topic: David & Greenstein, 1990; Cargill, 1996; Schmidt & Werle, 1997; Swann, 2000; Blind, 2004; Gallagher, 2007; Brunsson & Jacobsson, 2000; Spivak & Brenner, 2001; Swann & Lambert, 2010; Tamm Hallström & Boström, 2010; Timmermans & Epstein, 2010; Blind, 2011a; Blind, 2011b; Buthe & Mattli, 2011; Narayanan & Chen, 2012). However, although standards per se will be explicated in the following sections, for the sake of acquainting the reader with the topic and setting the foundation (that is, what standards are and what they do), this is not a thesis about standards. It is a thesis about standardization.

1.1 Introducing standardization

Standardization can be synopsized as the consensus process that leads to standards—that is, to the institutionalization of specifications and/or practices, denoting their gradual and dynamic perceptive validation (Blind, 2004; Greenstein & Stango, 2007; Tamm Hallström & Boström, 2010). Bowker and Star (1999) characterized standardization as an attempt to construct uniformity across space and time, leading to endorsed organizational guidelines, which constitute the emerging standards. A more recent definition by de Casanove and Lambert (2015, p.4) pointed specifically to the actors, or stakeholders, of standardization, claiming that standardization is a "voluntary and deliberate process of developing specifications based on consensus among all interested parties," and naming those interested parties as industry participants (that is, firms), consumers, trade unions, public authorities, etc.

The reason why this thesis focuses on standardization, and not standards, specifically lies in the dynamics within standardization processes. While standards can be immensely important, each one is destined to be surpassed and replaced (sooner or later), as technology evolves (referring to technical standards) and new techniques emerge (referring to both technical and other types of standards). Very often, standards are updated (often a number of times during their lifespan), instead of being replaced, which nonetheless is still an indication that standards ought to be recurrently renewed or risk becoming obsolete. Standards comprise outcomes, but it is the processes around those outcomes that keep the wheel spinning. As Cargil (2015, p.18) stated, perhaps a pinch too bluntly, "standardization, not standards, matters."

Cargil (2015, p.18) explained that standards per se are "relatively sterile documents," and that the real "art" is truly (the process of) standardization, viz. the art of managing (or even manipulating, as Cargil stated) cooperative actions, which results in standards. By the same token, Cargil (2015, p.18) discussed standardization as "a method of controlling the market, either politically, economically, legally, technologically or in any combination of these areas." Cargil's thoughts are intriguing, although his statements might come across as too definite and decisive, and others before him also recognized standardization processes as arenas of lively and dynamic negotiations (Brunsson, Rasche & Seidl, 2012; Hargrave and Van De Ven, 2006; Suarez, 2004; Greenstein, 1992).

1.1.1 Standardization and strategizing

It has been acknowledged in existing literature (although rather rarely) that firms' actions within standardization settings might bear essential consequences for those firms, and consequently ought to be well thought out. Namely, Betancourt and Walsh (1995), Shapiro and Varian (1999), and Schilling (1999) were among the first to discuss the potential connection between standardization and corporate strategy. Betancourt and Walsh (1995) introduced the concept of "strategic standardization" as a firm's effort to enhance its competitiveness by leveraging standardization, while Shapiro and Varian (1999) and Schilling (1999) discussed how a firm could strategically influence its chances of success in standards wars [1] and consequently push industry development towards advantageous (for the specific firm) directions. Along similar lines, Forselius (1998) suggested that active participation in standardization settings should be appreciated as a strategic tool (for firms), which must be attentively managed and aligned with the firm's overall strategy. Bird (1998) and Updegrove (2006) also delineated standardization as a potential strategic tool for firms and most recently Cargil (2015) stated that "the reality is that most professionals (i.e. company representatives) who are there (i.e. in standardization settings) are there to defend their corporate or business position."

In other words, in a number of instances in existing literature, standardization has been pointed out as possibly playing a part, or being "a tool," for firms' strategizing (meaning firms' pursuit of their corporate strategies), although prior work has not explicitly addressed how this is materialized or what specific corporate mechanisms take place in such (strategizing) processes. Perhaps more explicitly than anyone else before, de Casanove and Lambert (2015) argued that "corporate standardization … sets up standardization strategy in alignment with global strategy of the company." Nevertheless, again, understanding of how such "alignment" is achieved, or, more generally, of the specific corporate activities and mechanisms that enable a firm to utilize standardization strategically, remains limited. That is, even though corporate standardization seems to matter in strategizing (or at least is argued to matter by a number of scholars), we do not know much about the dynamics that take place on a corporate level in relation to standardization-related activities, and how those translate into long-term strategic rationales and connotations.

[1] That is, a battle for market dominance between incompatible technologies (Shapiro & Varian, 1999).

1.1.2 How standardization is organized

Standardization has been introduced already in previous sections, but this one aims to elucidate how, exactly, it is organized—that is, which entities and actors are involved in standardization. As de Casanove and Lambert (2015) explained (and Figure 1 illustrates), standardization is organized according to three geographical levels—namely national, regional and international—with independent standardization bodies acting on each level. The purpose of conducting discussions at several levels is connected to the fact that standardization is based on consensus principles.

More specifically, on the international level, participants represent their countries—and each country is entitled to one vote. De Casanove and Lambert (2015) called this level "inter-governmental," though this falsely implies that it is primarily governments that are involved in that level's standardization processes, when in fact the International Organization for Standardization (ISO) and International Electrotechnical Commission (IEC) (that is, two out of three examples for the upper level [see Figure 1]) are nongovernmental organizations. For that reason, "international level" is rather a more appropriate label.

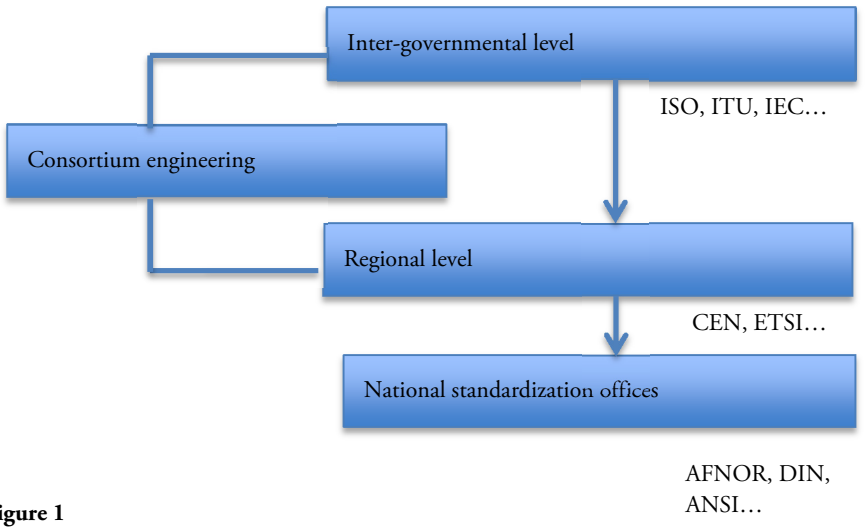


Figure 1
Standardization levels.
Source: de Casanove & Lambert (2015, p.4).

For participants to represent their countries on the international (as well as regional—that is, European) level, they need to coordinate on the national level. Examples of national standardization bodies are: the USA's American National Standards Institute (ANSI), the UK's British Standards Institution (BSI), Germany's Deutsches Institut für Normung (DIN), France's Association Française de Normalisation (AFNOR), Sweden's Swedish Standards Institute (SIS), etc. Within those national standardization bodies, national stakeholders reach agreements on their coordinated positions, which then they are called to defend at higher standardization levels (that is, regional and international).

Irrespective of level, the way in which standardization bodies are organized follows a relatively homogenized pattern: a steering committee supervises the overall activities of the body, while a number of technical committees focus upon specific standardization topics. Within each technical committee, a number of working groups are delegated more specific areas of interest, related to the respective standardization topics. The participants in those groups and technical committees are experts on the respective topics (and usually come, voluntarily, from relevant and interested firms). All technical committees report back to the steering committee (de Casanove & Lambert, 2015).

An additional type of standardization organization is the industrial consortium, which is organized outside the formal standardization bodies and most often arranged by industry (rather than by level, as is primarily the case for formal standardization organizations). That is, industry participants (of a specific industry and/or related industries) decide to come together and develop industry standards. Examples of such consortiums are: the 3rd Generation Partnership Project (3GPP) for the wireless telecommunications industry, Internet Engineering Task Force for the computer industry, and the Automotive Material Intelligence Consortium for the automotive industry.

1.1.3 The outcomes of standardization: standards and their effects

Although this is not a thesis about standards, but rather focuses on standardization per se, the former ought to be briefly introduced and explicated as well. Standards are the outcomes of standardization processes and are defined as published documents, which set specifications and processes to ensure that a product or service functions as intended, fulfills the purpose it was designed for, and reliably performs in the way it is supposed to (ISO, 2016). Standards may be characterized as formal or informal, depending on how they emerged; the

former originated from formal standardization processes (that is, they were designated by a formal standard-setting organization) and are based on negotiation processes and voluntary consensus, while the latter are initiated by industry consortia, or even individual companies, and achieve market dominance through a market selection process (Blind, 2011, 2004). The above dichotomy of formal and informal standardization is extensively characterized as *de jure* and *de facto*, respectively (Dokko, Nigam, & Rosenkopf, 2012).

Different types of standards have particular positive and negative economic effects (Blind, 2004). First, standards ensure compatibility and interoperability among different components, products, or systems (Suarez, 2004). Relevant examples are IT or telecom standards, in terms of ascertaining the functionality of operating systems. By accomplishing that functional objective, they allow for the creation of networks. Direct network effects (or network externalities) occur when a technology becomes more valuable as the number of users increases (Katz & Shapiro, 1985). Indirect network effects occur when the number of available complementary products increases (Farrell & Saloner, 1985). When systems are compatible, switching costs, and therefore enforced lock-ins, are avoided. Furthermore, operational efficiency is enhanced through interoperability standards, since they improve supply chain coordination and efficiency (Stigzelius & Mark-Herbert, 2009). Second, minimum quality and safety standards set the necessary requirements of products and thus serve as signaling mechanisms to buyers. Standards that set the minimum requirements for health and adult social care are examples within that category, performing as a guarantee to the potential user or customer (Care Quality Commission, 2013). Such standards decrease information asymmetries and have important economic effects, such as avoidance of adverse selection and reduction of transaction costs (Den Butter, Groot, & Lazrak, 2007; Blind, 2004). Third, variety-reduction standards enable economies of scale (Blind, 2004; Farrell & Saloner, 1985). Engineering standards that accurately outline the materials that should be used as inputs in a production process may be pointed as an example. They are drastically associated with less variety of inputs, which enables mass production and distribution. Adoption of those standards makes it considerably easier for firms to communicate with their suppliers, thereby preventing conflicts and repeated efforts to define the desired input characteristics in each transaction (ANSI, 2013). On the downside, this reduction of variety discourages product innovation and increases market concentration (Matutes & Regibeau, 1996). Fourth, information standards provide information about product characteristics (Tassey, 2000). This includes real estate information standards, which provide credible information concerning sustainable real estate investments (REIS,

2013) in order to reduce information asymmetries. Thus, they facilitate trade by reducing transaction costs (Blind, 2004).

The benefits of standardization reported above are usually assumed to appear across whole sectors of the economy in a relatively homogeneous way. However, despite the fact that the particular effects of standards have been widely examined and discussed in previous research, the (standardization) processes that lead to standards (either formal or informal ones) are not yet well understood, from either a research or a practical perspective (referring to standardization practitioners, who cannot count on any applicable guidance when it comes to standardization-related activities, common challenges, or how to overcome them).

As it currently stands, prevailing research has mostly focused on international standardization and the dynamics that take place when firms try to implement international standards, as well as the effects on economies, industries, and firms. Understanding is very limited when it comes to the dynamics that take place on a firm level in regard to overall management of corporate standardization.

1.1.4 Object of study: standardization management

Before moving on to the theoretical problematization of corporate standardization, this section aims to crystallize (even more clearly and straightforwardly) the object of study of this thesis: management of standardization (and to some extent also of standards), within corporations (and to some extent also outside of corporations). The reason why those parentheses are needed is, firstly, that standardization is a dynamic process that cannot be completely isolated from its outcomes (that is, standards). Nevertheless, standardization per se (processes and mechanisms) comprises the primary focus of the study. Secondly, although the emphasis lies on how corporations manage standardization activities, denoting an intraorganizational spotlight, very often the objectives of corporate standardization (especially from a strategic point of view) are connected with goals and intentions outside of the organization—that is, in relation to external instances such as product positioning, target market, competition, etc. For instance, as Tee and Gawer (2009) discussed, firms can manipulate industry architecture (that is, outside of the organization, but for the benefit of the organization), in association with platform establishment. By the same token, Garud, Jain and Kumaraswamy (2002) stated that standardization

generates agreements (that is, standards) among parties with diverging interests, often forged through cooperation among competitors within an industry (viz. again outside of organizations). Even more explicitly, Garud et al. (2002) emphasized that standards are the result of firms' proactive actions. In other words, corporate standardization-related activities do not exclusively take place within the organization. For that reason, external standardization activities (in which corporations partake) will not at all be overlooked in this study—but will be explored from an intraorganizational frame of reference; that is, how the organization plans and organizes its participation and what are its intentions within participation. Hence, the object of study is *standardization management within corporations, meaning how and why corporations manage standardization-related activities internally and externally—that is, how they make decisions (internally) and how they pursue those decisions (externally).*

This corporate focus aims to spotlight the whole range of standardization-related activities, meaning from the day-to-day operations to the long-term (potentially strategic) rationales and connotations. Specific challenges that firms face in relation to standardization management will be addressed, decision-making explored, and past experiences positioned as lessons from which to learn.

The exploration of standardization management in corporations—that is, obtaining a better understanding of how corporations reach standardization-related decisions, and plan and act upon those decisions before stepping into international standardization committees (or after leaving them), might unearth unmapped strategic connotations of standardization management (that is, a promising strategic role and potential of standardization management in corporate strategizing). As mentioned above, international standardization dynamics have been widely discussed, but it is in fact primarily individual firms (among other actors) that are involved in it. Increasing understanding of the corporate dynamics of standardization could offer valuable insights for both the standardization and the strategy literatures.

1.2 Research purpose

Having elucidated the object of study in the preceding section, the purpose of study ought to be specified too. This research project tackles the issue of corporate standardization and addresses standardization management and

standardization-related decision-making. *Specifically, the purpose of this study is to increase understanding about the role that standardization plays in corporate strategizing, especially focusing on the related activities and strategic motives in regard to standardization management at the firm level.*

Hence, the motives behind corporate decisions regarding standardization management and the subsequent activities shall be particularly examined, moving towards scrutiny of crucial strategic choices, as well as the strategic connotations related to standardization, on a corporate level. In other words, this thesis focuses on common aspects of strategy, such as standards and standardization, and why they can be of great importance in corporate strategizing. This study aims to address corporate standardization from a strategic management point of view—that is, by considering the procedures and criteria associated with standardization-related decision-making and the overall intraorganizational dynamics around standardization, encompassing both internally and externally oriented choices. Understanding the (perhaps hidden to date) strategic intentions behind a firm's decision to be involved in standardization could shed light on corporate standardization from an as-yet unexploited point of view in regard to standards and standardization—that is, of strategic management. More specifically, by facilitating understanding of the role of corporate standardization, this study will explore how standards and standardization can be embedded in a company's overall strategy. Realization of the research purpose will entail an important contribution for scholars, but also for managers, as it will increase understanding with respect to potentially vital choices, such as engagement in corporate standardization management (CSM). The findings will primarily contribute to strategy and management research and practice, as well as to a framework of strategic thinking in relation to standardization practice.

1.3 Problematizing standardization

As debated in the following passages, the (empirical) phenomenon of corporate standardization provokes inquiries about its nature, its role in business, as well as how to approach it theoretically in order to help us better understand it. In the ensuing sections, standardization is theoretically approached and problematized, beginning with the strategic management literature, since this study aspires to uncover standardization management specifically from a strategic management

angle. A number of well-established (and, of course, fruitful for the specific purpose) perspectives within the field of strategic management will serve as the starting point for such an endeavor. Additionally, focusing on one (dominant or "unique") theory in order to elucidate the phenomenon at hand (CSM in this case) cannot be considered realistic in social sciences and, in particular, in strategic management (Bao, 2015). Instead, various highly appreciated theoretical perspectives in strategic management may constitute a more sufficient lens through which standardization management may be unpacked. The following discussions aim to demonstrate why the phenomenon of standardization is not yet fully understood, by applying well-entrenched theoretical perspectives of strategic management and pinpointing the remaining theoretical gaps. Subsequently, the existing standardization literature is discussed, demonstrating further that those theoretical gaps, or shortcomings, remain unexplored to date, even after a thorough review of the literature (specifically, the standardization literature is presented and discussed in more detail in the next chapter). Finally, additional theoretical lenses (as discussed later) are presented and discussed as potentially informative in regard to CSM.

Following up on the discussions from previous sections, it has been bluntly noted (primarily by practitioners) that standardization matters for business (de Casanove & Lambert, 2015; Cargil, 2015). Likewise, a number of scholars have highlighted the importance of being involved in formal standardization for the pursuit of corporate strategy (e.g., Betancourt & Walsh, 1995; Forselius, 1998; Schilling, 1999; Jakobs, 2014, 2015). Schilling (1999) specifically discussed the influence of standardization on an industry's development (and hence a firm's opportunity to influence the industry through active involvement in standardization activities), while Jakobs (2014) debated how active contribution in standardization generates opportunities to shape emerging technologies (towards specific directions, depending on a firm's preferences). In other words, Schilling and Jakobs presented standardization activity of firms as part of those firms' corporate strategizing.

Along these lines, licensing and inclusion of firms' patents within emerging standards are probably the first things that come to mind when standardization activity is presented as part of corporate strategizing. However, interestingly enough, licensing is not at all the gist of what the abovementioned authors discussed. On the contrary, authors (Betancourt & Walsh, Schilling, Jakobs, etc.) have primarily focused on standardization that leads to open, widely accessible standards—and how engagement in such processes may comprise part of corporations' strategizing. However, considering the resource-based view

(RBV) of strategic management (e.g., Barney, 1991), according to which firms ought to focus on valuable, rare, inimitable and nonsubstitutable (VRIN) resources for their strategy, standardization activity leading to open, common resources that are available to everyone (including competitors, of course) would not be expected to play any vital role in strategy realization. From that perspective (akin to the RBV), heterogeneity of resources is placed in the center of value creation (Amit & Schoemaker, 1993; Black & Boal, 1994; Bowman & Ambrosini, 2000; Mahoney & Pandian, 1992), and consequently strategy making. Hence, standardization activities, which to all appearances do not follow the abovementioned idiosyncrasies of rarity, inimitability, and heterogeneity, seem to violate the basic assumptions of strategic management in a resource-based model (Barney, 1991). Not only would they be expected to be unrelated to corporate strategizing, but they could even be considered as impairing differentiation and hindering strategic management.

Nevertheless, in practice, firms appear to have engaged increasingly in standardization activities in recent decades (David & Greenstein, 1990), despite the fact that standardization outcomes promote commonality and serve as common and broad guidance for the many, by being universally accessible to a large number of potential adopters, and therefore, to some extent, bringing uniformity among competitors and forcing homogeneity (Brunsson et al., 2012). In other words, the empirical phenomenon of corporate standardization, and specifically the role that it is hinted to play in corporate strategy by a number of scholars, suggest opportunities to problematize and rethink the strategic prospects and rationales in regard to common (that is, non-VRIN) resources, which could still be vital for corporate strategy and have to date been rather overlooked.

1.3.1 Economizing literature

To some extent contrasting, or at least complementing, the aforementioned VRIN perspective, which emphasizes that firms ought to hinge their strategy on inimitability and subsequently develop isolating mechanisms to protect them from imitation (Barney, 1991; Powell & Arregle, 2007; Kraaijenbrink, Spender, & Groen, 2010), another stream of literature has stressed economizing tactics (e.g., Powell & Arregle, 2007; Williamson, 1991). Kraaijenbrink et al. (2010) discussed how the RBV comprises a "narrow conceptualization" of strategy realization, and presented the VRIN resources condition as "neither necessary, nor sufficient." As Powell and Arregle (2007, p.73) suggested, "for strategy

practice, the field's decades-long adherence to theories of competitive advantage […] has probably encouraged the view that firms should develop unique and inimitable competitive advantages, and protect them through market-sheltering behaviours" (Powell & Arregle, 2007). Instead, Powell and Arregle agreed with Williamson (1991) that a stratagem of error-reduction or economizing behaviors might be actually crucial in itself (Williamson, 1991; Powell & Arregle, 2007). Williamson argued that any strategizing effort will seldom succeed if production, for instance, is burdened by substantial cost excesses (Williamson, 1991).

By way of explanation, Powell and Arregle (2007) suggested that firms compete "on two axes: the axis of competitive advantage, where performance is driven by the inimitable resources and capabilities of high-performing firms; and the axis of errors, where performance is driven by failures to attend to the activities, resources and opportunities that are equally available to all firms." Faced with an incessantly fluctuating environment, an organization's subsistence depends on the timely and appropriate readjustment of internal processes (Barnard, 1968; Williamson, 1991). Durably replicating a firm's production processes over time is not a trivial thing (Nelson & Winter, 2009; Rivkin, 2001), and is significantly worsened when firms endeavor to increase their scale of operations (Knudsen, Levinthal, & Winter, 2013; Winter & Szulanski, 2001). The adjustment process might very well cause an upsurge of production costs and a loss of efficiency (Knudsen et al., 2013). On the other hand, returning to the criticism assigned to the RBV, this view has been deemed insufficient to explain firms' attainment in unpredictable environments (Barney, 2002; Kraaijenbrink et al., 2010).

In other words, the economizing literature has recognized the importance of common (that is, non-VRIN) resources in strategizing (as opposed to the RBV), and thus arguably even laid the groundwork for encompassing the use of corporate standards as part of firms' stratagem for outperforming its competitors (that is, by eliminating avoidable errors through the use of standards). Nevertheless, the question remains as to why firms would decide to partake in formal standardization activities, and hence develop standards together with others (including their competitors), instead of utilizing their own mechanisms for avoidance of errors internally. It could certainly be argued that firm representatives insert themselves into such standardization processes in order to learn from others (in terms of how to avoid errors in the future); however, if that were the attitude of everyone involved in standardization activities, it would not take long before such standardization activities vanished. If everyone is there to

learn from others and nobody shares anything, what is the point of joining such activities?

Nonetheless, since standardization activities have survived over decades, and firms have not lost their interest in joining them, it may be contended that there is more to standardization engagement; possibly, as a few authors have argued, standardization plays a role in corporate strategizing, *despite the fact that we neither know exactly how, nor fully understand the dynamics involved*. For instance, intraorganizational standardization-related decision making remains a mystery; how and why firms decide to become involved in standardization, what procedures take place, and what their motives and rationales are for such a decision remain open questions. What are the strategic connotations, if any, related to firms' engagement in standardization? Current literature within economizing, among other streams in strategic management, does not enable us to fully understand the phenomenon of corporate standardization or provide sufficient answers to the abovementioned inquiries.

1.3.2 Transaction cost economics

Transaction cost economics (TCE), as discussed by Williamson (1975, 1988) and based on early works by Coase (1937) and Commons (1934), is concerned with the boundaries of firms, and comprehends firms and markets as alternative governance structures with dissimilar transactions costs (that is, indirect, nonproduction costs). Transaction costs are essential for organizations since they are incurred in every transaction and might differ substantially among alternatives. Hence, organizations are propelled by the necessity to reduce costs when conducting any type of transaction (either interacting with each other or conducting them intra-organizationally).

As long as transaction costs are minimized by a hierarchical economic organization, the existence of such an organization is justified—as opposed to the coordinative mechanism of the market (Rossignoli & Ricciardi, 2015). Hierarchical organizations (such as firms) exist because they often provide more efficient mechanisms for allocation of resources and conduct of activities than the market economy per se (Rossignoli & Ricciardi, 2015; Coase, 1937). Hence, hierarchy and market are the two alternative (and "extreme") structures available for the development and coordination of all kind of economic production. On the matter of seeking the most efficient structure to organize transactions, decision makers ("entrepreneurs," according to Coase [1937]) are then called

upon to determine which one of those antithetical structures makes the most sense for fulfillment of the various transactions. Their decision will consequently determine the boundaries of their organizations; in other words, the "make or buy" decision.

This dichotomy ("make or buy") may refer to any type of resources and/or activities that interest an organization, meaning that firms have to decide whether to conduct a transaction in-house ("make" decision) or buy it in the market ("buy" decision). Standards (as a type of resource) and standardization processes (as a type of activities) may be approached from a TCE-theory angle, in the sense that firms may decide whether they should "make" the standards or simply "buy" them. In other words, it is up to "the entrepreneurs" of the firm—that is the firm's decision makers—to determine whether their organization is better off engaging in the standard-making activities (via the respective standardization committees per se) or simply "buying" the standards—that is, waiting until standardization processes have generated outcomes that have subsequently become published and widely available.[2]

As Rossignoli and Ricciardi (2015, p.9) stated, and as was previously discussed by Coase (1937) and Williamson (1975; 1988), the response to the "hierarchy" or "market" question (that is, the "make or buy" decision) is an economic one based on the incurred transaction costs, and "the more numerous and more complex the transactions, the higher the (transaction) costs." Once the necessity to develop specific transactions has been recognized by firms (or once the need for the use of common standards has been recognized by firms, as mentioned in previous sections and will also be further discussed in following ones), these (necessary transactions) may be administered either in the market or through hierarchy. Thus, the firm's concern is to identify its "boundary of efficiency" and position itself so that those transactions are accomplished at minimal cost (Rossignoli & Ricciardi, 2015). Building on the deliberations by Coase (1937) and especially Williamson (1975, 1988), it is subsequently contended that it is not necessarily the absolute "costs" that need to be considered, but rather the trade-off—that is, costs (for each alternative option) versus benefits (for each alternative option). In other words, it is rather the trade-off that matters.

[2] Allegedly, firms are also faced with the option of neither being involved in standardization processes nor using standards at all; however, such an assumption is hardly realistic in today's globalized business environment.

Nevertheless, in the case of corporate standardization (that is, a corporation's engagement in standardization processes), existing literature does not help us spotlight those trade-offs, and subsequently reach the "make or buy" decision. More specifically, how standardization-related activities are organized and managed within corporations, as well as what the respective intraorganizational challenges are before these firms step into an external standardization committee, are unknown. Such issues comprise examples of the "cost side" of corporate standardization (referring not only to financial resources, but also to time, human resources, coordination complexities, etc.). Likewise, the "benefit side" of corporate standardization (again, corporate standardization stands for a corporation's *engagement* in standardization processes) remains somewhat unidentified as well. An important distinction to make here is between "benefits of standards" and "benefits of standardization." These benefits might in fact be dissimilar, since the former (benefits of standards) may very likely be achieved by an organization without that organization being actively involved in the standardization process per se; simply, an organization could buy and implement standards (the outcomes of standardization processes) once they became available. Existing research has identified a number of "benefits of standards," such as internal efficiency (Beck & Walgenbach, 2005; Den Butter, Groot, & Lazrak, 2007), improved quality (Crampes & Hollander, 1995), access to markets (Bialous & Yach, 2001; Montiel, Husted, & Christmann, 2012) and others (a more elaborate discussion on standards' effects is found in section 1.1.3).

However, since a plethora of "rational firms" (according to Zhao, Xia, & Shaw, 2007) decide to be themselves engaged in the standardization processes, instead of simply buying and implementing standards, perhaps the benefits of standardization go somehow further than the abovementioned benefits (of standards). Indeed, (transaction) costs for engagement in standardization are rather high—and certainly much higher than the costs for buying a published standard, which could amount from a few hundreds dollars to merely a few thousands (for instance, ISO's "purchase" list). On the contrary, engagement in standardization—that is, by participating in standardization committees, can be extremely time consuming, long lasting, and costly. To provide indications of such costs, Jakobs (2015) put forward indicative amounts of $10,000,000 for the development of an average IT standard (Spring & Weiss, 1995), or 1000 person-years (that is, a measurement combining the number of persons and their time contribution) of experience, 20 person-years of actual effort, plus $3 million for the development of a major international standard (OTA, 1992). More recent estimations have not surfaced, although standardization experience,

and subsequently efficiency, can be assumed to have increased since 1995 and 1992, respectively, still growing complexity and technological advancements allow the assumption that today's international standardization processes cannot be much simpler, or cheaper, than they used to be some 20 years ago.

Hence, summarizing this section's discussion, if a firm is called on to decide whether it will "make" or simply "buy" standards, what are the intraorganizational dynamics, activities, and rationales (that is, benefits) that lead to the (much costlier) latter option? Existing literature does not shed any light on such matters.

1.3.3 Standardization literature

In recent decades, a notable amount of well-grounded academic research on the subject of standardization has emerged (e.g., Blind, 2004, 2011a, 2011b; Brunsson & Jacobsson, 2000; Buthe & Mattli, 2011; Cargill, 1996; David & Greenstein, 1990; Narayanan & Chen, 2012; Gallagher, 2007; Schmidt & Werle, 1997; Spivak & Brenner, 2001; Swann, 2000, 2010; Tamm Hallström & Boström, 2010; Timmermans & Epstein, 2010). Nevertheless, a large share of this work has focused on technological aspects and outcomes, and much less on the intraorganizational aspects and processes. That is, the processes of standardization-related decision making within corporations, as well as the intraorganizational activities that prepare corporations' participation in standardization work (such as standards-setting organizations, standardization committees, or industrial consortia), have not been embraced as examined topics in this notable amount of research.

By way of explanation, despite the fact that the importance of standardization for industrial dynamics has been approached from different theoretical perspectives (as will be further discussed in the next chapter), it soon becomes apparent that the majority of prevailing research has been directed towards (1) technological battles and developments, (2) outcomes of formal standardization (such as ISO standards) and the respective effects (on a macro-economic, industrial, and firm level), and (3) the dynamics that take place when individual firms try to implement those standards. For instance, Narayanan and Chen's (2012) brilliant review piece, although written from a management-oriented perspective, focused exclusively on technology standards, and more specifically on strategic choice in relation to technological developments (yet without addressing the corporate decision-making processes behind those strategic

choices at all). Likewise, Brunsson, Rasche, and Seidl's (2012) pivotal work on the dynamics of standardization thoroughly discussed organizational adaptation to standards, as well as the necessity for organizations to adapt to emerging standards instead of ignoring them, but did not address how organizations could proactively engage in standardization processes (before the standards actually become finalized and they then have to "adapt" to them). In fact, even David and Greenstein (1990), who predominantly focused on understanding standard-setting processes (that is, standardization), approached the topic from an industry-wise perspective, eventually discussing the consequences for industry structure and economic welfare—and leaving us in the dark regarding the intraorganizational activities in respect to standardization processes, from the day-to-day operations to the long-term (potentially strategic) rationales and connotations.

Altogether, the current standardization literature is very limited when it comes to the dynamics that take place on the firm level standardization (that is, before and after participating firms adhere to formal standardization committees), or how they even consider and decide whether to partake. Although it is critical to distinguish between the role of standardization for an individual firm in relation to the collective (industrial and macro-economic) intentions and effects of standardization, and although such realization might have substantial implications for strategic management, only very few scholars have addressed the topic from a corporate managerial perspective. Schilling (1999) and Warner, Fairbank, and Steensma (2006) explicitly expressed that individual firms could greatly benefit from influencing the emergence of formal standards in their favor, since they would be essentially influencing the future of the industry they operate in. Both studies addressed effective participation in standardization committees as the way to pursue such outcomes; however, they did not aim to debate the intraorganizational dynamics and mechanisms in order to actually do it (in terms of how to organize and manage the activities for such a pursuit). That is, the firm-level standardization-related activities and challenges, as well as how firms explicitly manage them, remains a black box; namely, the black box of CSM.

Betancourt and Walsh (1995) comprise a distinctive example in which the concept of (strategic) standardization management has been introduced and utterly concentrated upon the firm itself. They discussed strategic standardization management as "a management discipline and methodology that investigates all aspects of standardization across a business and/or industry, then defines, recommends, and implements appropriate strategies and policies to

leverage standardization so that a firm can gain competitive advantage and avoid disadvantage." Betancourt and Walsh (1995) stressed that standardization management "is not about standards," which Cargill (2015) and de Casanove & Lambert (2015) also asserted. Contrariwise, standardization management is about "leveraging all aspects of standardization" (Betancourt & Walsh, 1995), aligning standardization with the overall business strategy (de Casanove & Lambert, 2015), and managing standardization to accomplish business goals, not "standards" per se (Cargill, 2015). Nevertheless, all of the abovementioned authors limit themselves to introducing and defining the concept, and mainly justifying its strategic importance for companies that wish to remain competitive in the dynamic globalized environment of recent decades. In that frame, Betancourt and Walsh (1995), stated: "In fact, there are horror stories, known to many of us, about critical standardization issues that were mishandled by major companies." However, they did not go as far as to actually address the actions, practices, or challenges related to standardization management; that is, they did not dig into that process itself. The only step further they took towards the actual management of standardization was to suggest that strategic standardization management requires some degree of central coordination, along with meticulous assessment (beforehand) of the corporate goals and possibilities with standardization involvement.

In order to unpack the processes of CSM, the research stream on strategy process theory could help immensely due to its nature and fundamental focus on holistic corporate activities and managerial processes. The following section aims to further elucidate this issue.

1.3.4 Strategy process theory

Strategy process research, which Hirsch (1991) portrayed as "full color cinematography," as opposed to a static photographic representation of the organization, has been claimed to lie at the heart of all strategic management research (Chakravarthy & Doz, 1992), especially due to its focus on organizational phenomena and processes. As strategy process theory is based on longitudinal field-based research and essentially constitutes a highly inductive type of study, it offers the means for shedding light on possibly vital, inescapable dilemmas in the innate, natural dynamics of organizational action and adaptation (Burgelman, 2003). Consequently, strategy process research allows, and has indeed enjoyed, contributions from numerous theoretical and multidisciplinary perspectives (such as business strategy, organization theory,

sociology, and public and social policy), comprising a fruitful mishmash of differing disciplinary and national academic traditions (Pettigrew, 1992). In fact, various theoretical perspectives have been willingly amalgamated in strategy process research, precisely due to the fact that it is concerned with discerning specific phenomena, rather than fixating on and testing individual theories.

Strategy process research aims to provide a rich(er) comprehension of the processual micro factors, and subsequently addresses central questions of fundamental interest to managers, such as how a firm's strategic position may be firmly supported through pertinent and fitting decision-making processes and administrative systems and procedures. For instance, strategy process circles around the emerging relationships between firms' decision-making processes and their subsequent strategic positions, as well as how firms modify their decision-making processes "in response to environmental changes and through [their] own proactive actions" (Chakravarthy & Doz 1992). As Pettigrew (1992) discussed, the scrutiny and analysis of any single process crops up not only within an embedded context, but also alongside other processes, thus requiring comprehensive understanding of an overall network of entangled processes. Such enquiries (of holistic understanding) ward the researchers off theories of isolated and individual causes, in the direction of theorizing about a fusion of forces that determine the character of the various processes, and even elucidating differences in outcomes (of such organizational processes).

In other words, strategy process research is (like many other perspectives) concerned with the interface between the firm and its environment, but also attends to the behavioral interactions of individuals (such as managers and lower-level personnel), groups (within the same or several organizational units), organizational units, and even firms (Hirsch, 1991). The abovementioned depictions (of how strategy process theory functions and what it aims to do), could rather straightforwardly be associated with the endeavors and basic ideas of this thesis, in the sense that it aims at unpacking the processual aspects of standardization-related activities and decisions within organizations. That is, it focuses on how individuals within corporations (managers, standardization personnel, etc.) reach standardization-related decisions, how they plan and act upon those decisions, what the strategic connotations are, and how organizations respond to environmental changes (such as international standards), as well as how organizations may be proactive (for instance, by participating in standards-setting organizations, where they necessarily interact with other firms).

Because the study at hand concentrates to such a large extent upon the intraorganizational aspects of standardization management processes, specifically addressing the activities, motives, and even strategic outcomes of those processes, strategy process research comprises a highly suitable and fruitful perspective to consider. Strategy process research encompasses a stream of research that is fundamentally concerned with understanding *how* organizational strategies are formulated and implemented, and which organizational processes are involved (van de Ven, 1992). In an equivalent way, this project is concerned with *how standardization* specifically might be encompassed in organizations' strategizing, and what processes and procedures are involved (that is, in CSM). Applying a strategy process perspective on the phenomenon of corporate standardization could highly advance our understanding of the intraorganizational aspects and processes of standardization management.

1.3.5 Co-opetition

Understanding the intraorganizational aspects of standardization management (as addressed in the previous section) is of course a major part of unpacking the black box of corporate standardization. Nevertheless, the endeavor to account for the potentially overarching role of CSM in corporate strategy calls for a focus on how firms deliberate both internally and externally oriented decisions and choices. In this vein, the theoretical perspective of coopetition could be particularly useful, but has to date been utilized only limitedly in the standardization literature (in general), and not at all from a corporate standardization viewpoint—that is, in terms of how standardization is managed on a corporate level, and with what motives and effects.

Corporate standardization activities, which involve partaking in external standard-setting committees and hence potentially revealing internal standardization-related knowledge, embrace remarkable coopetitive associations between competing market participants. More specifically, a clear understanding of why, and how, it is (intraorganizationally) decided that a firm should pursue external standardization activities is still missing. What are the corporate motives behind such participation, and are there specific criteria in place for making such decisions? The theoretical lens of coopetition could greatly facilitate understanding of corporate standardization activities and decision making, especially within regimes in which coopetitors remain, at the same time, foremostly competitors.

Alexy, George, and Salter (2013) discussed how selective revealation (of crucial information and knowledge) induces collaborative behavior, which subsequently provides timely access to diverse knowledge that would otherwise be unavailable. In the context of a standards-setting committee, collaborative work among different companies can enhance knowledge sharing and thus comprises an innovation catalyst (Blind, 2013), despite the fact that standardization has often been considered a hindrance to innovation (Blind, 2013; Farrell & Saloner, 1985). Work by a number of scholars has shown that coalitions and networks provide access to important resources and boost innovation (Ahuja, 2000; Ahuja, Lampert, & Tandon, 2008; Lei, 2003; Powell, Koput, & Smith-Doerr, 1996; Sampson, 2007; Tether, 2002; Tsai, 2002). Coopetitive relationships, such as standardization, involve a high degree of interdependence and are full of conflict, yet the potential for payoff is also high (Gnyawali & Park, 2011). When knowledge escalates after deployment, externalities can arise, aiding a number of companies—and often including the company that has shared the knowledge, enabling it to enjoy benefits from others' application of that knowledge (Kraaijenbrink et al., 2010). Taking this into account, it can be better understood why many firms nowadays cooperate intensively—while still competing (Kraaijenbrink et al., 2010). Therefore, it is highly important to examine conditions in which firms decide to engage in coopetitive standardization (that is, corporate standardization-related decisions) and how they manage the respective (inter- and intraorganizational corporate standardization) activities.

To demonstrate clearly how the aforementioned theories or theoretical perspectives might help us understand corporate standardization better, and hence why they have been discussed in connection to this study, Table 1 summarizes the points of problematization.

Table 1
Summarized points of problematization in connection with standardization management.

Research purpose:	***Increase understanding about the role that standardization plays in corporate strategizing, especially focusing on the related activities and strategic motives in regard to standardization management at the firm level.***
Theoretical perspective/literature:	Relevance for the problematization of corporate standardization:
Economizing literature	Standardization as a means for error reduction/economizing.
Transaction cost economics	"Make" or "buy" decision; partake in standardization or buy standards.
Standardization literature	Firm-level standardization, before and after partaking in formal standardization.
Strategy process	Rich(er) comprehension of the processual micro factors and intra-organizational aspects of standardization management.
Co-opetition	Uncover the corporate motives towards co-opetitive associations between competitors.

1.4 Practical implications

This chapter discussed, rather thoroughly, that existing literature (referring to both standardization and strategy literature) has largely neglected providing in-depth discussion of the potential role of standardization management (that is, intraorganizational standardization-related activities, as well as interorganizational dynamics through participation in external standardization) in corporate strategizing. Consequently, it has not yet been acknowledged how corporate standardization might be translated into specific corporate activities, intentions, deliberate choices and, potentially, even strategic prospects towards the pursuit of competitive strategy.

As mentioned above, international standardization dynamics have been widely discussed, but (although not clearly acknowledged) it is actually primarily individual firms (among other actors) that are involved in it; increasing understanding about the corporate dynamics of standardization could offer valuable insights both for the standardization, as well as the strategy, literature.

The exploration of CSM and a better understanding of how corporations reach standardization-related decisions, as well as how they organize their activities before stepping into international standardization committees (or after leaving them), might unearth unmapped strategic connotations of standardization management.

Along similar lines, the specific challenges that firms face in relation to standardization management per se, as opposed to the challenges encountered when firms implement already finalized standards, have barely been addressed in existing literature, although they could serve as constructive past experiences and valuable lessons from which to learn. The creation of a solid CSM framework, in which focal aspects and success factors have been identified, may serve as a practical toolkit for practitioners (that is, managers and standardization personnel), which they can apply directly in their companies when making standardization-related decisions (such as where to focus, what standardization committees to partake in, or how many resources to assign to specific activities). More specifically, such a framework will be useful primarily for firms that are in the process of building their standardization management (as guidance throughout that process), but also for firms that already have a well thought-through standardization management plan (as an assessment tool of their current practices).

2 Theoretical antecedents: Standardization and strategy

This chapter primarily provides a review of standardization literature; nevertheless, it also highlights selected prevailing literature on strategy and organizational theory in order to explore the connection, or even intersection, of standardization and corporate strategy.

The nature and effects of standards are examined in order to facilitate a spherical understanding of the standardization field, at the same time that the role of standards and standardization in the overall strategy of the organization are carefully considered, viz. the role of corporate standardization, in corporate strategizing, towards (corporate) value creation.

To initiate such understanding, previous research into the role of standards and standardization processes is examined, with the intention of connecting earlier work to the field of strategic management. In order to encompass a multilayered understanding of the empirical phenomenon (standardization), various aspects of standardization are considered—namely, institutional, industrial and corporate ones, before placing attention on CSM. Thereafter, the discussion focuses on standardization management, despite the fact that, to date, research on standardization management remains limited. For that reason, a compilation of prevailing research on standards and standardization (in general) is utilized for the creation of a preliminary theoretical framework on standardization management—although existing research has often not focused on CSM per se. Nevertheless, insights from previous standardization literature are invaluable for this study.

2.1 Standardization review

This chapter commences by presenting a broad review of existing standardization literature, in order to highlight the previous work within the field, and hence, in essence, to explore how researchers so far have attempted to understand standards and standardization. Particularly due to the fact that existing research specifically targeting standardization management is rather limited, the general standardization literature is used to build a solid understanding of the field. Following the (somewhat brief) presentation of the general standardization research, an extensive discussion specifically on standardization management follows, in order to explain the topic in depth, as well as the efforts made and insights gained ahead of this project.

2.1.1 The three levels of standardization

Standards and standardization literature can be characterized as mainly two-fold, namely focusing on either the macro- or the micro-level effects of standards (and, to some extent, of standardization as well). The macro-level stream of standards and standardization literature focuses on societal and institutional effects; more specifically, it refers to institutional constraints, which can be political, social, economic, etc. Norms, relations, values, and societal structures are the focus of attention, as well as how these evolve/change over time (Garud at al., 2002; Narayanan & Chen, 2012; Tassey, 2000). On an institutional level, research on standards and standardization has predominately approached the topic through an institutional theory lens and has, to a large degree, addressed issues concerning regulatory aspects, harmonization, and negotiation processes. The specific effects of standards (from an institutional viewpoint) have been apparent and justifiable, focusing (as discussed in the previous chapter) on consumers' welfare following increased demands for safety and quality, interoperable systems, reduction of information asymmetry, facilitation of international trade and growth of world trade flows due to decreased trade barriers (Bialous & Yach, 2001; Blind, 2002; Den Butter et al., 2007; Montiel et al., 2012).

Still within the macro-level stream, but predominantly concerned with the role of market versus organized efforts as a means to develop standards, lies the "industry" (as a unit of analysis in standardization literature). Industrial mechanisms and effects have not been ignored in standardization literature, but,

on the contrary, comprise a dominant part of previous research, with an industrial organization perspective being particularly pertinent. More specifically, since standardization generates agreements among parties with diverging interests, which are hence often forged through cooperation among competitors (Garud et al., 2002), industry plays a decisive role in the emergence of standards of interest (Bialous & Yach, 2001). The outcomes of standardization have both enabling and constraining effects (Garud et al., 2002), resulting in firms being able to manipulate industry architecture in association with platform establishment (Tee & Gawer, 2009).

Overall, cooperation or competition (between firms, but also between alternative standards as in, for example, Blind [2011a] and Cusumano [2010]) comprise themes at hand from an industrial standardization viewpoint. Industry compatibility, governance and network effects have been mentioned as the main drivers, as well as the major effects of standards, on an industry level. Thereafter, once standards have been established within an industry, their role and impact on the individual firm becomes of interest, as has been systematically investigated in a number of studies. That is, standards aim to create stability and sameness, despite the fact that standardization itself is a highly dynamic phenomenon ((Brunsson et al., 2012). Broadly speaking, within the industrial setting the development of standards (that is, standardization) incorporates both macro- (for example, technological regimes and institutions) and micro-level factors (for example, firm entrepreneurship and strategy). In regard to the macro level, standardization activity has been reported in previous research as being driven by technological, institutional/environmental, and market factors, and even considered an external contingency. While, as far as the micro level is concerned, from a strategic viewpoint standards are the result of a firm's proactive actions, captured by entrepreneurship and competitive strategies.

However, as discussed in the previous chapter as well, very few studies have focused on the intraorganizational (or even interorganizational) management of those "proactive actions" of firms. Nevertheless, standardization management will be analyzed in detail in a later section, following a brief review of standardization literature. For the most part, empirical validation of standards' and standardization's effects on the corporate level is rare, despite having been initiated and called for (e.g., Blind et al., 2010; DeSarbo, Di Benedetto, Song, & Sinha, 2005; Katsikeas, Samiee, & Theodosiou, 2006). Most published research has described the desired effects, rather than observed ones. Empirical evidence of the effects that a firm could expect after adopting a standard remains limited, but even more importantly, extant research has neglected to examine

the deliberate strategic choices in regard to standards and standardization. What are the motives for such choices, how does the decision-making process take place in the firm, and how is the decision best executed? These questions remain to be explored.

To summarize the abovementioned sections, namely the review of existing research on standards and standardization across all three levels of analysis (institutional, industrial, and corporate), Table 2 provides an overview of the main patterns and logics revealed, with the exposed variations and different emphases intrinsically signaling the varied meanings and proposed uses of standards and standardization on the different analytical levels. Nevertheless, a number of topics persist regardless of level—viz. technology, rules, governance, compatibility, and negotiation process. Thus, Table 2 outlines the most commonly revealed patterns in existing research. It by no means designates that other focuses are not considered in previous research, but rather reveals the particular themes and concepts highlighted.

Since CSM is the object of study in this thesis, the remainder of this theoretical chapter will focus on the third column of Table 2; namely, the corporate level, at which the individual firm comprises the primary center of analysis. From a theoretical point of view, an organizational theory perspective (with an emphasis primarily on behavioral approach and secondly on decision making) has been extensively utilized in standards and standardization research (on the corporate level). That is, taking the firm as the basic unit of analysis, organizational theory has been heavily applied and in fact has been the most discussed and investigated theory to date, with the aim of indicating the importance that standards can play in organizations. In that frame, standards have been described as effective mechanisms that restructure incentives and regulate individual and organizational behaviors (Tenbrunsel et al., 2000), serving as a hybrid form of control that incorporates properties of both formal directives and informal norms (Sandholtz, 2012). In addition, an industrial organization perspective has been largely applied in standardization literature, concentrating on the varied impact and role of standards on a firm, in comparison to the impact on the overall industry. That is, the center of this theoretical angle is the firm per se, although with a primary concern for the structure and boundaries between firms and markets (Conner, 1991). In other words, the focus of analysis (under an industrial organization perspective in standardization literature) is essentially industry structures and dynamics, and how these can be significantly influenced by standards' establishment (Tee & Gawer, 2009). More specifically, the rules of the game regarding firms' interactions are, to a large extent, entrenched by

technical standards, which ascertain systems' interoperability and therefore promote network externalities (Matutes & Regibeau, 1996). Alliances and cooperation between firms in standardization work have been a major topic of interest within this theoretical approach (industrial organization), though of course from the industrial organization viewpoint—that is, not through an individual corporate perspective.

Table 2
Patterns in standards and standardization research, on different levels of analysis.

	Institutional level	Industrial level	Corporate level
Analytical unit	Nations, societies	Industries, multinational org., SSOs	Firms
Empirical objects	Regulation Specifications	Tech standards Platforms	Tech standards Routines Processes
Dominant theory	Institutional theory	Industrial organization	Organizational theory
Main reason for standards	Regulatory Harmonization Negotiation	Network effects Coordination Compatibility	Routines Codification Learning
Dominant research method	Archival data	Case studies (standards)	Case studies (firms)
Key references	Slager et al. (2012) Dokko et al. (2012) Timmermans and Epstein (2010)	Tee and Gawer (2009) Gallagher (2007) Den Butter et al. (2007)	Okhmatovskiy and David (2012) Blind et al. (2012) Perez-Aleman (2011)
Impact for strategic management	Market access	Market size and shares	Economies of scale

2.1.2 The role of the firm regarding standardization outcomes

Drawing on the discussions in previous sections regarding the vital role of standards in corporations and the emergence of standards through firms' cooperation, the individual firm's involvement in standardization processes arises as a central enquiry.

Funk (2003) determined that firm involvement in the emergence of a standard affects the value captured afterwards, due both to information advantages and

influence of the standardization process. More specifically, Funk (2003) discussed how firms can manipulate entire industry architectures through their own strategies. His empirical study drew upon cellular phone industries in different countries, with the most prominent one being the case of NTT DoCoMo, the leading Japanese cellular service provider. Since Japan's MPT (regulatory authority in Japan) required the specifications of the Personal Digital Cellular (PDC) standard to be opened to all interested Japanese firms in 1993, NTT DoCoMo realized that it needed a more shrewd strategy than it had up to date used in analog technology. The new strategy encompassed utilization of slight information advantages (in the PDC standard) to obtain preferential cooperation from suppliers. More specifically, NTT DoCoMo offered preferential information about the "open" Japanese digital phone standard in exchange for preferential access to complementary assets (the lightest phones from four phone suppliers). Ultimately, the outcome was that NTT DoCoMo managed to create various dominant designs within the PDC standard, and subsequently escalated its market shares. Eventually, other phone manufacturers were forced to change their own strategies and comply with DoCoMo's dominant designs. By examining this case with several others within the cellular phone industry, Funk's study pinpointed that although market conditions do determine how standards and dominant designs emerge, firms can also heavily influence the process and outcomes. DoCoMo's supplier management (which in that case related to standardization dynamics) influenced the value creation and appropriation patterns in the industry.

Along these lines, Zhao et al. (2007) conducted an empirical study within the context of a standards-developing consortium for e-business standards (which are critical for electronic interorganizational transactions). The authors argued that firms that are active along the standardization process enjoy increased and earlier benefits (from adopted standards) in comparison to firms that do not actively participate (but simply adopt the standard once it has been developed). In fact, Zhao et al. (2007) claimed that organizations have to make a "strategic choice" in advance, namely whether to get involved in the standard development process and/or whether to adopt the forthcoming standard. Depending on the outcome of that decision, Zhao et al. (2007) classified firms into three categories: (1) the "leading developers" (firms that are actively involved in the standardization process); (2) "passive adopters" (firms that adopt the standard without joining the development process); and (3) "nonadopters" (firms that do not adopt the standard at all). Despite the costs incurred by the firms-developers due to standardization involvement, those are basically the firms that decide upon the industry's forthcoming standards, and hence, to some extent, upon the

industry's future direction. As Zhao et al. (2007) further discussed, "developers should envision the impacts of their actions on firms outside the standard consortium," in essence claiming that leading developers have a say in other industry participants' fate.

Complementing Zhao et al.'s claims, Suarez (2004) also stated that firms themselves are able to impact their environment through active involvement in standardization, while Schilling (1999) discussed how firms could strategically influence the establishment of specific technology in an industry (viz. through the outcomes of standardization), thus to a large degree shaping evolution of the industry and what forthcoming generations of products will look like. That is, firms' chosen actions can drive and promote particular standards, which might then lead to those firms gaining advantageous positions and competitive advantages (Cusumano, 2010; Funk, 2003; Gallagher, 2007; Suarez, 2004). From a strategic management perspective, a set of firm-specific actions and resources form explanations for the dominance of specific technologies and outcomes of standardization processes. As can be concluded from prior research, firm-specific choices are influential throughout the standardization processes, and, depending on firms' abilities to standardize, the value-capturing potential from standardization differs markedly.

2.1.3 Question marks on the supposed role of the firm

Interestingly, Tee and Gawer (2009) also studied NTT DoCoMo's strategies, similarly to Funk (2003), but in comparison to a Dutch KPN landline and mobile telecommunications company. While Funk (2003) explicated how the Japanese cellular service provider fruitfully pursued its platform strategy and influenced overall industry architecture, concluding that firms have the capacity to do so, Tee and Gawer (2009) presented a somewhat different story. More specifically, soon after DoCoMo's success story, the Dutch KPN attempted to copy it, which looked like a feasible attempt due to structural similarities between the Japanese and the Dutch contexts. Moreover, both KPN and NTT DoCoMo were market leaders, network operators, and incumbents, with KPN, similarly to DoCoMo, being the first incumbent operator and market leader at the time. Even the timing of the companies' introductions of platform strategies was fairly comparable, according to Tee and Gawer. Finally, strong cooperation between DoCoMo and KPN was in place (due to the financial stake the Japanese company held in KPN), allowing the assumption that the Dutch company did undertake the appropriate steps and strategy. However, the

outcomes were diametrically opposed for the two companies; the strategy that allowed DoCoMo to reshape the industry architecture failed KPN miserably.

Tee and Gawer (2009) suggested that KPN failed in its endeavor to achieve platform leadership, despite its strategy deployment, due to differences in underlying industry architectures. In other words, the study aimed to explore the interaction between evolutionary processes, industry architecture, and business strategies, and firmly concluded that it is not merely firms' actions and choices that determine strategic outcomes.

In order to shed light on Tee and Gawer 's contrasting results (which are not necessarily surprising, but are markedly divergent to a number of other studies' conclusions, such as the ones discussed earlier in this section), organization theory might have something to add here. More specifically, as early as 1976, March thoroughly discussed the concept of organizational choice in relation to management and decision making, stating, "we emphasize choices as a consequence of our intentions," which in essence implies the very basic assumption that organizational actions and choices are supposed to follow as a consequence of specific organizational (strategic) intentions. As an example of this basic assumption, we interpret DoCoMo's success story as a successful (and to some extent enlightening) strategy to pursue, inferring that the specific outcomes (of platform leadership) were in line with the managers' intentions since the beginning, and were achieved by the company through explicit choices (viz. decisions and actions). Most theories of organizational choice behavior (as well as individual choice behavior, for that matter), have acknowledged the idea that goals preexist, that "purpose is an obvious presumption" (March, 1976). Subsequently, most theories have also accepted that organizations act upon those goals, choosing among alternatives. In that sense, organizations strive to take actions that, within the limits of their resources, will bring them as close as possible to attaining their preexisting goals. Hence, organizational decision making is essentially presented in strategic management as an attempt to find augmented ways to consistently obtain what is "valuable in the world" (March, 1976). However, March actually criticized this concept of organizational choice and decision making, contending that choice is "at least as much a process for discovering goals as for acting on them." Justifying his claim, he brought up issues such as incomplete information, incomplete goal consistency, and a variety of external processes and disruptions encroaching upon goal development.

Taking into consideration March's conceptualization, and applying it to DoCoMo's (standardization-related) success story, the fact that the company

made precisely the right choices and decisions, thoroughly planning and executing its business strategy in advance so that the desirable goal was attained (namely advantageous standardization outcomes connected to the PDC standard, and subsequently platform leadership) could perhaps be questioned. Similar strategic choices did not land KPN a comparable outcome. Based on existing literature (in both management and standardization), the aforementioned contrasting outcomes cannot be thoroughly expounded. That is, it remains ambiguous whether it was simply a coincidence that the conceived platform strategy worked miracles in DoCoMo's context (where it was first applied), but failed in KPN's (where it was copied), or in fact it is more sensible to assume that DoCoMo worked its way towards success, without having predetermined its goals and choices, but instead, "at least as much," discovering them along the process of acting on them (as March, 1976 suggests). By the same token, while a plethora of scholars have suggested that firms' chosen actions within standardization settings might lead give these firms advantageous positions (e.g., Schilling, 1999; Funk, 2003; Suarez, 2004; Zhao et al., 2007; Cusumano, 2010), it is perhaps ambiguous to discuss the role and strategies of individual firms in regard to standardization processes and outcomes. It is rather complicated to determine whether firms' success stories within standardization settings were really planned or somewhat emerged, when we know next to nothing concerning how those firms planned their standardization management activities, and/or how they pursued them. Consequently, very little is known of the specific challenges firms face when managing standards and standardization, and how they could overcome such challenges successfully. These points will be taken up in ensuing sections; however, first, the matter of CSM ought to be nailed down, to the highest possible degree, based on existing literature. As expressed in the previous chapter as well, existing literature largely neglected in-depth discussion regarding the intraorganizational standardization-related activities and dynamics. Nevertheless, a number of recent publications (as well as few older ones) have taken up the topic of CSM (although it has still not been wholly covered to date) and, for the purpose of this study, ought to be thoroughly discussed in the following sections. Along with those discussions, strategy process theory will be integrated in an attempt to advance understanding of CSM literature.

2.2 Corporate standardization management

As demonstrated in the discussions above, standards and standardization might incorporate important implications for strategic management, since they have been expressed by a number of scholars as playing a potentially vital role in strategy realization. Management of standardization originated in the late 1800s, when the first attempts of managerial theorization sprang from engineers' endeavors to codify and systematize manufacturing practices, primarily within railroad operations (Sandholtz, 2015; Chandler, 1977; Taylor, 1993 [1903]). Nowadays, standardization is progressively employed in a plethora of business activities, such as product design, software engineering, and other types of tangible and intangible work (Sandholtz, 2012; Timmermans & Epstein, 2010). However, existing research has been highly limited to conversations on the anticipated and realized effects through standards, while scarcely considering how standardization should be managed.

As far as I am aware, Betancourt and Walsh (1995) were the first to introduce the concept of (strategic) standardization management. They stated that they set out to write about the concept of standardization management "because of its importance as a management discipline and methodology in today's dynamic business environment" (referring to the business environment of more than two decades ago). In particular, aspects such as globalization of markets, increasing competition (both domestic and international), rapidly developing technologies, and complex manufacturing facilities are among the principal areas that Betancourt and Walsh detected a need for firms to leverage the various aspects of standardization in an attempt to enhance, or even safeguard, their global competitiveness. The authors claimed that their article is based on the experiences of "many best-in-class companies" whose competitive position has been strongly enhanced by properly applied strategic standardization management, although the authors neither named any of these companies nor explicated in detail how the companies conducted their standardization management.

De Casanove and Lambert (2015), similarly to Betancourt and Walsh (although 20 years later), elaborated on how critical it remains for corporations (probably even more critical than it was two decades ago) to embrace and leverage standardization in order to enhance, or even preserve, their competitive positions in an increasingly competitive and globalized business environment. What Betancourt and Walsh (1995) depicted as "strategic standardization

management," de Casanove & Lambert (2015) discussed as "standardization strategy"—yet both publications bring forward the coordinative aspects of standardization (throughout the overall corporation), and the importance of the standardization strategy (or strategic standardization management) being well aligned with the global strategy of the corporation. That is, corporations should very carefully select the kind of standards to develop (or, in other words, the type of standardization to be involved in), making sure "to capture the ins and outs of corporate standardization" (that is, the highest benefits possible) (de Casanove & Lambert, 2015, p.1). In that sense, for efficient standardization management, de Casanove and Lambert (2015, pp. 5,6,9) stressed attention towards the prominence of the "community" (that is subsequently supposed to use the newly developed standard); if the standard does not meet the needs of the community efficiently, it will soon be forgotten, hence wasting the time and resources that were devoted to its development. In order to make sure that this risk is eliminated to the greatest degree possible, the relevant stakeholders need to be involved in the process. Otherwise, merely "assembling a set of high-level experts around the table is not a guarantee of success" (de Casanove & Lambert, 2015). In addition, since standards require a number of resources to be developed, as de Casanove and Lambert also added, an organization ought to carefully consider its standardization strategy and intentions in advance, before becoming involved in a (probably long and costly) standardization process that might lead nowhere (in particular if the necessary assessments were not cautiously made beforehand).

Of course, making meticulous assessments and reaching appropriate decisions is easier said than done. In practice, the standardization scenery has become "some kind of a jungle," which "creates risks for a company to miss new business opportunities emerging from standards (think USB stack taking over most traditional communication buses), or updates that would impact performances of new products (e.g. certification authorities changing regulation, for instance the FAA allowing twin-jets for long haul flight across oceans), or disrupt an established market" (de Casanove & Lambert, 2015). Hence, it might be too challenging for firms to detect where (and how) their efforts and resources (fees, delegated personnel, etc.) should be dedicated (meaning in what standardization fields, since deploying every one of them is simply not possible). It is a matter of standardization management (as well as of strategic management) to select those standardization fields of primary importance, as well as to coordinate and optimize the company's involvement and strategies (that is, standardization strategies), although in practice little is known about the specific intraorganizational processes and activities taking place.

2.2.1 Standardization management and value creation

As expressed in earlier sections, this thesis aspires to relate previous studies on standardization to the strategic management field, meaning that corporate effects and consequences are of interest, but even more focal are the reasons and logics behind the involvement of corporations in the development of standards. The corporate decision-making processes leading to the development of standards (either within a corporation or within an external standardization committee) comprise competitive and, in extension, coopetitive dynamics of vital interest in the field. Future research from a strategic management view (such as the study in hand) ought to further investigate how firms' strategies shape industrial standards, and how industrial standards shape firms' strategies per se. Since firms' competitive moves constitute the basic elements of interfirm rivalry (Miller & Chen, 1996), revealing how firms' competitive moves in the standards battle influence industrial standards and improve firm performance may help extend the understanding of standardization dynamics. Towards an in-depth discussion of how firms could create value through standards and standardization, the activities and processes related to standards and standardization shall be investigated—that is, standardization management.

Examining value creation per se, which consists of "a highly aggregated dependent variable" (Ray, Barney, & Muhanna, 2004) would perhaps overshadow standardization-related corporate effects, especially given the fact that very often those standardization-related processes and activities aim at long-term consequences, which might become evident in performance even years after the activity per se. Therefore, observing the efficacy of business processes instead ("as a dependent variable," as Ray et al. explained) may be more appropriate than merely looking at overall firm performance without breaking it down to specific processes' outcomes (Ray et al., 2004). Namely, as Ray et al. (2004) further elaborated, distinctive advantages that are noticeable at the level of a business process might not resonate in the overall firm performance. Activities and business processes comprise the mechanisms through which corporate value is ultimately created, and hence research studies should be focusing on uncovering these processes, which in fact lead to business outcomes, rather than on observing overall performance. What is more, activities and processes are genuinely of interest, since it has been acknowledged that no matter what competitive advantages are possessed by an organization (for example, resources, capabilities, core competencies, etc.) unless they are translated into specific activities and/or processes, they cannot contribute to a

firm's performance—that is, they will not create value. Finally, as Strauss and Corbin (1990) stressed, strategic outcomes, such as value creation through standards, can be better captured when the internal process—for example, standardization management itself—is studied and explicated.

2.2.2 Standardization management and strategy process

Strategy theory is wholly focused on the internal processes and strategy creation in order to create value. Strategy process, which has attracted growing interest in recent decades and continues to grow, is specifically focused on understanding how organizations formulate and execute their strategies, and what processes are involved. Furthermore, strategy process theory is developed around dynamic strategy concepts and contexts, contrary to the worn-out dichotomy of strategy formulation and strategy implementation (Mintzberg, 2003). In consequence, it comprises a theory about the role of strategy in firms by providing insights into how internal environment decisions and selections arbitrate the coevolution of industry-wise sources of competitive advantage and firm-level bases of idiosyncratic competence, thereby illuminating the linkage between corporate strategy and strategic action (Burgelman, 1994).

The various disciplines that have applied and subsequently shaped strategy process theory since the 1950s, encompassing wide-reaching managerial and organizational interests, have contributed exceptional vigor and a broad understanding of the fundamentals of strategy process to the field (or more accurately, subfield).

The earliest perspective of strategy (often named "original perspective of strategy" in the literature, as well as "design school" [e.g., Mintzberg, Lampel, & Ahlstrand, 1998; Mintzberg, 2003]) dates back to Selznick (1957), followed by Chandler (1962), and further defined sharper by Andrews in 1965 (as in Learned et al., 1965). The principle of the original perspective is the development of an idiosyncratic, best strategy fitting the internal and external circumstances of the organization (Young, 2003). That is, strategy formation is seen as attaining the essential fit between the firm's internal strengths and weaknesses and the environment's external threats and opportunities (Mintzberg, 2003). Strategy formation is based on a SWOT assessment (Young, 2003), conducted by senior management who formulate "clear, simple, and unique strategies in a deliberate process of conscious thought" (Mintzberg, 2003). The original perspective, or design school, was the predominant view of

the strategy for many decades—at least into the 1970s and arguably to date, given its inherent influence on managerial practice and academic teaching. Nevertheless, the design school did not develop further, in the direction of progressing variations within its own context. Instead, it merged with other views, in other contexts and frameworks (Mintzberg, 2003).

What the design school of strategy formation seemed to forget or underestimate, and what later views on strategy process theory appear to grasp, is that "there is no one best way to create strategy" (Mintzberg, 2003). Instead of dictating such a "best way," strategy process theory is concerned with conceptualization of the intrafirm patterns and arrangements of managerial activities entangled in the strategic process (Burgelman, 1996). Bower (1970) and Burgelman (1983) investigated in depth the "generative mechanisms" (Pondy & Mitroff, 1979) of corporate strategy making, explicating how the actions of various individuals in a corporation syndicate to generate strategic outcomes at the firm level, as well as how forces at the firm level affect the actions and activities of those individuals (Burgelman, 1983, 1996).

Strategy process conceptualizes the concurrent engagement of variously positioned managers, and while it may be used in order to assess how well aligned those activities are, it is still acknowledged that all managerial activities are "boundedly rational, purposeful, and driven by managers' perceptions of their and the firm's interests" (Burgelman, 1996). In other words, strategy process research has consented to individuals' bounded rationality, and, more specifically, recognizes decision makers as boundedly rational actors (Cyert & March, 1963; Simon, 1945). However, at the same time, it accepts rational behaviors of organizational members and subsequently anticipates rational behaviors of decision makers (Chakravarthy & Doz, 1992).

Hence, how do these at times rational and at other times boundedly rational decision makers go about making strategic decisions and selecting specific activities and strategies for the benefit of their organizations? Strategy process research has looked upon the structures, planning, controls, human resources, incentives, and even values of an organization in attempting to identify its decision-making procedures (Chakravarthy & Doz, 1992). More specifically, it has aimed to identify and describe those administrative systems and components within the organization that exert an important influence on the behaviors and decisions of the decision makers (viz. managers), and how the stimuli of the various systems bundle together to produce the context for consistent strategic decisions and actions (Hendry, 2000; Chakravarthy & Doz, 1992). In that frame, focus is called upon the behavioral interactions of individuals and groups

within organizations, as well as upon multiple other contextual factors, decision processes and administrative procedures, in order to approach holistically and "track" the strategy process (Chakravarthy & Doz, 1992; Hirsch, 1991). As Mintzberg (2003) explained, the "Don't bore me with the operating details; I'm here to tackle the really big issues" syndrome has been the conviction for a plethora of managerial practices. Effective strategy processes do, always, come down to specifics.

Accordingly, an effective standardization strategy depends on the company's external environment (Grossmann, von Gruben, & Lazina, 2015); however, analogously, it depends on the objectives of the company and a set of intraorganizational standardization-related micro-activities (Slager, Gond, & Moon, 2012). An investigation and analysis of the specific intrafirm challenges, activities and interactions of the various organizational parties involved in CSM might help us to better understand the phenomenon—that is, how corporate standardization is pursued, what the related activities are, and what its potential role in strategy formation and realization is. As strategy process research has long acknowledged that there is no panacea in strategic management (that is, no one best way for strategy creation or best form of organization), and different forms function well in different contexts (Mintzberg, 2003), it may be the case that different forms of CSM also work better in particular contexts. Delving into a systematic consideration of the various processes taking place in the organization and how they are structured and conducted (in relation to CSM) will provide a broader, deeper, and more fruitful appreciation of the phenomenon altogether, and the intrafirm dynamics involved.

Therefore, the endeavor of unpacking the (1) processes, (2) activities and (3) challenges of CSM could immensely benefit from strategy process theory, due to the latter's nature and its fundamental focus on holistic corporate activities and managerial processes. CSM, which remains uncharted and rather unknown to date in prevailing literature, ought to be examined holistically, in order to trace and appreciate its processes; that is, in order to understand the activities and micro-activities involved, grasp the challenges and possible remedies, capture decision-making mechanisms and motives, and finally unearth the undercurrent, or perhaps more obvious, potential role of standardization in corporate strategizing. For instance, Grossmann et al. (2015) discussed how standardization strategies may encompass an issue of critical significance not only for standardization managers, but for general managers as well, by elaborating on the example of Daimler AG. By introducing company standards of higher quality levels than the established market standards, Daimler was able

to utilize standardization as a strategic instrument. In other words, Grossmann et al. (2015) confirmed that corporate standardization might play an important role in corporate strategy, but did not elaborate or further advance understanding of how organizations manage corporate standardization and what explicit processes are involved.

The thesis in hand is specifically concerned with how standardization might be encompassed in organizations' strategizing, as well as what explicit processes and procedures involved. It could thus highly benefit from referring to strategy process theory—which addresses a number of central questions of fundamental interest for managers (Chakravarthy & Doz, 1992) and is concerned with understanding how organizational strategies are formulated and what organizational processes are involved (van de Ven, 1992). Through the employment of strategy process theory, this project sets out to unpack the processual and strategic aspects of CSM—that is, the standardization-related activities and decision-making within organizations.

2.2.3 Standardization management and coopetition

In addition to unpacking the (intraorganizational) processual and strategic aspects of CSM, the external dynamics of standardization management cannot be omitted. Organizations must balance external pressures, for which the interdependencies among them (that is, among the various market participants) render those relations too important to be ignored in a framework for standardization. Social order is not stable (Dokko et al., 2012), as relations and organizations constantly change and evolve as a consequence of the interactions, adaptations, and negotiations of their participants, with different institutional logics, fields, and interests, within the dynamic process of standardization (Haack, Schöneborn, & Wickert, 2010). In fact, corporate standardization might be seen as an explicit way to manage such interdependencies. More specifically, Mione (2015) discussed how standardization can be utilized to organize market functioning and coordination, and characterized standard setting as "the locus where different visions are supposed to combine in order to organize good market functioning." Standardization comprises a potentially coopetitive relation/interaction, for example in the context of formal standardization committees, where collaborative work among different company representatives is necessary, at the same time that their various interests are kept in mind. Coopetitive relationships, such as standardization, involve high degrees of interdependence, and potentially both conflict and payoff (Gnyawali & Park,

2011). Zhao et al. (2007) and Zhao, Khan, aad Xia (2011) stressed the collaborative aspects of standardization, since most standardization processes (and particularly all formal ones) require inputs and cooperation from related companies. The cooperative development is a collective action, where the output of standards is jointly supplied by developers' individual investments into the standardization process and/or the standards-setting organization. Therefore, it is highly important to examine conditions in which firms decide to engage in coopetitive standardization and how they manage it. In other words, to increase understanding of standardization management, a focus on corporations' voluntary cooperation towards common intentions (corporations that typically also compete) could be very useful—that is, a coopetitive theoretical lens shows noteworthy potential for standardization management, as will be further indicated in the following sections.

As indicated above (and especially in Table 2), coopetition is by no means a theoretical stream that has dominated standards and standardization literature. Nevertheless, it was presented and discussed in Chapter 1 as a potentially fruitful lens through which to increase understanding of standardization management. Coopetition provides the opportunity to examine the intersection between industrial dynamics and corporate actions, with a focus on competitive dynamics, and hence accommodate a better understanding of standardization and strategic decisions. In this section, the theory of coopetition is addressed again, but only in brief given that a more detailed discussion has already been provided in the previous chapter.

Over time, corporations form collaborations with other parties in order to gain a better position in local and global markets and create competitive advantages (Kossyva & Georgopoulos, 2011). Typically, coopetition is considered a win–win strategy for engaged firms. In order to survive and remain competitive and innovative in "today's networked and knowledge-based economy," coopetition is becoming necessary (Kossyva, Sarri & Georgopoulos, 2014, p.90). Since competing companies hold pertinent resources and face similar challenges, collaboration among them allows the development of valuable new knowledge that can substantially benefit them all (Gnyawali & Park, 2011). However, collaboration does not eliminate the competition between firms; features of both competition and collaboration remain present (Bengtsson & Kock, 1999, 2000). This is also the case within standardization work, where market competitors collaborate in order to develop and establish industry standards. Therefore, standardization management inevitably encompasses elements of competition and collaboration at the same time. Theories that acknowledge and recognize

only competitive aspects of market participants' interactions will most likely be unsuccessful in fully comprehending standardization management. On the other hand, the perspective of coopetition contrasts the idea that competition is the general rule—and for that reason might have a lot to offer to better explain standardization management. More specifically, coopetition comprises a frequently undertaken strategy, especially by firms that have to manage emerging technologies, such as biotechnologies, information and communication technologies, electronics, semiconductors, etc. (Garraffo, 2002). Garraffo (2002) explained that emerging technologies increase the level of uncertainty in regard to market opportunities and technology advancements. Similar risks are borne within standardization settings, where analogous uncertainties ensue (in regard to standardization outcomes and, hence, prevalent technologies). Thus, Garraffo continued, firms affected by these (emerging and to some degree uncertain) technologies become able to lessen uncertainty by cooperating (viz. sharing resources and spreading risk) with competitors. Involvement in standardization settings entails competitors coming together and formulating a "network of innovators" (Garraffo, 2002). Centered on the principal idea of dynamic interaction between collaboration and competition (Chen, 2008; Gnyawali, He, & Madhavan, 2006; Gnyawali & Madhavan, 2001; Lado, Boyd, & Hanlon, 1997), coopetition is considered a unique strategy that exploits the benefits of both collaboration and competition (Bengtsson & Kock, 2000; Brandenburger & Nalebuff, 1996).

Discussing Garraffo's work further, he developed a framework of three types of coopetition (based on the level of cooperation among competitors on technology development and market creation—that is, low or high level of cooperation). The first two types refer to (1) exchanges of existing knowledge (encompassing low commitment in both cooperative technology developments and collaborative efforts for market creation) and (2) collaborative research and development activities (encompassing high commitment in cooperative technology developments and low commitment in collaborative efforts to access the marketplace). However, the most relevant type of coopetition for standardization management is (*3) alliances for setting new standards in the market,* which, according to Garraffo (2002) encompasses high commitment in collaborative efforts for market creation but low commitment in cooperative technology developments—though the latter point is rather debatable. By way of explanation, Garraffo provided as an example of the third type of coopetition (that is, the one relevant to standardization): the alliance between Apple Computer, Inc. and Sony Corporation in order to manufacture Apple's Powerbook computers. Apple Computer, Inc. and Sony Corporation are clearly

competitors (since both of them manufacture computers), but they decided to coopete against other competitors/innovators who were working towards the development of new and powerful computers (namely, Hewlett Packard, Compaq, IBM, Texas Instruments, Dell, etc.). Initially, the purpose of the alliance between Apple and Sony was to conduct cooperative research and development activities, specifically focused upon the manufacturing of Apple's Powerbook (that is, encompassing high commitment in cooperative technology developments and low commitment in collaborative efforts to access the marketplace). Nevertheless, such an alliance easily evolved into a coopetitive agreement towards collaborative efforts for the product launch in the marketplace (Garraffo, 2002). This alliance then turned into a standard-setting one; the coopetitors' commitment to collaborative efforts for market creation increased (as Garraffo claimed with reference to his third type of coopetition related to standard setting). However, it is sensible to assume that the commitment to cooperative technology developments also remained high (in contrast to Garraffo's proposition). Namely, Mione (2009), who also discussed coopetition in connection with standardization, observed that firms (or, in fact, collectives of firms, meaning coopetitors) that are most active in the development of standards are leaders and innovators in the technology space (that is, confirming the close relation of standardization-related coopetitive efforts with technology development). Those firms, Mione continued, have to cooperate in order to successfully *manage formal standardization* and establish specific (desirable) standards, while also remaining competitors.

Although Mione (2009) discussed standardization and coopetition from a clearly institutional perspective, focusing on the necessity of consensus towards the emergence of norms (basically, *de jure* standards), she positioned coopetition as a required phase of entrepreneurship strategy in order to establish broadly acceptable norms (again, standards). Mione discussed how norms emerge through acts of coopetition, further developing and essentially shaping the market, while coopetitors compete to endorse their own technology and indicate the direction that is most beneficial to them. In other words, Mione (2009) touched upon the competitive part of cooperation, while remaining in the domain of normative work; that is, with the aim of stating "that norms operate effectively on the market."

Concluding this section, there is evidence that firms reap benefits from carrying out coopetitive stances and activities, yet, again, they face a dilemma between the need to collaborate in order to create value and the temptation to be opportunistic in order to appropriate a greater share of the created value

(Gnyawali & Park, 2011; Lavie, 2007; Ritala, Hurmelinna-Laukkanen, & Blomqvist, 2009). The exact same dilemma may arise in connection with formal standardization work, and subsequently with CSM (as corporations are the ones carrying out standardization work), where coopetitors might reap benefits from setting industry standards, but, on the other hand, might have to share specific know-how or other means of value appropriation. Furthermore, Garraffo (2002) emphasized that it is essential to better understand and explicate, theoretically and empirically, the phenomenon of coopetition in relation to other (more well-known) streams of research, and in different competitive environments (that is, industries), to corroborate how frequently coopetitive activities take place and which configurations they assume. Despite the fact that systematic examinations of why and how firms engage in coopetition are currently limited (Gnyawali & Park, 2011), some work has been done within standards and standardization research (such as the abovementioned work by Garaffo, Mione, and others). Nevertheless, this study aims to approach CSM from a strategic management point of view, focusing on the firm-level activities and motives—that is, firm-level standardization management. To this end, the theoretical lens of coopetition has a lot to offer. In the following sections, the corporate activities and intentions of standardization management will be unraveled.

2.3 Standardization management challenges

As already introduced within this chapter, making standardization-related decisions and managing corporate standardization is by no means a small matter. In order to delve into the processes and activities of standardization management, existing research (encompassing standards and standardization literature, as well as prevailing strategy literature) is scrutinized in order to understand the corporate challenges related to standardization management—that is, the various challenges encountered by the personnel managing standards and standardization within firms.

In this section, a synopsis of the aggregate challenges that corporations must (based on existing literature) handle in relation to standardization management is briefly presented, while each one of these standardization-related challenges will be further elaborated in the following passages. Later on, specific suggestions for managing these challenges will be discussed as well (again, based on prevailing relevant research), in essence codifying the factors to be specifically

examined throughout this study—that is, framing the preliminary theoretical framework for the study.

First, simply *identifying those issues that encompass potential value* for a firm and could play an important role in its performance is a key factor, as Jensen and Webster (2009) discussed, and is a foremost challenge that firms have to overcome. Firms have to "seek, identify and solve technological problems" (Jensen & Webster, 2009), and must do so in a *timely manner (or quickly enough)* so that they do not lag behind competitors—that is, so they do not become "*technologically locked-out*" (Schilling, 1998). Consequently, besides being aware of state-of-the-art technology, firms need to continuously catch up with the technological (and even nontechnological) developments. As Jensen and Webster (2009) described, knowledge-creation processes—that is, learning—encompass mechanisms and processes that are not solely based on "luck," but rather comprise deliberate actions by firms to *pursue new opportunities* for innovation (see Hayek, 1937; Kirzner, 1975). Schilling (2002) stressed that "failure to invest in learning can cause a firm to be unable to keep up with technological progress." Certainly, this will be unfortunate for the firm, since it could mean it is incapable of meeting customers' requirements (Schilling, 2002). In addition, at the same time that firms need to ensure that they do not lag behind, local implementation of well-recognized international standards can be a tricky and ineffective process. Despite the fact that formal standards are drafted universally, *cultural differences* hinder universal implementation and point to dissimilar executions (Haack, Schöneborn, & Wickert, 2012; Servais, 2004). Difficulties inevitably arise from the "mismatch" between global initiatives and local dimensions (Haack et al., 2012; Servais, 2004). However, economic processes are borderless and firms thus have to work their way towards overcoming any cultural differences and challenges that do emerge (Haack et al., 2012; Servais, 2004).

Last but not least, Christmann (2004) discussed how firms have to handle *often-dissimilar kinds of pressures* from a number of external stakeholders as well. Christmann identified three major types of external stakeholders—namely, governments, industry participants, and customers—whose demands are often perceived as salient to the firm (Mitchell, Agle, & Wood, 1997). Of course, besides these three key stakeholders, many more aim to affect the firm (Christmann, 2004). Such a compilation of multi-voice desires and demands, along with a global and already complex standardization environment, poses a challenging equilibrium for firms. How firms reach the fine balance required, and respond to the dissimilar demands, comprises another day-to-day challenge.

Finally, in order to manage all abovementioned challenges related to standards and standardization operations, a *significant amount of human and capital resources* is required (Betancourt & Walsh, 1995). Without the necessary resource contribution, standardization initiatives have no possibility to persist and function effectively (Zhao et al., 2011). Hence, the final challenge that firms might face is simply being able to commit respectable resources to standardization management. The challenges related to CSM are discussed in detail below (see Table 3 for a summary).

2.3.1 Identifying value-potential issues

To start with, simply identifying value-potential issues could be challenging enough for corporations in today's worldwide standardization arena. As Betancourt and Walsh (1995) pointed out, it is important for firms to be able to scrutinize the various aspects of standardization across their overall business and industrial environment in order to make appropriate standardization-related decisions and effectively identify value-potential matters. Betancourt and Walsh (1995) thoroughly discussed the results of a number of studies conducted by "a leading benchmark consulting company, with the participation of 28 others." The studies benchmarked the "Best-in-Class" companies in relation to standardization management, and concluded that it was primarily companies that had been able to identify the (standardization-related) "strategically significant" areas for their business that demonstrated the most effective standardization action plans—that is, standardization action plans that were closely linked to the overall business objectives and strategy. In other words, in the abovementioned benchmark studies, not all companies in question were able to do identify standardization areas and issues with the greatest value potential, but the payoff was significant for those who succeeded in doing so.

Similarly to Betancourt and Walsh (1995), de Casanove and Lambert (2015) focused on identifying areas and issues of high priority and potential for organizations, stressing that, early on, every organization's personnel ought to contemplate what kinds of standards are important for the organization, and subsequently what type of standardization the organization should strive to get involved in. With resource limitations preventing firms from being involved in every standardization area, careful selection of the most prominent (for the specific firm) fields must be made, so that efforts are deployed and concentrated there. However, the standardization landscape can be very complex and overwhelming, often rendering it extremely difficult for firms to identify where

to place their efforts and resources, and how to get involved (de Casanove & Lambert, 2015).

Jensen and Webster (2009) also discussed (although not in relation to standardization specifically) that corporations need to "seek" and "identify" the issues (or "problems," as Jensen and Webster called them) that bear potential value for them. The authors emphasized that those processes and mechanisms (of identification) are not primarily based on "luck" (despite the fact that luck may sometimes play a role). On the contrary, firms must deliberately and actively look out for those (value-potential) issues and identify them early on (Kirzner, 1975), no matter how multifaceted and complex this might be. Ways to face the challenge of value-potential identification (specifically from a CSM perspective) in convoluted and overwhelming business environments (as most of them are nowadays) is further elaborated in section 2.4.2.

2.3.2 Avoiding technological lock-out

In a similar fashion, a major challenge connected with the need for alert standardization management is the hazard of being technologically locked out (Schilling, 1998). Technological lockout occurs when a firm is unable to access a particular market because it is unable to comply with established technology standards, or simply because the firm has "fallen so far behind the state-of-the-art technology," that it is not feasible to catch up (Schilling, 1998). As Schilling (1998, 2002) discussed, firms might find themselves technologically locked out within a matter of years, or even weeks. Technology markets often demonstrate extreme path dependency, allowing incidental and/or idiosyncratic events to have a large impact on technological successes and failures. Nevertheless, such impact develops methodically; that is, accrues over time instead of occurring over night (Schilling, 1998). The main reason for that pertains to the necessity for compatibility (among different manufacturers' products). Compatibility, although not diminishing horizontal differentiation among components of different manufacturers, allows consumers to combine components from various providers, resulting in a larger variety of accessible systems. Interbrand compatibility very likely increases industry demand by enabling customers to create systems that are adjacent to their individual requirements (Matutes & Regibeau, 1996). In other words, technological compatibility boosts network externalities (or demand-side economies of scale) by creating networks of compatible users (Gallagher, 2007). Consequently, it is immensely important for firms to keep up with the technological developments in an industry and

ensure it is not found lagging behind, which in essence would mean excluding itself from the network of compatible providers. Such an occurrence would hurt the firm's business in regard to both new users (who would usually choose a broadly compatible solution), as well as old users (who might switch systems in order to maintain compatibility).

Furthermore, network effects and compatibility issues might be so powerful within an industry that new and superior technologies do not replace outdated ones, for the sake of avoiding severe coordination problems (Matutes & Regibeau, 1996). Farrell and Saloner (1988) and Den Butter et al. (2007) discussed situations in which technologies are not renewed, and old standards are perpetuated, while they should not be [perpetuated]. By way of explanation, firms might find themselves technologically locked out not only because their technology is lagging behind, but possibly also because their technology is progressive and incompatible (that is, incompatible with technologically inferior alternatives), while users are hesitant to switch due to the inherent uncertainty and the risk that other users might not switch (Matutes & Regibeau, 1996; Farrell & Saloner, 1985). Hence, a major challenge related to standardization management is to ensure that the corporation will not find itself technologically locked out within its industry, either due to technological crawl or as a result of incompatible technological progress.

2.3.3 Acting in a timely manner

In close relation to the abovementioned challenge of avoiding technological lockout comes the endeavor of corporations to act in a timely manner, on the one hand in order to ensure that they do not find themselves technologically locked out (as discussed in the previous paragraph), but on the other in order to increase the chances of their particular technologies being established (or "locked in;" see Katz & Shapiro, 1986; Arthur, 1989). For instance, Burgelman (2002), examining Intel's extraordinary transitional strategy-making process (transitional in the sense of becoming increasingly tied to the company's existing product market, over an 11-year period), highly emphasized the importance of lockin effects for the endeavor's success. Andy Grove, the chief executive officer (CEO) of Intel Corporation for the period 1987–1998, created an extremely successful strategy trajectory by focusing on the personal computer market segment, in which the company induced coevolutionary lockin with the industry.

Similarly, and directly related to standardization, Arthur (1989) highlighted two milestone studies of historical events resulting in major lockins, namely the QWERTY typewriter keyboard (David, 1985) and the alternating current (which is an electric current that reverses its direction frequently and at regular intervals within each second, and is commonly used in power supplies) (David & Bunn, 1988). In relation to these two cases of lockin, among others, Arthur (1989) stated "certainly it is easy to find cases where an early-established technology becomes dominant, so that later, superior alternatives cannot gain a footing." In both cases, Arthur (1989) claimed, coordination externalities justify the lockins; that is, offer a technical solution quickly (or, in a timely manner) to an emerging problem or challenge during a standardization process increases the chances of "locking in" that solution.

Along these lines, Suarez and Utterback (1995) discussed the fact that established standards often result from a battle between technical alternatives, such as different computer architectures, where early footings often come with significant advantages (such as first-mover advantages [see Lieberman & Montgomery, 1988]). Funk (2003) pointed to the bandwagon effect (a phenomenon by which the rate of uptake of opinions, beliefs, and ideas increase the more they have already been adopted by others [see Goidel & Shields, 1994]) as significantly impacting which alternative (among competing technological designs) prevails as an industry standard. For that reason, Funk continued, acquisition of an early installed base might be proven crucial for the dominance of particular technologies (that is, particular industry standards [see Rohlfs, 1974; Oren & Smith, 1981; Farrell & Saloner, 1985; Katz & Shapiro, 1985; Shapiro & Varian, 1999]). In addition, since early footings cannot be achieved unless the organization has acted quickly enough, timely action might be critical for successful CSM.

In addition, although not referring to standardization management per se, but to corporate management (and decision making) in general, Kanter (1979) argued that the ability to act in a timely way "make it possible to accomplish more." This opened up a discussion about powerfulness in corporate settings and relates it directly to the ability to mobilize resources in order to "get things done," which in turn is firmly connected with the ability (of organizations' personnel) to perform the pertinent actions within an appropriate time frame—that is, in a timely manner.

2.3.4 Pursuing new opportunities

Besides being well aware of state-of-the-art technology, and being able to keep up with technological (and other) developments in the industry, firms must be capable of pursuing new opportunities in their environments (Chakravarthy & Doz, 1992). Krueger (2007) and Hamel and Prahalad (1989, 1994) argued that firms have to exhibit some degree of "strategic intent" towards new opportunities, while Eisenhardt and Sull (2001) posited one of the "simple rules" of sound strategic logic: "jump into the confusion … keep moving … and pursue opportunities." Organizations must augment their opportunities and reduce barriers (Andrews & Roland, 1987), in the sense that supply creates demand. By being proactive (Kootstra 2009), organizations are capable of generating unique product concepts (encompassing of course both tangible products and services), and the newly created demand thus engenders new models, innovative products, and growing opportunities to pursue (Pentikainen 2009; Joziasse 2000). Specifically in relation to CSM, de Casanove and Lambert (2015) emphasized that a company with an effective standardization strategy can make these (new) products "become the reference for the market," introducing the idea that pursuit of new opportunities might be closely related to standardization management, and in fact the latter (that is, standardization management) could markedly assist towards the former (the organization's pursuit of new opportunities).

Today's dynamic environments (as is the overall business environment, as well as standardization settings) possibly provide greater opportunities (Wiklund & Shepherd, 2003). However, navigation through them is more complicated than ever; tensions are exaggerated, with organizations struggling to stay within the imposed limits (for example those imposed by the market, by legislation, as well as by current technological possibilities), and at the same time competing to pursue new opportunities and push forward into new products and scenarios for the future (Garcia, 2012; Deserti, 2011). Garcia (2012) discussed how the exploration of new business opportunities requires "analytical and scientific thinking," which is based on observation of past data, but at the same time calls for provision and unfolding of future events. This inevitably complicates the situation and results in a scenario in which most companies today are primarily dedicated to exploiting existing knowledge rather than exploring new opportunities—that is, new concepts and ideas. Eisenhardt and Sull (2001) also pinpointed the pragmatic complications of companies' pursuit of new opportunities, as demonstrated in their case study of an American computer

maker. More specifically, Eisenhardt and Sull discussed how, despite the elaborate and structured process for product innovation, their case company remained unable to respond to market changes and pursue new innovations and opportunities. Although Eisenhardt and Sull (among other scholars) did not specifically discuss standardization management, their elaborations pinpoint the existent managerial challenge of managing and pursuing new opportunities—which the standardization literature in turn relates to CSM per se. As mentioned previously as well, ways to go about the pursuit of new opportunities, from a CSM viewpoint, will be further elaborated in section 2.4.5. As mentioned previously as well, ways to go about the pursuit of new opportunities, from a CSM viewpoint, will be further elaborated in section 2.4.5.

2.3.5 Managing cultural differences

The previous sections focused primarily on identification of opportunities and technological elements (such as the firms' need to ensure that they do not technologically lag behind), somewhat trailing the fact that highly technological societies (like most societies of recent decades) have put emphasis on the technological contexts and aspects of standardization concerning daily life—despite the fact that it is actually largely cultural systems that designate which technological innovations become widely acceptable (Valadez & Clignet, 1984). Societal and cultural dimensions greatly influence the standardization process through existing assumptions, beliefs, and expectations (Tempel & Walgenbach, 2007), since standards creation is fundamentally a social act (Timmermans & Epstein, 2010).

Standards are built collectively in order to work in a standardized way in a variety of contexts; nonetheless, every standard needs to be plugged into a physical and cultural infrastructure that allows it to function (Timmermans & Epstein, 2010). Along these lines, Newburry and Yakova (2005) scrutinized standardization preferences within various cultural settings and recognized significant differences in actors' responses with reference to comparable (or even identical) deliberations in regard to standardization of activities. More specifically, Newburry and Yakova (2005) looked into the preferences of employees of a global firm in the service industry (namely, a public relations agency headquartered in the UK, but maintaining offices all over Europe, North America, and Asia) and detected that employees from cultures of high power distance (that is, those who accept that power in institutions is distributed unequally among individuals), high uncertainty avoidance (those who feel

threatened by ambiguous situations and try to avoid them through particular rules), and high context (that is, cultures that emphasize harmony, relationships, and cooperation) prefer greater standardization of organizational activities and perform better under high uncertainty avoidance. On the other hand, employees from high individualism cultures (that is, cultures that put personal task accomplishment before group interest) might prefer less standardization.[3]

In other words, despite the fact that increased globalization requires higher levels of standardization (Servais, 2004; Timmermans & Epstein, 2010), cultural differences might be an immensely important factor to take into consideration when firms' managers and standardization personnel contemplate their CSM. Standardization endeavors and local implementation (even of well-recognized international standards) could be proven very complicated and ineffective processes in practice, perhaps even with adverse effects, since formal standards are drafted universally but very often cultural dimensions (that is, cultural concerns and constraints) hinder a universal implementation and point to dissimilar executions (Haack, Schöneborn, & Wickert, 2012; Servais, 2004). By coordinating people and things in new configurations, standards (and possibly also standardization processes as such) transform institutional settings (Timmermans & Epstein, 2010), unavoidably stimulating predicaments from the "mismatch" between global initiatives and local dimensions (Haack et al., 2012; Servais, 2004). Nevertheless, economic processes (which standardization processes aim to structure) are borderless, and thus firms have to work their way towards overcoming any cultural differences and challenges that do emerge (Servais, 2004).

2.3.6 Managing dissimilar demands from various stakeholders

In addition to cultural differences that firms must manage and overcome for more effective CSM, other external pressures regularly come into play, such as demands and desires from various stakeholders, which in fact very often conflict, or are at least dissimilar. As mentioned already, Christmann (2004) has

[3] Newburry and Yakova (2005) applied Hofstede's (2001) indexes to classify the respondents' national culture. In addition, Hall's (1976) high- (vs. low-) context cultures dichotomous variable was utilized, coding Denmark, Norway, UK, US, Germany, Canada, New Zealand, Australia, and Ireland as low context (emphasizing personal control over relationships), while Thailand, China, Singapore, Taiwan, Hong Kong, Malaysia, Spain, Italy, Belgium, France, and Mexico were coded as high context (emphasizing relationships over personal control).

specifically discussed how firms have to handle often-dissimilar kinds of pressures from a number of external stakeholders. Suarez (2004) has also pointed that specific series of standards arise, after sociopolitical processes and negotiations, once organizational communities come to support particular proposals. Manning, Boons, Von Hagen, & Reinecke (2011) investigated the specific role of key stakeholders and argued that economic and institutional conditions have served as critical drivers of particular standards' evolution globally. Hence, in spite of the challenging nature of simultaneously acknowledging (and potentially satisfying) several stakeholders, corporations should not ignore the various voices if they wish to pursue standardization management successfully. Open and collaborative processes lead to more appropriate standards (Choi, Raghu, & Vinze, 2004) and diverse participation in the development of a standard provides possibilities to reduce obstacles for implementation and greater coordinating capacity (Zhao et al., 2011).

Furthermore, in a discussion about standardization management specifically in relation to mortgage securitization markets, Kaniadakis (2015) underlined how crucial it is for CSM to account for stakeholders and the overall social implications. Kaniadakis criticized the securitization industry, claiming that instead of developing standardization management strategies that would support the function and vision of a collective understanding (of credit risk management), the industry prompted a fragmented functional specialization that eventually undermined the accord of the risk-analysis process. The issue is problematic, as he explained, due to the fact that the implications of standardization management might extend much further than the scope of "narrow management planning" around productivity and competitiveness goals, to much broader social contexts and relations. For that reason, particularly in mortgage finance, standardization management (both as an academic field and as professional practice) is progressively diverging from a straightforward business logic (that is, one solely cherishing efficiency, profitability, and competitiveness), and is opening up to embrace a more inclusive type of accountability. That is, the employees managing standardization are not only accountable to their respective organization, but to other stakeholders as well (at the level of both the industry and the broader public). Figure 2 is taken from Kaniadakis' (2015) conclusions, where the author aimed at further visualize his argument.

In other words, standardization management professionals, when making decisions about standards adoption (or any other type of standardization-related choices) ought to aim beyond operational efficiency and organizational

performance; they should consider the implications for the specific organization, while simultaneously taking into account the broader sociopolitical implications. Besides being closely aligned with business strategy, standardization management strategies must also be aligned with the wider social policy visions, at least within the specific industry (referring to social and innovation policy issues that guide the development of an industry).

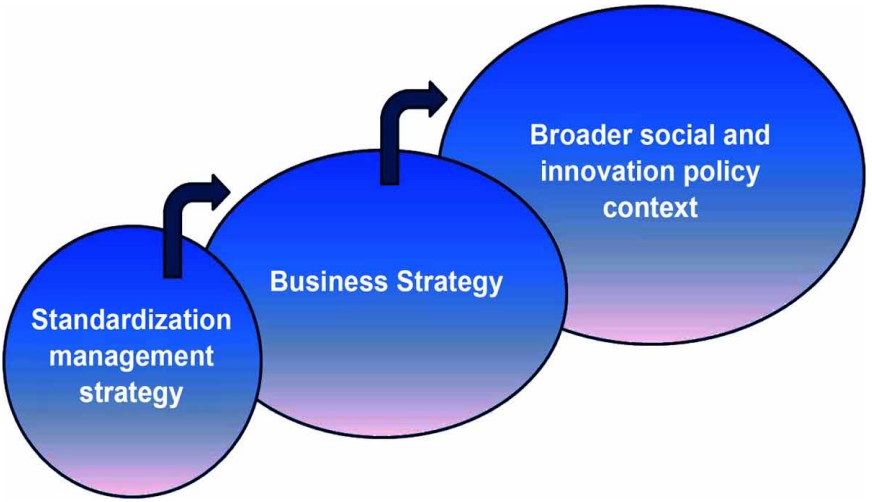


Figure 2
Standardization management "in context."
Source: Kaniadakis (2015).

In Kaniadakis' (2015) view, standardization management does not (or should not) exclusively serve individual firms' goals and interests ("selfish interests," as he called them), but must also take into account the systemic and longer-term implications (at minimum at the level of the industry). Thus, standardization management is drifting away from the level of managerial decision making and is becoming highly politicized.

However, it is important to stress that Kaniadakis was wholly focused on the securitization industry and mortgage finance. As he also stated, "the particular historical circumstances and idiosyncrasies of this industry surely put standardization management in a unique context on which lies the future of the industry itself and questions on the role of the financial system in society more generally." In other words, it is reasonable to assume that the societal implications are somewhat more straightforward and penetrating in the case of

mortgage securitization than they might be in some other industrial circumstances—although systemic effects and broader implications resulting from CSM may be anticipated in all industrial, and subsequently societal, settings. Although Kaniadakis' findings and conclusions might be too contextual and not very easily generalizable in regard to standardization management within other industries, he put forward a very good (and rather generalizable) point. Namely, he emphasized that the focus on standardization management, both as an academic field as well as a field of professional practice, must address the mechanisms by which the various industrial actors (such as producers and users of standards, regulators, policy makers, professional associations, etc.) interact and engage in efforts to balance the emerging tensions among them. Therefore, suitable analysis of CSM, even if based on intraorganizational dynamics, should not leave hidden the externally oriented objectives and attitudes (that is, within the external, whether formal or not, standardization arenas).

2.3.7 Committing significant amounts of resources

Finally, in order to manage all abovementioned challenges related to standards and standardization operations, a plethora of human and capital resources need to be committed for the firm's standardization management (Betancourt & Walsh, 1995). That is, a significant amount of resources must be made available by the organization in order to deal with all aforementioned issues—in other words, in order to keep an eye on the identification of value-potential issues for the corporation and retain alert standardization management so that the firm does not find itself technologically locked out, as well as for managing timely action, pursuing new opportunities, and at the same time managing cultural differences and other external pressures from various stakeholders. Betancourt and Walsh (1995) discussed how "efficiently managing and acting on these initiatives is a formidable challenge, [for which] the human and capital resources required are more than the vast majority of corporations are prepared to commit." Similarly, Boh, Soh, and Yeo (2007) and Folmer and Roes (2015) pinpointed "commitment of resources" as one of the milestones for standards development (although specifically in reference to the electro-technical industry).

Regardless of industry, de Casanove and Lambert (2015) emphasized that "standards require a lot of resources to be developed." Likewise, Jakobs (2014) categorized organizations that are not highly involved in standardization as often

lacking the resources to do so, meaning that many firms that would be eager to be engaged in standards development (and hence realize the benefits thereof), are unable to do so since they do not have the slack to deploy the required (human and monetary) resources for such activities. Laporte and Chevalier (2015) also discussed the fact that many organizations are not able to be involved in standards development due to a lack of resources—which often applies to smaller firms, but could be the case for any organization, regardless of size. More specifically, Laporte, Renault, and Alexandre (2008) conducted a study investigating the reasons why small organizations (VSEs) choose to not utilize standards (and customarily choose to not deploy active CSM). Lack of resources was ranked as the prevalent reason for this among the study's respondents (in particular, at least 28% of the questioned organizations would otherwise wish to utilize standards, and that percentage increased by up to 43% depending on interpretation—that is, if standards were "easier" to use, potentially referring to resource commitment again).

Table 3 summarizes the challenges related to CSM as discussed in sections 2.3.1–2.3.7.

Table 3
Summary of standardization management challenges.

Standardization management challenges
Identifying value-potential issues
Avoiding technological lock-out
Acting in a timely manner
Pursuing new opportunities
Managing cultural differences
Managing dissimilar demands from various stakeholders
Committing significant amount of human and capital resources

In the following sections, the challenges related to CSM will be discussed further, again based on existing research, with the aim of recognizing specific means (or potential "factors") by which corporations cope with these challenges. The identified factors—which are, in other words, expected to influence CSM as they encompass firms' ways of coping with the related challenges—will form the study's preliminary theoretical framework for CSM. More specifically, by scrutinizing and investigating how organizations might overcome the challenges

they face in relation to standardization management, this study aims to elucidate and understand in depth the essence and nature of CSM per se.

2.4 Preliminary theoretical framework

In the previous sections, potential influencing factors of CSM have been accrued based on prevailing standardization and strategy literature and from the standardization management challenges discussed in the previous sections. The potentially influential factors, or elements, of CSM will be further investigated below in order to uncover the black box of standards and standardization management activities and processes—as well as how the treatment and application of these could be linked to strategic implications and value creation.

Nonetheless, since existing research specifically addressing standardization management remains rather limited to date, construction of the theoretical framework is largely driven by publications addressing standards and standardization in general, as well as strategic management, and, to some extent, organizational theory. Despite the fact that these publications have not specifically pinpointed standardization management, it will be shown that they arguably lay the foundation for the development of an analytical framework for understanding standardization management.

The preliminary theoretical framework, which amalgamates a plethora of prevailing literature into one, integrated framework, provides the opportunity to obtain a more holistic perspective. Previous contributions from various authors have been informative and constructive; however, the composition of a multiperspective theoretical framework offers great potential for further advancement, through an integrative approach. Hence, in the subsequent sections the above-listed challenges will be cited again, yet this time in conjunction with possible "solutions"—that is, a number of factors that potentially influence a firm's standardization management. The compilation of those factors comprises the outcome of a thorough review of existing literature, as well as the integration of different streams of previous research.

2.4.1 The firm: Strategy, structure, and culture

For the purpose of attending to the previously discussed challenges regarding CSM, the composition of a preliminary theoretical framework ought to depart from the firm-specific attributes—that is, the distinctive idiosyncrasies of the firm aiming to manage its corporate standardization.

The overall direction of the firm is expected to be determined by its strategy, which is summed up by Grant (2016, 2010) as "a unifying theme that gives coherence and direction to the actions and decisions of an individual or an organization." Consequently, a firm's strategy establishes how it may achieve its goals and objectives, and, broadly speaking, how it will attain success (Grant, 2016).

Even more so, "corporate strategy" specifically (as contrasted to "business strategy" which is less relevant for CSM decisions) defines the scope of the firm, meaning in which industries and markets the firm will compete. As Grant (2016) stated, corporate strategy incorporates decisions regarding diversification, mergers and acquisitions (M&A), vertical integration, internationalization, as well as allocation of resources among the various businesses of the firm. Business strategy, on the other hand, is centered upon how the firm competes within the selected (from corporate strategy) markets and/or industries, and subsequently how the firm establishes competitive advantages within those markets. While both parts of strategy are crucial for a firm's successful conduct, within the context of this thesis the primary and overarching focus is on corporate strategy per se—that is, the scope of the firms and how this may (or may not) relate to CSM. The scope of the firm, outlined by corporate strategy, encompasses a multitude of dimensions, such as the firm's products and customers, the countries of operation and the firm's ownership of vertically related activities.

Hence, corporate strategy is arguably the most overarching attribute of a firm (or at least one of them, along with other firm-specific characteristics), and ought to be encompassed in a framework for CSM—and notably so in regard to a study whose main purpose is to relate (potentially) CSM to specific corporate strategic objectives (as in the study at hand).

Furthermore, besides corporate strategy setting the stage and direction for corporations (Grant, 2016), Christmann (2004) pointed out that how organizations respond to various pressures throughout the standardization processes (such as to dissimilar, or even conflicting, demands from different stakeholders) is associated with internal firm characteristics. Specific firm

characteristics and organizational circumstances play an important role in determining the idiosyncratic setting within which an organization will attempt to influence standardization and standards (Chow, Lindquist & Wu, 2001; Gerst et al., 2005; Haack et al., 2012; Sandholtz, 2012; Zhao et al., 2011).

In order to identify the particular firm characteristics that potentially affect a corporation's standardization management, a further categorization will be utilized, namely "hard" and "soft" firm characteristics. These notions are borrowed from the concepts of (hard and soft) skills (Andrews & Higson, 2008; Burns, 1997), as well as (hard and soft) information (Baliga, 1999; Petersen, 2004), pointing to the intangibility (Andrews & Higson, 2008), or nonverifiability (Baliga, 1999) of either skills or information. The same distinction between hard and soft can be useful in the discussion on firm characteristics as well. That is, characteristics such as administrative structure, which can be rather straightforward acknowledged, will be referred to as "hard firm characteristics." On the other hand, aspects that are much more ambiguous, such as organizational culture, will be referred to as "soft firm characteristics." This distinction is considered meaningful towards a more ambitious and precise examination of standardization management determinants, due to the dissimilar nature of these two diverse types of organizational features. For instance, organizational structure is a (hard) factor that can be effectively decided upon, potentially altered quickly and straightforwardly acknowledged, while culture is a (soft) firm characteristic that cannot be as easily tracked or rapidly reformed. Clustering these into one grouping would only neglect this essential dissimilarity and consequently limit the ability to study their (potentially dissimilar) impacts on standardization management.

2.4.1.1 Structure

As previously hinted at, organizational structure is a hard firm characteristic that shall be examined in terms of playing a role in an organization's standardization management. Timmermans and Epstein (2010) stated that "every standard needs to be plugged into a physical and cultural infrastructure that allows it to function," while Zhao et al. (2011) argued that (social) structures essentially determine whether standards will endure. In that frame, it can be argued that the organizational structure—that is, the environment in which corporate standardization is managed—could play an equivalently important role for successful standardization management, and ought to be considered and examined.

In terms of overall corporate strategy making (inspired by strategy process theory), Burgelman (2002) discussed organization structure, and more specifically higher centralization, as a possibly critical element in the ongoing process of making (and implementing, as those steps are not really separated in strategy process research) corporate strategy. In his 2002 case study of Intel's attempt to reformulate its corporate strategy, Burgelman described the company's gradual centralization as fairly noteworthy; more specifically, as reported by a senior executive (at the time of the study) of Intel, the whole company appeared organized in a way that "funneled things up" to Andy Grove (the CEO at the time), Gordon Moore (Grove's predecessor), and Craig Barrett (Grove's successor). In other words, Intel Corporation's strategy making and control was centralized in the sense that it was overly dominated by just three individuals. Such centralization emerged progressively, at a time that the company was recovering from a recent "defeat" (Burgelman, 1994, 2002) in its semiconductor memory business, and was refocusing towards its microprocessor business. Of note here is the fact that the aforementioned process (of extremely centralized management and strategy making) resulted in Intel's clear domination in the personal computer segment. Equivalently, and focused on standardization management this time, Betancourt and Walsh (1995) looked at a series of benchmark studies conducted in 1991, whom they referred to as the "Best-in-Class" companies (with reference to their overall performance as well as their standardization management). The authors emphasized that all those benchmark companies exhibited "a well-defined standards development process, with a focus on efforts to speed up standards development […] and there were leveraged *centralized* standards administration activities." Following up this observation, Betancourt and Walsh provided a number of leading questions (to be asked within any organization) in order to evaluate the organization's standardization management, with the most crucial ones (which also comprise recurring themes in all of their listed questions) relating to the firm's consideration and realization of why standardization is important for its business, what the potential impact of standardization developments on the firm's business is, and *who the people responsible for standardization within the company are* (that is, pointing to organizational structure).

Especially in regard to the latter—employees that are straightforwardly responsible for standardization management in the firm—Betancourt and Walsh suggest the creation of a centralized office for standardization management, meaning a centralized business unit specifically dedicated to the purpose of gathering input and endorsing a cohesive standardization-related strategy. Centralization, as a general principle of management, was stressed by Fayol as far

back as the late 1940s. Fayol (1949) claimed that centralization comprises a basic attribute of managerial function—so basic that he compared it to the natural order of both animal and social organisms (that is, firms and other organizations). Fayol explicated that just as in every animal organism sensations congregate in the brain, and from the brain orders are transmitted to the rest of the organism to set it in motion, equivalently for social organisms a centralized directive part converges inputs and subsequently sends out orders to set the organism (viz. organization) in cohesive motion (Fayol, 1949). However, other than putting forward advice for the creation of a centralized standardization office, Betancourt and Walsh (1995) did not provide further guidance for effective standardization management. In fact, they implied from the beginning that providing such guidance was not even their objective; instead, they aimed to trigger readers' thinking on the materialized benefits by highlighting the importance of strategic management of standardization, and hence initiating consideration and analysis of standardization management.

Similarly to Betancourt and Walsh (1995), de Casanove and Lambert's publication in 2015 emphasized that, during recent decades, many big companies have already set up a Corporate Standardization department (or, in other words, a centralized office for corporate standardization), which is charged with the task of making consistent decisions in regard to the company's participation in external standardization work. In addition, even after the standardization bodies (and committees) in which the organization should partake have been carefully assessed and decided, optimal attendance and participation (in those standardization committees) requires a sharp and well-defined view of "who goes where," and why. The corporate standardization unit ought to be in charge of the intraorganizational communities, or intraorganizational networks, so that the various operational levels sustain a reliable and up-to-date mapping of the organization's participations (de Casanove & Lambert, 2015).

2.4.1.2 Culture

On the side of soft firm characteristics, Chow et al. (2001) and Sandholtz (2012), in their empirical and conceptual studies, respectively, found proof that organizational culture exerts a distinctive influence on standards' implementation within organizations.

More specifically, Chow et al. (2001) focused on national culture and the effect it might have on standards' implementation and effectiveness within organizations, and conducted a large-scale experiment in order to test culturally

based expectations (in connection with standards and standardization). Consistent with the initial assumptions, the experiment's results provided evidence that national culture predispositions heavily impact personnel's reactions and attitude towards intraorganizational implementation of specific standards. Although Chow et al.'s study examined employees' responses to specific standards' implementation, it may be argued that intraorganizational implementation should be perceived as an element of CSM; hence, the study's results may be extended to overall CSM.

On the other hand, Sandholtz (2012) focused on organizational subcultures, instead of national ones, and studied in depth two divisions of the same corporation—an American manufacturer. The two divisions in question appeared in fact as very "distant" ones (in terms of context, historical antecedents and internal processes), entailing very different "legacies" (as Sandholtz described them), where in one group a culture of cynicism and chaotic work practices prevailed, as opposed to a much more structured and inclusive environment in the other group. In agreement with Chow et al.'s (2001) results, Sandholtz concluded that the varied organizational (sub)cultures played an immense role in terms of whether the adopted standards (and supposedly implemented ones) were coupled or decoupled from the actual day-to-day work in the organizations (that is, the two separate divisions). Specifically, in the former case (driven by a culture of cynicism) the standard-related activities were very much decoupled from the actual work, while in the latter case (the division with a more affirmative culture) the standards were implemented much more effectively and fruitfully. In addition, Sandholtz (2012) argued that the organizational level of analysis was still missing in extant publications concerning administrative standardization and the elements affecting it (such as organizational culture), since theories have primarily focused on actors at the institutional level of analysis. However, "for a standard to be put into practice" (once adopted, for instance), it must penetrate the intraorganizational hierarchy, from the managerial hierarchy to the functional units and subcultures in question (Sandholtz, 2012).

Furthermore, as touched upon in earlier sections as well, Haack et al. (2012) and Servais (2004) pointed out that despite the fact that formal standards drafts aim toward universal implementation, cultural differences might not allow such attainment. Moreover, Servais (2004) showed that the methods chosen to implement certain labor standards were predicated on culture. In other words, previous research has indicated that organizational culture has to be taken into account as highly affecting a corporation's standardization management.

Following on from the above, culture might play some role in an organization's standardization management practices, and hence shall be scrutinized and encompassed within the preliminary framework.

2.4.2 External participation

As discussed in the previous section, the firm's corporate strategy, along with other firm-specific characteristics, determine how organizations respond to various pressures throughout the standardization processes. With a view to identifying value-potential issues for the corporation and the avoidance of technological lockouts, regular collection of relevant information—or "information advantages," as Funk (2003) characterized a preferential access to information—has been addressed in previous research as potentially playing a decisive role. Consecutively, in contemplation of firms' collection of important and relevant information, Leiponen and Helfat (2010) deliberated the idea of firms' participation in external standardization committees as an effective way to do so. External participation in standardization committees allows firms to collect useful input in regard to the technological status of other industry participants, and hence ensure that they do not find themselves technologically lagging behind, or developing incompatible products. As Rysman and Simcoe (2008) emphasized, standards-setting organizations increase the significance of standardized technology through formal endorsement and other efforts to promote industry coordination, since standards—as the outcomes of standardization—are foremost accentuated as modes to ascertain interconnectivity (Warner, Fairbank, & Steensma, 2006; Weiss & Cargill, 1992). Gerst (2003), for instance, stated that in order to ensure compatibility in an increasingly networked environment of business partners, standardization on different levels is enforced. Along these lines, Gerst, Bunduchi, and Williams (2005) explored characteristics and factors that shape the development and implementation of standards, concluding that, overall, industry cooperation asks for systems' compatibility—grounded by common standards, which emerge and endure through "communities of practice." In other words, industrial dynamics (both existing and upcoming) are enunciated in the interactions and negotiations of market participants within standardization settings (Greenstein, 1992), where the collective actions of (participating) firms develop and transform emerging outcomes (that is, standards), as well as emerging industrial structures (Hargrave & Van De Ven, 2006; West, 2003).

On that account, participation in standardization settings is a way to minimize "the inherent risk of innovative activity" (Leiponen & Helfat, 2010) by being regularly involved and updated on the industry's progress. Delcamp and Leiponen (2013) and Ballester, Calvo-Armengol, and Zenou (2006) also stressed that firms engaging in standards development activities often do so primarily in order to attend to the newly created knowledge along the process. More specifically, discussions within standardization settings encompass the potential to keep participants updated on the status of the industry, as well as warn them about potential technological drawbacks, while giving them time to catch up before it is too late. Hence, inspired by the aforementioned authors, external participation in standardization committees could be considered potentially critical for CSM, and will therefore be encompassed by this study's preliminary theoretical framework.

2.4.3 Resource commitment

In close proximity to external participation (in ongoing standardization committees, as discussed in the previous section) follows the necessity for commitment of a significant amount of corporate resources (human and capital ones) for the pursuit of CSM. As Zhao et al. (2011) explicitly stated, without the necessary resource contribution, standardization initiatives have no chance of persisting.

Cargill (2015) discussed the fact that milestone standards, such as the HTML5 specification and other standards related to the World Wide Web, have been created and financed extensively by companies who have been "willing to commit significant human and monetary resources to producing [Web] standardization." On the same issue, de Casanove and Lambert (2015) explained how the identification of relevant standardization bodies and working groups, and subsequently the commitment of the "required resources" to those groups' work, is for the most part well justified for a firm. In fact, de Casanove and Lambert (2015) even went as far as characterizing the resources spent on standardization management as a potential "golden token," for instance in cases where the firm is involved in working groups that publish standards supporting a regulation that heavily impacts business.

By the same token, in linking resource commitment to participation in external standardization groups, Abdelkafi and Makhotin (2015) contended that "the allocation of high level of resources" (for example, through the creation of a

dedicated department for standardization, or through the allocation of standardization-related tasks to top managers) will most likely escalate the chance that the firm participates in major standardization committees. Meanwhile, Lehr (1992) has long argued that effective participation in standardization requires significant capital and human resources, such as technical and business expertise. Both capital and human resources need to be in place, and available for standardization management pursuits at the times that "suitable opportunities" surface in the environment (Wiklund & Shepherd, 2003)—but also in order to create such opportunities for the firm.

Subsequently, at a corporate level, adequate resource contribution could be expected to a large extent to affect—and, in fact, regulate—CSM. Resource commitment might be proven to comprise a key element of the study's preliminary framework, and ought to be encompassed by it.

2.4.4 Timing

Another challenge previously discussed in relation to CSM (and in turn related to external participation in standardization committees as well), has to do with the need for organizations to act in a timely manner, meaning that they must be neither too slow (and risk lagging behind), nor too fast (and risk moving and acting detrimentally quickly). As Gilbert and Strebel (1987) noted while deliberating strategy process theory, "a successful strategy should be flexible enough to exploit market changes by making timely shifts back and forth." Even though the authors were referring here to the overall corporate strategy, and not standardization strategy specifically, their analysis could arguably be applied to standardization management as well. Gilbert and Strebel discussed how the prospects for strategic leverage may vary substantially over the course of an industry's development, which means that if firms wish to remain competitive, they ought to develop certain capacities of "switching strategic emphasis … in order to outdistance the competition" (Gilbert & Strebel, 1987). Vital role in being capable of doing so could play timing (Arthur, 1989), as of "the timing at which activities take place," which hence could be perceived of impacting its effectiveness (Georgiou, 2004). More specifically, in his longitudinal study in the context of the UK's Accounting Standards Board, Georgiou (2004) presented evidence that the timing of standardization-related activities (standardization-related lobbying activity, in his study) was perceived by corporate managers as impacting the effectiveness of activities (primarily senior

managers were involved in the study, as they were considered to be most knowledgeable about their companies' activities).

Arthur (1989) specifically discussed timing in regard to technological choices per se, while Georgiou (2004) focused on the role of timing in regard to activities of companies' lobbying related to standards. That is, the two authors addressed rather distinct angles (of timing), though nevertheless both contending that it might play a decisive role in corporations' favorable outcomes. Therefore, the importance of timing could be extended to any other activity in relation to standards and standardization (such as the establishment of specifications within the setting of a standardization committee). In addition, de Casanove and Lambert (2015) discussed how organizations should select the kind of standards to develop (or, in other words, the type of standardization they should be involved in, to benefit themselves) and put forward a number of relevant criteria for this, starting with market maturity. In other words, de Casanove and Lambert put forward market timing as a major factor to consider in the matter of CSM.

Hence, inspired primarily by the standardization literature and secondarily by Gilbert and Strebel's (1987) discussion on strategy process theory, the potentially significant role of timing will be examined with reference to CSM, and will thus be encompassed in the preliminary theoretical framework.

2.4.5 Precedence

Finally, while careful timing has been cited as critical in determining the efficiency of organizations' actions in relation to their strategy in general, and standardization management specifically, in some cases the organization's precedence could in fact increase the chances of success, especially when aiming to pursue new opportunities and "locking in" new developments.

Namely, Schilling (1998, 1999, 2002) and Arthur (1989) drew attention to precedence as a powerful explanation for particular standards' success (or failure). More specifically, precedence refers to the tactics firms use to get a head start and diffuse early on particular specifications within the standardization settings (either formal or informal), in order to enjoy an elevated opportunity to establish them (Schilling, 1999; Arthur, 1989; Katz & Shapiro, 1986). More specifically, individual firms' actions initiate and establish standards through competition/network forces (Blind, 2004). Once an important agent adopts a specific standard, others will most likely follow in order to avoid the risk of

incompatibility (Farrell & Saloner, 1986; 1988; Schoder, 2000). As mentioned in previous sections, the emergence and establishment of standards is largely driven by designs for interoperability, network externalities, and coordination mechanisms (Schoder, 2000; Blind, 2002; Cusumano, 2010; Okhmatovskiy & David, 2012), and although vehicles for standardization encompass primarily collective action within standards-setting organizations, standards may also emerge from individual (dominant) actors (Rysman & Simcoe, 2008), for example through competitive imitation (Guler, Guillén, & Macpherson, 2002). Endorsed standards might exert "an influence on judgments," meaning that as long as a proposed solution appears to conform to a standard, its cognitive attractiveness is enhanced, even in the case that the solution itself is not superior (Tenbrunsel et al., 2000).

Along similar lines, de Casanove and Lambert (2015) highlighted that lower levels of market maturity are best when organizations develop standards (that is, force during the market's early stages, viz. precedence), since chances are far greater for elimination of competition and market dominance with a newly developed technology or management method (in such manner, any type of standard), at the time when market positions are still at stake. Strengthening de Casanove and Lambert's argument, Sutton (1984) and Georgiou (2004) also advocated that presenting suggestions at an early stage of the standard-setting process positively influences the probability of being heard, contrary to speaking up when everyone else is presenting alternative suggestions as well. Therefore, precedence, which has been addressed in the standardization, as well as the strategic management literatures, before, shall be encompassed in the preliminary theoretical framework and further investigated for its potential role in CSM.

2.4.6 Summary of potentially influential factors

In the sections above, the challenges and issues that emerge in a firm in connection with CSM were presented again and broken down into various factors that will be examined as potentially influential in regard to CSM. The outcome is therefore the construction of a preliminary theoretical framework for the study of CSM, encompassing a number of factors that may be contemplated as influential for CSM, based on a thorough literature review on standards and standardization. These factors have been identified and accrued through a number of distinct publications.

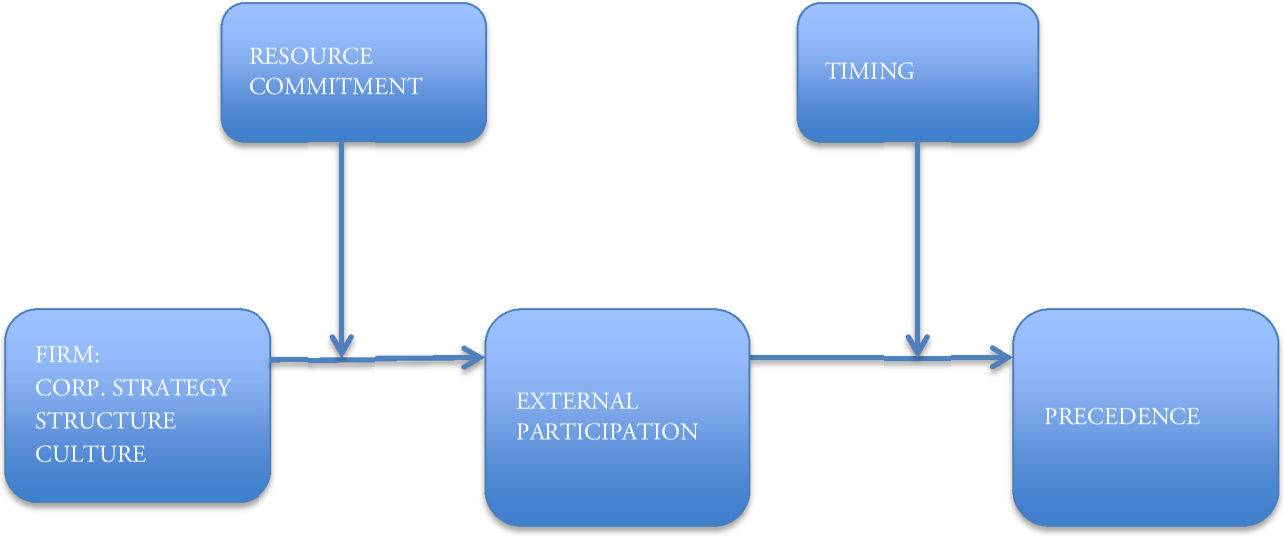
2.5 An integrative research approach

In the previous sections, a number of standardization-related challenges were identified and sequentially linked to factors that may be contemplated as influential for CSM, based on a thorough literature review of a number of distinct publications. The outcome of this inclusive review, which encompassed both standards and standardization literature, as well as strategic management literature, was the construction of a preliminary theoretical framework for the study of CSM. Utilizing this understanding and synthesis, an integrative preliminary framework for CSM is schematically presented in Figure 3.

The theoretical framework, which is (as mentioned already) the outcome of a compilation of previous studies from the consolidation of different fields (namely the fields of standardization and of strategic management) and thus is based on a broad scientific base, encompasses an integrative approach on standardization management. On the contrary, alternative theoretical frameworks for standardization management have not been identified in existing literature to date, despite the fact that a number of scholars have accomplished notable contributions indirectly related to particular aspects of standardization management within the broader arena of standards and standardization. Nevertheless, a more holistic approach is required, and could be beneficial for a more thorough, overarching understanding of the issue of standardization management. Figure 3 aims at precisely this objective.

In other words, the preliminary framework was designed and developed with the aim of providing a useful tool for researchers who are interested in examining a number of factors that might bear the potential to influence CSM. Such factors have been acknowledged in previous literature, but it remains necessary to investigate them through empirical material—as will be tackled in this study.

Figure 3
Preliminary theoretical framework for CSM.



3 Research Methodology

This chapter discusses the methodological approach that was designed and used for the study; that is, two in-depth case studies. The choice of industry and specific firms are presented, along with the process of data collection. Data was gathered from multiple sources, such as observations, semi-structured interviews, and company documentation, in order to achieve data triangulation. Furthermore, an early stage of data analysis is demonstrated utilizing pattern-matching logics (Yin, 2013, 1994).

3.1 Research design

Since the aim of this study is to explore corporate standardization management processes, an in-depth case study approach is employed. For the investigation of such a phenomenon, which consists of "how" and "why" questions, case study research is the most appropriate, since extensive and in-depth understanding is required (Eisenhardt, 1989; Yin, 2003). The essence of a case study is that it attempts to elucidate a set of decisions, along with why and how they were taken, and with what result (e.g., Schramm, 1971); these aspects are all addressed in this study. More specifically, the empirical study was designed to address the following questions:

- *How* can standards and standardization be utilized in strategizing?
- *How* is corporate standardization (and how are standardization-related decisions) managed?
- *What* are the challenges connected to corporate standardization management, and, subsequently, *what* are the factors that play an important role in corporate standardization?
- *What* are the strategic connotations related to standards and standardization on a firm level?

Hence, the intention is to kick-start a theoretical understanding of standardization management by extending and complementing, or even challenging, existing research. More specifically, by exploring in-depth two corporate cases of standardization management, and to some extent comparing them, this study aims to facilitate practical, as well as theoretical, understanding of corporate standardization management.

Achieving the aims of the study requires a good contextual understanding and in-depth processual analysis (Larsson, 1993), which calls for a qualitative, case study approach. Drawing from case studies' aspect richness—that is, a complex preliminary theoretical framework, Larsson (1993, p. 1517) stated that case studies offer the opportunity to study "more complex phenomena," and are therefore superior to large numbers of (superficially studied) observations (cf. Tsoukas, 1989). While "the typically longitudinal and multisource data collection of case studies captures organizational processes and multiple stakeholder perspectives better" (Larsson, 1993, p. 1517 cf. Walton, 1972), an in-depth case study allows the collection of process data, subsequently enabling consideration of various organizational "events, activities, and choices" over time (Langley, 1999), which might empower the researcher to uncover hidden relationships and connotations. Such possibilities of bringing to light and analyzing a variety of complex and dynamic organizational phenomena in order to better understand them motivates the selection of a case study methodology for this study (Miles & Huberman, 1994; Langley, 1999).

On the other hand, the in-depth, single case study approach does not come without "major drawbacks," mainly referring to the incapacity to examine cross-sectional patterns (Larsson, 1993, p. 1517). However, utilizing the same framework for a number of cases allows for cross-case synthesis (Yin, 2013)—that is, cross-case comparisons that enable the detection of differences and similarities between the cases (Larsson, 1993). In order to retain the advantages of the case study methodology, which will best serve the research question in this case, but also enable cross-case comparisons (and at the same time taking pragmatic limitations into account), scrutiny of two in-depth cases was considered most appropriate for the purposes of this study. As also promoted by Barley (1984), two cases will be analyzed in parallel to enable a discussion of similarities, as well as discrepancies.

In regard to alternative methods, such as a quantitative study design (for example, distributing survey-like, closed-ended questionnaires to a large number

of organizations), they are considered inappropriate since they would not allow for a sufficiently broad understanding in relation to the abovementioned questions. The rationale for this judgment pertains to the highly probable failure to capture crucial aspects of standardization management, which have not been embraced in the preliminary framework and thus will not be included in the questionnaires. Namely, a quantitative research design would not enable the uncovering of new, additional empirical insights that have not been exposed in previous research. More specifically, such an inflexible setting would likely fail to provide sufficient empirical insights into the multifaceted matter of standardization management, especially for an exploratory study such as this one (Creswell, 2013). Instead, an explorative, open-ended methodology is considered most suited to the current purposes.

Case studies have often been criticized as generating idiosyncratic results, which do not allow generalization (Eisenhardt, 1989). However, analytical, as opposed to statistical, generalization is the aim of the case study method (Yin, 2013, 1994); more specifically, analytical generalizability towards existing theory and potential generation of new theory. A similar argument is strongly supported by Siggelkow (2007, p. 20), who attacked the popular criticism of the "nonrepresentativeness" of case studies. Siggelkow argued that selecting the appropriate case to shed light on specific questions is far more important than selecting a "representative" case in that respect. He stated that representative cases (for example, organizations) will not offer any insight into, or understanding of, the specific matters that a study is targeting. In other words, carefully selecting specific cases for study might be a much more critical matter for the researcher than selecting a plethora of them, or an acceptable "representative" sample. Of course, then, care must be taken when assessing the findings and drawing conclusions; "the specialness pays off, however, if it permits particular insights that allow one to draw inferences about more normal firms" (Siggelkow, 2007).

In regard to what represents a "case" in this study, it should be noted that the initial idea was to contemplate each standardization department as a separate case. However, after the first round of interviews, it became clear that focusing upon the standardization departments alone would limit the scope of the study; specifically, the companies' technical experts and specialists were found to play a crucial role in corporate standardization, despite not explicitly belonging in the standardization departments. In fact, the companies' technical experts and specialists were managing the most crucial parts of corporate standardization (that is, through participation in standardization committees as well as in

reference to all technical content of standards). Therefore, soon after initiation of the project it became clear that the study should not be limited to depicting standardization departments, but should develop as a story of corporate standardization management—encompassing within the delineation of each "case" each part of corporate standardization management (that is, the standardization department, technical experts, corporate participation in formal standardization committees, and even involvement of higher management). Hence, the closest definition of the nature of this study is *"a case study of two cases of corporate standardization management, in a global capital-intensive context."*

3.2 *Ceteris paribus* setting

Furthermore, again related to the fact that the current study is highly explorative from the very beginning, the aim is to investigate issues that have rarely been discussed holistically in existing literature, meaning that few instructions and pre-established settings were available. Thus, it was determined that firms operating within the same industry would be selected for study. In order to explore corporate standardization management and, to the highest degree possible, compare the two distinct cases and grasp similarities and differences in their choices and actions, the most effective approach was to frame the study in a *quasi*-ceteris paribus *environment*.

Of course, it can be argued that it does not make sense to talk literally about *ceteris paribus* corporate cases, since it can be assumed that there are no identical firms in the world. However, at least one apparently dominant element that could be controlled for is the industry of operation (outlined from a product, customer, and business activities perspective, as defined in Merriam-Webster, 2015). This made it possible to complete the study and draw meaningful conclusions on firms' choices and actions. Had various industries been taken into account, comparison of their corporate standardization strategies would have been less straightforward, since a recurring dilemma would be whether the choices made are really distinct in terms of the firms themselves, or a product of the different industries in which the firms operate (and the different products they handle).

Therefore, within this quasi-*ceteris paribus* environment, two very different firms were selected for study in order to obtain a certain degree of variance, and a

good balance between commonality and uniqueness in regard standardization work. Other than their obvious similarities, such as industry of operation, country of origin, and location of headquarters, those two companies share very clear differences, such as company size, target market, corporate strategy, type of ownership, etc. In that context, the relations and dynamics between a preliminary theoretical framework and empirical evidence are expected to be captured to the highest possible degree.

3.3 Methodological considerations

In order to fulfill the study's purpose, four fundamental methodological phases took place; namely, construction of a preliminary theoretical framework, collection of empirical material, analysis of the data, and finally revision of the theoretical framework.

The first phase (*construction of a preliminary theoretical framework*) was mainly deductive, drawing from previous research. The preliminary theoretical framework has strong connections to existing literature regarding standards and standardization in general, since specific research addressing standardization management has been limited to date. The second phase *(collection of empirical material)*, aimed to generate data related to the preliminary theoretical framework. This phase was, to a very large degree, inductive, opening up and allowing for the manifestation of additional concepts, regardless of whether they were included in the initial framework. Nevertheless, the impact of the theoretical framework cannot be dismissed. The third phase (*analysis of the data*) consisted of utilizing the material in a pattern-matching manner (Yin, 1994) in conjunction with the theoretical framework. Finally, analysis of the material led to the fourth and final phase (*revision of the theoretical framework*), in which additional empirical insights were added to the theoretical framework, along with overall adjustments and modifications. The outcome of this phase formed the final theoretical framework, contributing towards finalization of this project.

The abovementioned methodological approach has both deductive and inductive phases, since the background of the researcher and the impact of the predesigned (at least to some degree) theoretical framework ultimately did not allow for a purely inductive approach (Ählström & Sjöström, 2005). This study can thus be depicted as semi-deductive (Stein, 1997) due to its strong affiliation

with the theoretical framework, as well as semi-inductive due to the equally strong contribution of the empirical material and findings.

The theoretical research framework aims to explore the outlined process in regard to corporate standardization management and its strategic implications. This aim is achieved primarily by obtaining a thorough understanding of managerial processes, as well as standardization-related procedures. Such a framework examining corporate standardization management has not been fully (if at all) covered in previous literature. Therefore, the goal is to develop theory or provide analytical structures of reference (Yin, 2013).

3.4 Epistemological considerations

Trustworthiness of findings is often uncertain when conducting theoretical analyses, which are restricted by theoretical preconceptions and presuppositions, especially when researchers are tempted to reflect on their observations through "preferential" theories and perceptions (Stevenson & Byerly, 2000). In order to avoid such misconduct in my own research, *interrater reliability* (as mentioned earlier) played an important role already from the early stages of my scientific instigations.

Lakatos (1976) defined scientific progress as the incorporation of new achievements within a new and better theory that comes to explain what the older theory cannot, and thus eliminate it. In that process, Lakatos considered as acceptable scientific compromise the dismissal of negative evidence when a better theory is not already available to eliminate the older one, claiming that this refusal of negative evidence promotes scientific advancement when there is no better theory to cover the gap. This study's epistemological context does not sign up for such a designation of progress, which disregards the flaws of a theory based on existent empirical evidence. On the contrary, Popper's (2013, 2005, 1999) rationale for empirical falsification has been a more solid motivation, in the sense that well-crafted empirical evidence plays a major role in the endorsement or rejection of theory. Otherwise, the core concept of theory and science, as I perceive it, is impaired: support of flawed theorization, which has been proven not to explain the empirical phenomenon after all, does not seem to serve its purpose. Quite the reverse, a gradual rejection-development of new theory, not necessarily happening in parallel, yields actual scientific advancement.

Better theories, in essence, means better explanations of the world (Losee, 2003). The contribution of social science's advancements, then, is to provide sounder explanations of social surroundings; social theory progresses in order to facilitate our reflections and interpretations of social phenomena. In other words, social theory appears to perform the role of mediator and facilitator in explaining reality (Little, 1991). As supported by Little, there are regularities underlying social phenomena, which can be recognized as causal (or etiological, as I prefer to call them), and thus foster the identification of particular associations and patterns between the social environment and human behavior. However, Little described those regularities as law-like ones, which, for me, comes across as rather disturbing and vividly contradicting the overarching outlook on social science—that is, despite the fact that regularities do potentially exist, and subsequently expectations of occurrence and causal mechanisms may appear, a denotation of certainty within social sciences is rather problematic. This is because social life has to do with individuals, whose behaviors can be repeatedly observed and even classified into patterns, but by no means wholly analyzed and predicted. Adding to individuals' complexity, social phenomena spring from the individual's behaviors within an environmental context, which occurs as parts of a larger system. Environmental conditions cannot be fully observed, grasped, or duplicated either. "Accuracy" is hardly even in question when it comes to social descriptions. However, verification of theories through observational data is unquestionably meaningful, as it promotes advanced understanding of social processes and interactions.

3.5 Selection of industry: Automotive—Heavy trucks

Very clear reasons contributed to selection of the automotive industry as a suitable context for the exploration of standardization management, due to a number of *peculiar characteristics* of automotive products. An automotive vehicle "is a complex, fabricated-assembled product, comprising a large number of components, functions, and process steps" (Clark, 1991). Interconnectivity of vehicles of different manufacturers is crucial in order to ensure "system benefits," and hence those vehicles ought to collaborate and "talk to each other" (Herrtwich, 2011). Standardization activities safeguard such interconnectivity, while at the same time lowering the costs of overall system architecture and, in addition, spawn (legal and moral) assurances that the produced vehicles comply with safety requirements.

A number of characteristics (such as engineering complexities and global presence, as discussed in more detail in the following sections) render standardization activities and outcomes decisive for the success or failure of the industry's products and co-operative systems, extending far beyond the technical aspects. As Herrtwich (2011) stated, "future business models [for intelligent transportation systems] are highly dependent on what is standardized now!" Automotive manufacturers contribute significantly to worldwide standardization of cooperative systems, through participation in standardization bodies, membership in worldwide standardization consortia, and contribution to global efforts regarding the harmonization of intelligent transportation standards (Herrtwich, 2011).

3.5.1 Engineering complexities

The process of developing and manufacturing an automotive vehicle is "complex and long-lived," involving hundreds of different subprocesses as well as "thousands of functionally meaningful components, each requiring many production steps" (Clark, 1991). *Engineering complexities* incorporate the sum of different parts and components, inflexible levels of cost and quality, a number of multifaceted objectives, and characteristic uncertainty in the customer's evaluation of the product. Furthermore, planning and design are complicated by forcibly fluctuating markets, long lead times, and a multiplicity of alternative products (Clark, 1991).

Standards and standardization can play a major role in managing the abovementioned challenges and complexities of the industry and the automotive product. The various components' *technological sophistication*, along with a requisite *tight interdependence* among them, renders *internal coordination* of the overall product crucial, but also challenging. Moreover, the use of countless common parts across vehicles—that is, across somewhat different products—further complicates interproject coordination (Clark, 1991).

3.5.2 Global initiatives

What is more, and to some degree justifying the above, the automotive industry has been at the *forefront of globalization* through increasing global initiatives (that is, international standards); for instance, regarding design and manufacturing processes (Lucato, Júnior, Vanalle, & Salles, 2012). It is one of

the world's most important economic sectors by revenue (OICA, 2011) and is considered as one of the *most global industries*, since its products are sold all over the world and the industry is dominated by a relatively limited number of companies with wide-reaching recognition (Humphrey & Memedovic, 2003). The global presence of heavy-truck manufacturers presents a critical argument for their participation and engagement in formal standardization committees (which was one of the selection criteria for the study's context, as will be discussed in a following section).

3.5.3 Product of critical importance

Finally, the automotive industry constitutes one of *particular importance* in today's societies. Over the past 50 years, automobiles have allowed people to live and work in ways "that were unimaginable a century ago" (Hwang, 2014). Automotive vehicles are "fundamental to a *functioning global economy* and to the well-being of the world's citizens" (Hwang, 2014), with a global turnover of 1,889,840 million euro (OICA, 2015)—while also playing a key role in the technology level of other industries and of society (Hwang, 2014). A large part of the world's population are employed in related manufacturing and services; automotive vehicles are built using the goods of industries including steel, iron, aluminum, glass, plastics, glass, carpeting, textiles, computer chips, rubber, and so on (OICA, 2011).

Hence, as Hwang (2014) also stressed, smarter and more efficient processes could be of *key significance* within the automotive industry, which represents the concluding reason to study standardization management in the automotive industry, where the findings could be of great importance.

3.5.4 Application for other industries

A number of characteristics of the automotive industry have been mentioned, and make it an intriguing arena for the study of standardization management. Nevertheless, the main findings could arguably be translatable to other industries as well. As Clark (1991) pointed out, "the auto industry is so rich that it cannot help but share some basic patterns with other industries." More specifically, comparable principles apply broadly among organizations that manage "fabricated-assembled" products (Clark, 1991), due to the similar key challenges (such as integrating engineering and manufacturing and establishing

links between various technically complex parts). Furthermore, as (Clark, 1991) stated, "even in process-intensive industries such as steel, aluminium, and engineered plastics, these problems are sufficiently general that analysis of the auto industry can provide useful insights."

Hence, in-depth understanding of the selected cases within the automotive industry could provide valuable insights into the mechanisms and dynamics of corporate standardization in other industries as well, via recognition and utilization of the acknowledged framework. Nonetheless, before finally endorsing this claim, the issue should be further scrutinized.

3.6 Selection of case companies

As established in earlier sections, the decision was made to conduct the empirical study using two companies operating in the automotive industry and in quasi-*ceteris paribus* environments—for example, at least in the same country.

Although it could be argued that using only two case studies is fairly limited for the exposure of idiosyncrasies, and, subsequently, the generation of new theory, the level of in-depth and contextual understanding required to grasp the various processes, events, decisions, and qualities of this study necessarily limit the number of selected cases. Instead of striving for observation reach, this study ought to be aspect-rich, as mentioned earlier in this chapter. Additional cases would require substantial amounts of additional data, not to mention the additional space for discussion of these data and their contextual surroundings. Hence, taking into consideration the abovementioned pragmatic limitations, along with the nature of this study—that is, an exploratory, pattern-matching qualitative study—using a total of two cases was considered as an acceptable and realistic balance for this research project. The trade-off of using more cases would probably have been too high, leading to a decrease in the quality of case content for the sake of adding more insights. In addition, on the grounds that the preliminary theoretical framework calls for rich content, as well as the fact that further development of this framework is needed, extensive access to independent respondents and company documentation is a key issue that could not be compromised in order to obtain adequate contextual understanding and an in-depth view towards the unpacking of organizational circumstances and processes.

Finally, since the study is designed to explore the processes and motives related to corporate standardization, the selected case companies needed to be well aware of international and corporate standardization—that is, they needed to have a clear standardization presence and be fairly integrated in the standardization community. Acknowledging the preliminary theoretical framework, according to which a centralized standardization office comprises of an important factor for standardization management, the companies were preferred to have a dedicated standardization department in place. However, this criterion was not binding for selection of the case companies.

The primary criteria for the selection of case companies can be summarized as follows:

a. The companies operate in the same industry;

b. The companies originate from the same country;

c. Extensive/unlimited access to the companies could be secured;

d. The companies have a standardization department.

Taking the above criteria into consideration, Volvo Group and Scania AB were found to meet the criteria and consequently were considered appropriate candidates for the study. Volvo Group and Scania AB are two large automotive manufacturers, operating in the same industry and in general terms facing similar external circumstances—despite also encompassing several differences (for example, Scania 's smaller company size). The companies' external environments remain quasi-*ceteris paribus*, rendering it very interesting and educational to investigate the different choices of the two companies in relation to standardization management and analogize their motives, intentions, and approaches.

3.7 Construction of preliminary theoretical framework

Despite the fact that new theory development should ideally spring from unbiased empirical accounts from the case study (for example, grounded theory [Glaser & Strauss, 1967]) instead of merely testing existing theory, it is unrealistic to assume that any researcher is completely free from previous theoretical insights or presumptions (Eisenhardt, 1989). The construction of a preliminary theoretical framework is aimed at assisting the researcher's work,

and in fact enhance understanding of emergent theory (Miles, 1979). In that frame of mind, the theoretical basis on which this study's preliminary framework was built departed from two main streams of literature: *(1) standards and standardization literature* (e.g., Schilling, 1999; Blind, 2004; Brunsson & Jacobsson, 2000; Tamm Hallström & Boström, 2010) and *(2) strategic management literature*, especially focusing on three distinct theoretical streams, namely transaction cost economics (e.g., Williamson, 1975, 1988), economization (i.e., Williamson, 1991; Powell & Arregle, 2007; Kraaijenbrink et al., 2010), and coopetition (e.g., Bengtsson & Kock, 1999; Brandenburger and Nalebuff, 1997; Gnyawali & Park, 2011).

The reason for focusing on these specific streams of literature pertain to the purpose of the study, which is to address standards and standardization from a strategic management point of view—which has been, to date, largely overlooked. However, in the same vein, a very open and inclusive approach in regard to general standardization literature had to be maintained, since standardization publications specifically focusing on the strategic implications of corporate standardization management are rare (e.g., Betancourt & Walsh, 1995; Schilling, 1999; Mione, 2015).

A combination of deductive and inductive approaches, the former referring to the preliminary theoretical framework while the latter refers to empirical insights throughout the conduct of the study, contributed to gradual adjustments of the preliminary framework towards more fruitful portrayals. That is, the framework for corporate standardization management was tweaked at the intervals of the different interview rounds as additional empirical insights were gained during the research process. For instance, the importance of external participation (in formal standardization committees) was heavily emphasized by the various interviewees, leading to closer attention to Leiponen and Helfat (2010) and Funk's (2003) suggestions. On the other hand, a preliminary aspiration to look into specific monetary effects of standards was downplayed after the first steps of the empirical study, as it was considered that such direction would not meet the purpose of the study (that is, elucidating how standards and standardization are managed and utilized in corporate strategizing).

3.8 Data collection

For collection of the data, I conducted three rounds of two-hour, semi-open interviews with each case company (along with numerous informal discussions over coffee or during meeting breaks). Each round of interviews lasted two to four days, usually involving two to four interviews per day, each of which lasted between one and two hours. All interviews were recorded and transcribed, amounting to 13 two-hour interviews with Volvo Group at its headquarters in Sweden within one year, and 17 two-hour interviews with Scania AB at its headquarters in Sweden within one year. The respondents were carefully selected as key people in each company who would also be knowledgeable about the issues in question. For their selection, I presented recommendations of profiles and job descriptions, and the heads of the standardization departments then assisted me with identification of those persons. The selected respondents held various positions, namely representatives of the standardization units, technical experts, local managers, and higher-level managers. Hence, the interviewees also had different areas of responsibility and job descriptions, which provided an unbiased picture and a compilation of stakeholder voices. The respondents were interviewed individually, providing an opportunity for cross-comparisons of their answers. Table 4 lists the interviewees from each company, the dates of their interviews, and their positions. A more detailed illustration regarding construction of the interview guides is provided in the following sections.

Besides the formal interviews, informal conversations with employees and local managers served as an immense source of valuable input for this study. In particular, during lunch and coffee breaks I enjoyed having the opportunity to converse with knowledgeable people and make "off-the-record" requests for additional insights or even (indirectly—that is, without naming names or quoting colleagues) triangulate information collected through the formal interviews. Following these informal discussions, I made notes that I kept in my data archive, and very often (when fitting and fruitful) incorporated those insights into following interviews and discussions. For instance, such insights helped me formulate subsequent interview questions, as well as request interview appointments with specific individuals within the case companies.

Table 4
List of interviews.

COMPANY	INTERVIEW ROUND	INTERVIEW DATE	RESPONDENT'S POSITION
Scania	First	June 2013	Standardization engineer
Scania	First	June 2013	Standardization engineer
Scania	First	June 2013	Standardization engineer
Scania	First	June 2013	Standardization engineer
Scania	Second	September 2013	Area specialist
Scania	Second	September 2013	Manager
Scania	Second	September 2013	Manager
Scania	Second	September 2013	Area specialist
Scania	Second	September 2013	Area specialist
Scania	Second	September 2013	Standardization manager
Volvo	First	November 2013	Area specialist
Volvo	First	November 2013	Manager
Volvo	First	November 2013	Manager
Volvo	Second	December 2013	Standardization engineer
Volvo	Second	December 2013	Standardization manager
Volvo	Second	December 2013	Standardization engineer
Volvo	Third	August 2014	Standardization engineer
Volvo	Third	August 2014	Area specialist
Volvo	Third	August 2014	Manager
Volvo	Third	August 2014	Manager
Volvo	Third	August 2014	Standardization manager
Volvo	Third	August 2014	Manager
Scania	Third	September 2014	Standardization engineer
Scania	Third	September 2014	Manager
Scania	Third	September 2014	Standardization manager
Scania	Third	September 2014	Standardization engineer
Scania	Third	September 2014	Manager
Scania	Third	December 2015	Former CEO

In other words, the informal discussions, although not recorded or transcribed, added useful insights to my overall view of the companies and their processes.

A number of additional sources were also utilized, particularly for reasons of reliability. For instance, throughout the whole process of data collection, an open eye was kept on reports, archival data, and public announcements made by

the companies, while I also had the opportunity to study a number of internal company documents, such as project plans and policy documents—many of which are not available to the public. These contributed to my overall understanding of processes and circumstances within the organizations. Moreover, throughout the first and second rounds of interviews in each company, I participated in whole-day standardization and planning meetings. During those meetings, I observed the ongoing discussions and took detailed notes while also recording them.

A supplementary source of contextual understanding in this study came from regular attendance at various types of standardization meetings; even before initiation of the empirical study within the companies, I had the opportunity to participate in a number of meetings of standardization bodies—for example, ISO and SIS committee meetings, as well as policy discussions regarding the future of standards and standardization within European Committee for Standardization (CEN) and Teknikföretagen. Once again—despite the fact that structured interviews were not conducted at this stage—I was able to spend plenty of time in discussion with the meetings' participants, during breaks, lunches, and social events, which carved, from a very early stage, my overall understanding of standardization-related issues. I consider this a valuable experience that arguably benefitted my own empirical study. To name the most obvious example, through this experience I built a necessary pre-understanding that proved helpful in conducting communications with people in the companies later. Thereafter, when the collection of empirical material was initiated within the companies, I attended further standardization meetings (referring both to internal standardization meetings with the companies, as well as ISO working groups in which my case companies were participating). I even requested to be included in the e-mail discussions of the participants, which was approved, and this allowed me to follow the ongoing processes and discussions over a long period of time (approximately three years).

Finally, as part of a large research group within the arena of standards and standardization, I had the opportunity to discuss my own and others' empirical work on a regular basis and share knowledge and insights. Towards the final part of my project (once I already had preliminary findings and conclusions), I partook in a number of workshops with practitioners (again including the case companies, as well as companies from other industries, such as Alfa Laval, Ericsson, Tetra Pak, Atlas Copco, Xylem Water Solutions Global Services AB, Cadenza Software AB, and SIS), where I had the chance to "test" those findings and discuss them with a plethora of practitioners, from a range of industries.

3.8.1 Theoretical base

As mentioned in the previous section, the study's theoretical base, which of course also formed the base for developing the interview guides, entails two streams of literature, namely strategic management literature (e.g., Barney, 1991; Penrose, 1959; Peteraf, 1993; Peteraf & Barney, 2003; Kraaijenbrink et al., 2010; Powell & Arregle, 2007; Williamson, 1991) and standards and standardization literature (e.g., Betancourt & Walsh, 1995; Arthur, 1989; Schilling, 1998; Schilling, 2002; Leiponen & Helfat, 2010; Jensen & Webster, 2009; Choi et al., 2004; van den Ende, van de Kaa, den Uijl, & de Vries, 2012), since specific literature on a standardization management framework has not been conducted to date. Hence, the aforementioned streams of literature formed the point of departure for the preliminary framework, and subsequently guided the construction of questions covering the various theoretical concepts involved in the framework.

When writing the interview guides, I was cautious in rewording the theoretical concepts in operational questions to ensure that I would be able reach to the respondents and did not sound "too academic" or as if I was "speaking a different language." For instance, instead of asking about organizational inertia or technological lock-out, I asked how easily changes are materialized in the company or whether they are concerned of staying out of market.

3.8.2 Interview process

The overall course of each interview largely depended on the position of the interviewee. At the start of every interview, I asked the respondent to describe his or her job description and responsibilities, which gave me a fairly good picture of which questions I should address to that particularly individual—that is, it enabled me to tailor the interview guide to the specific respondent. In addition, in order to ensure that I would receive accurate and relevant replies, I stressed right at the beginning that if some questions were not relevant to that person's work, they could let me know and I would move to another question. However, I remained vigilant of potential misunderstandings and rephrased the questions where needed to ensure that communication with the respondent was accurate and we were on the same page. For instance, I often asked several rephrased questions for each theoretical concept.

Generally, the process of tailoring the interview guide continued throughout the duration of the interviews, as the discussion was evolving. This ensured that the most relevant information was extracted from each respondent. This was an aim from the beginning of the study, which also relates to the fact that semi-open questions were constructed; that is, while the structure was predetermined, to ensure that the basic theoretical concepts were covered, the semi-open setting also offered the benefit of allowing the respondent to initiate additional topics (Bryman & Bell, 2011).

3.8.3 Interview guides

Each interview round aimed to meet different objectives, which resulted in a dissimilar base for the construction of the interview guides.

3.8.3.1 First interview round

Regarding the first round of interviews in each company, the foremost aim was to grasp how standardization is organized within the companies, which led to a focus on the overall structure of processes and activities and connection to strategic implications and rationales. Interviews were mainly with standardization engineers—that is, members of the standardization units—and managers. The rationale for this was that standardization engineers were expected to be the most well informed about the processes and functions of corporate standardization, while input from a number of managers would complement information on the strategic connections. However, the same questions were posed to both standardization engineers and managers, in order to cross-compare their (possibly variant) views and replies. This round can be seen as a pilot study that mainly aimed towards getting to know the companies and formulate an understanding of the contextual factors and circumstances in the organizations. A more detailed account of the list of questions is provided in Appendix I.

3.8.3.2 Second interview round

For the second interview round, the interview guide was wholly based on the preliminary theoretical framework—that is, the focus was on the particular challenges connected to corporate standardization management and the potentially influential factors included in the framework. However, the questions remained fairly open in order to allow the interviewees to add topics

and factors that were not addressed in the preliminary framework. Again, standardization engineers were interviewed, but also area specialists, and local and higher-level managers. This aimed to access a multiplicity of voices and stakeholders, in order to obtain an overall view. A more detailed account of the list of questions is provided in Appendix I.

During creation of the interview guide, and even more during the process of the actual interviews, concepts and mechanisms such as "interaction between the standardization department and the rest of the organization," "external standardization committees as a way to collect information and knowledge," "external standardization committees as watchdogs," "processes of knowledge acquisition," "hazards of knowledge leakage and protection mechanisms," and "internal communication flows" emerged as noteworthy points of the study. Many of those concepts were not part of the preliminary theoretical framework, but sprang from the empirical material. However, the fact that those concepts were not encompassed in the preliminary framework was not a reason to overlook them, but, quite the opposite, was a reason for further exploring them in a subsequent set of interviews.

3.8.3.3 Third interview round

Finally, the first two rounds of interviews in the companies enabled me to produce an even more targeted and refined interview guide for the final round, as I had gathered a number of empirical observations and thus had gained better insights regarding the circumstances and processes of the companies. Hence, the third round, which occurred many months later after an early-stage analysis of the previous material, entailed more targeted questions, departing from earlier empirical insights and including cross-checking of new elements and findings. Again, a multiplicity of voices was accessed by reaching out to standardization engineers, area specialists, and managers. Some of those respondents had been interviewed in a previous round, while others were new. The rationale for the repetition was to assure the longitudinal nature of the study and cross-check the former and latter responses of the interviewees one year later.

In the latter round, concepts such as "strategic positioning," "interrelation of internal and external standardization efforts," "protectionism vs. openness," "precedence," and "organizational awareness" were refined and ultimately encompassed in the revised theoretical framework as insightful findings of this research project. Again, a more detailed account of the list of questions is provided in Appendix I.

3.9 Data analysis

The collected data were qualitatively processed, with the aim of relating objects and processes to the initial framework. Since this study has a demarcated theoretical framework, emerging patterns relate to both theory and empirical findings (Yin, 1994). The analysis attempts *to apply the empirical material to the theoretical framework, while remaining vigilant for disagreements and diversities.* Along this process, the potential for theory development or theory advancement was observed using a pattern-matching approach (Yin, 1994).

The empirical material was, at least to some degree, viewed from certain viewpoints, which enabled any emerging findings regarding the research purpose to be noted. The outcomes were not predetermined or addressed to certain directions. Empirics are allowed to speak for themselves (Ransom & Kirk, 1953; Blazer & Kaplan, 2000), but theory was also taken into account throughout the process in order to facilitate understanding in the first place, but also to assist the analytical phase—that is, interpretations.

Nevertheless, it should be pointed out that this study is probably biased towards specific viewpoints and interpretations, theoretically speaking. Since the construction of the preliminary framework was based on standardization and strategic management literature, in particular focusing upon the resource-based view, economizing and coopetition, the empirical material and how this material should be viewed is unavoidably heavily framed towards that direction. More specifically, the type of empirics targeted when visiting the case companies, as well as the specific material focused upon and stressed as critical during analysis of the data, cannot be claimed as wholly unbiased, though the specific purpose of the study was kept in mind throughout all processes. Another researcher, with another study purpose and different theoretical tools at hand, could have drawn, to some extent (or perhaps even to a large extent), alternative conclusions.

Presentation of the case companies starts with an exploration of the critical and chronological events that led to the current arrangements of processes, in order to shadow and capture their progressive evolvement, along with exploration of strategic intentions and effects. Regarding the strategic intentions, I scrutinize how the management intent to utilize standards and standardization, as well as how managers work with standards and standardization in practice (exploration of processes). Inspection of the success and effectiveness of the processes is attempted, beside scrutiny of the effects of standards and standardization in the company.

The narrative for each case company is structured chronologically, following the below-mentioned procedure of discussing (1) each company's core strategy over the years, as well as their positioning in regard to standards and standardization since their foundation; (2) a contextual description of each company's standardization management, with the aim of creating a sufficient and detailed background to aid the reader's comprehension; (3) the reasons stated by managers and standardization personnel of each company for managing corporate standardization; (4) the challenges that have emerged, and are still emerging (in regard to corporate standardization), and how those challenges have been managed in the past and are managed today; (5) the perceived outcomes of corporate standardization management in each case; and (6) a number of contextual factors, which are mainly related to corporate strategy and other corporate circumstances, and have been assessed as advocating the major standardization-related choices of each case company.

This procedure enabled chronological sorting or classification of events, decisions, and actions, which often hinted at outcomes and consequences, or even managerial motives in the first place, and hence facilitated the process of analysis per se.

Along the abovementioned process, the preliminary framework provided guidance for specifying important concepts, not only in regard to those that had already been included in the framework, but also apropos of other concepts that emerged from analysis of the empirical material. As Eisenhardt (1989) stated, early identification of "possible constructs" is helpful, even when these are still vague. The preliminary framework thus offered an "a priori specification of constructs" (Eisenhardt, 1989) that comprised the basis for further and more elaborate analysis of the empirical evidence.

3.9.1 Thematic analysis

As Marshall and Rossman (1999) suggested, when discussing *thematic analysis* the analytical process may be based on either prior constructs (or "categories"), or new, emerging ones, which become clear during the analysis process per se. More specifically, Marshall and Rossman (1999) stated that data analysis is the process of "bringing order, structure and interpretation to the mass of collected data... It is the search for general statements about relationships among categories of data, the search among data to identify content." The abovementioned description of thematic analysis accurately depicts my own

analytical procedure, which is, however, not unique, since thematic analysis is "often used to analyse data in primary qualitative research" (Thomas & Harden, 2008), or is even the most commonly used form of data analysis in qualitative research (Greg, MacQueen, & Namey, 2012). By way of explanation, thematic analysis points to the identification, examination, and outline of patterns within qualitative data, or "themes," as the name of the method communicates (Braun & Clarke, 2006); these themes become the categories for analysis (Boyatzis, 1998; Fereday & Muir-Cochrane, 2006). Of course, the identification of themes and patterns within specific data relates closely to the research question per se (Daly, Kellehear, & Gliksman, 1997; Fereday & Muir-Cochrane, 2006); thus, in this particular study the phenomenon of corporate standardization management was placed in the center of the analysis, with a specific focus on strategic objectives, corporate motives, central actors, and practical challenges (both in regard to short-term, day-to-day dilemmas, as well as long-term predicaments).

More specifically, the six phases of thematic analysis (Braun & Clarke, 2006) were conducted, as follows. (1) Familiarization with the data was a continuous process that started from the completion of the first round of interviews and transcription of the material, and continued through the completion and transcription of the third round of interviews. During this whole process, which lasted roughly a year, I frequently went back to earlier transcriptions to reread them and try to see whether any previously emerging themes no longer made sense, either because previous interpretations did not endure, or because they did not fit newly emerging material. Throughout those multiple reitarations back to the empirical material, notes were not made on the original copies but only on additional printouts that were saved separately. The purpose of this was to retain the possibility of rereading through the material with an unbiased mindset (to the degree that this was possible) instead of restricting new interpretations to the boundaries of earlier ones that were emerging through notes on the transcription copy.

Alongside the continuous familiarization with older and newer data, the second and third phases of thematic analysis took place, namely (2) generation of initial codes and (3) search for themes. A number of themes emerged during that phase; however, not all of them "survived" the aggregate analytical process in order to be included in the revised theoretical framework (as Braun and Clarke [2006] also suggest, that is very often the case in a thematic analytical process). The reason for themes being omitted in this particular study was mainly the fact that they were considered at a later stage to comprise fractions of larger (that is,

more encompassing) themes/categories. A characteristic example of this is "communication flows," which was initially acknowledged as a stand-alone theme, but was later recognized as an enabling mean for "organizational awareness" and "interrelation of internal and external standardization efforts." This latter procedure comprised the next phase of thematic analysis, namely (4) reviewing of themes (Braun & Clarke, 2006; Carpenter & Suto, 2008). During the reviewing phase, and while I was already deeply familiar with the data and the "data extracts" (Braun & Clarke, 2006)—that is, the emergent themes—a crucial question was whether they were forming a coherent analytical picture. Thematic maps proved to be very useful throughout that stage of analysis, where the relationships (among the various concepts) were visualized in an attempt to reflect the overall data and, perhaps even more crucially, to reflect my interpretations. Frequent discussions with colleagues (namely my supervisors, as well as a fellow researcher at SRC[4]) provided me with immensely valuable input at this stage, as my discussions with them helped me realize that relationships that seemed self-evident or well-grounded to me (having spent years on this project) needed to be further clarified and more clearly depicted in order to effectually communicate my observations and insights. Carpenter and Suto (2008) called this process of the researcher actively reflecting upon preconceptions, existing biases, and the context of data analysis as "disciplined self-reflection." The outcome of this stage is usually (and indeed was in my study) a satisfactory thematic map of the data, namely the *revised theoretical framework* that is provided at the end of Chapter 8). The penultimate phase of the thematic analysis, namely (5) defining and naming themes, was to a large degree conducted simultaneously with the previous phase (reviewing of themes), while the last one—that is, (6) producing the final report—denoted the definite end of the analytical process through the completion of the analysis chapter (Chapter 8).

3.9.2 Cross-case synthesis

Developing the narrative for each case in accordance with the constructs of the same preliminary framework supported a *cross-case synthesis* (Yin, 2009), which is evident in the cross-case comparison of the two companies. This cross-case synthesis, which shed light on both interesting similarities and eloquent differences between the two companies' standardization management, was a

[4] Standardization Research Centre, School of Economics and Management, Lund University.

considerable stepping stone in the analysis of the study's findings—which had been expected since the beginning of the project, and in fact served as justification for the study's use of the *comparative* case study approach.

The simultaneous processes of *thematic data analysis* (Marshall & Rossman, 1999) and *pattern-matching logics* (Yin, 2009) revealed both discrepancies and concurrences between the empirical material and the preliminary theoretical framework. The results of this process were fruitful towards affirming prior theory (when patterns did match), in some instances questioning the applicability of existing concepts to this study, and finally recognizing new, emerging theoretical concepts. The ultimate outcome was the revised theoretical framework for corporate standardization management, which strengthens existing theory through pinpointing its usefulness to corporate standardization management (as was the case for coopetition theory) and also to develop new theoretical concepts that can further enhance understanding of corporate standardization management (as was the case, for instance, in the standardization management approach).

3.10Validity and reliability

As mentioned in the previous section, in this study pattern matching (Yin, 2009) was employed, along with an abductive line of reasoning. Theory was considered for construction of the preliminary theoretical framework, and empirical data was then carefully accounted for in order to test the initial framework, as well as the data per se.

Through the iterative process of applying existing theory to new empirical material found in this study, an opportunity to validate the empirical data arose. This procedure, as suggested by Eisenhardt (1989), increases the case study's *internal validity*—which provides a corroborated understanding of "why or why not emergent relationships hold" (Eisenhardt, 1989). That is, in order to establish that formative relationships between examined aspects and findings had been unearthed, whereby certain conditions lead to consequential ones (Cook, Campbell, & Day, 1979; Yin, 1994; Gibbert, Ruigrok, & Wicki, 2008), inferences were drawn only after multiple evidence from various sources had been collected (that is, multiple, independent interviews and archival data).

Moreover, the deployment of multiple sources (for example, interviews, company documents) fulfilled the aim of testing the *reliability* of the empirics per se—that is, the affirmation that data collection procedures can be repeated and provide the same results (Yin, 2013). Such data triangulation functioned as a supplementary measure towards an increased level of reliability, in accordance with Yin's (2009) suggestion. At the same time, transparent documentation of the research procedures followed in this study was maintained, in order to allow for "a case study database" (Yin, 2013)—that is, all case study procedures were documented and are available for scrutiny (Yin, 2013).

Along that line, *respondent validation* (Mays & Pope, 1995) was obtained—that is, feedback from the respondents about the accuracy of my interpretation regarding the information they offered during the interview, which was intended to further increase the reliability of the empirical findings. In addition, by being part of a project team consisting of senior researchers, I was able to test my interpretations and findings on them before finalization, providing *interrater reliability* (Gibbert et al., 2008; Voss, Tsikriktsis, & Frohlich, 2002). Their knowledge and experience provided valuable help throughout this research project.

Finally, regarding *external validity*—that is, the generalizability of results (Gibbert et al., 2008)—although case study research does not allow for statistical generalization (Yin, 1994), this does not indicate that "case studies are devoid of generalization" (Gibbert et al., 2008). On the contrary, analytical generalization is the aim of case studies such as this one; this refers to the process of generalizing from empirical observations to theory, rather than to a population (Gibbert et al., 2008; Yin, 1994).

Along with the suggestions of Eisenhardt (1989) and Cook et al. (1979), the steps taken in this study towards an increased level of external validity were to (1) build a preliminary theoretical framework, (2) provide a clear rationale for the case study selection, (3) conduct a cross-case analysis, and (4) collect sufficient information on the case study context, which enables the reader to appreciate my sampling choices (Gibbert et al., 2008).

4 Automotive industry

Before presenting the cases per se, this chapter will provide a detailed discussion regarding the selected industry—that is, the automotive industry—in order to elucidate on the contextual factors that the case companies face.

The automotive industry includes a wide range of companies and organizations covering the design, development, manufacture, marketing, and sale of motor vehicles, construction equipment, motorcycles, and mopeds. The term automotive industry does not usually include businesses dedicated to the care and preservation of vehicles after delivery to the end-user, such as repair shops and fuel stations (Businessvibes, 2014).

Over the past 50 years, automobiles have become our "freedom machines," providing a means of transportation but also of personal expression. As the industry clearly recognizes, automotive vehicles in today's society are so much more than simply one element of a mobility system (Gao, Hensley, & Zielke, 2014). As Clark (1991) acknowledged over two decades ago, "a vehicle can satisfy customers in a number of ways beyond basic transportation." The customer–producer interface is delicate and multifaceted, with evaluation criteria being "highly subjective and emotional, involving fantasy and symbolism" (Clark, 1991).

4.1 History of the automotive industry

The term "automotive" was proposed by Elmer Sperry (American inventor and entrepreneur), a member of the Society for Automotive Engineers (SAE), and came from the Greek word *auto* (self) and the Latin word *motivus* (of motion), to denote a self-powered vehicle (Hughes, 1971).

The flinch of the automobile came as early as 1769, when steam engine vehicles suitable for human transport were created (Eckermann, 2001). The first cars,

which were powered by an internal combustion engine and fuelled by gas, were built in 1807, and developed to use universal gasoline or petrol in 1885. One year later, the modern automobile was created by the German inventor Karl Benz (ASME, 2012).

Steam-powered cars continued to be developed into the early 20th century, but the diffusion of petrol engines as the primary power choice in the late 19th century marked the end of steam automobiles. For many decades, the US dominated global automotive production, producing over 90% of all automobiles (Popular Science, 1929). By 1945, the US percentage had fallen to 75%, and by 1980 Japan had taken the lead, while in 1994 the US once again became the frontrunner in global automobile production. However, in 2006 Japan narrowly overtook US production again, and held this position until 2009, when China increased production to 13.8 million units. With 19.3 million units manufactured in 2012, China almost doubled the US production, which was 10.3 million units, while Japan was in third place with 9.9 million units (OICA, 2012). More detail on the development of the automotive industry and a competition analysis follows below.

4.2 Development of the automotive industry

As Clark (1991, p.8) claimed, "the world automobile industry is a microcosm of the new industrial competition," justified by the development of competition in the industry. That is, while back in 1970 merely a handful of companies competed on a global scale, just two decades later the number of world-scale players had risen to more than 20—and while particular companies once dominated—for example, General Motors—only a few years later those companies were facing serious competitive threats in all markets. However, in the last decade of the 20th century, the competitive environment began to change dramatically, particularly impacted by globalization. Competition is now more global than ever, leveraged by significant volume and cost advantages (Lucato et al., 2012). Nonetheless, global competitive intensity has increased in the past few years, as Chinese players expand from their vast domestic market (Gao et al., 2014).

At the same time, customers have grown more sophisticated, demanding, and selective. The number of available models has multiplied and technology has become more complex. Forty years ago, a buyer would have to look long and

hard to find anything but a traditional V8 engine and rear-wheel drive, while two decades later the variety became enormous regarding all different parts of a vehicle, including number of cylinders, multivalve options, front-wheel or four-wheel drive, new technology in brakes, engine control systems, etc. (Clark, 1991).

In this environment, product development and improvement has become a central point of competition and managerial action. Speed, efficiency, and effectiveness have become focal concerns for automobile manufacturers (Clark, 1991). The new competitive conditions, along with associated technological advancements, have created a new competitive arena that affects almost all industrial sectors on a worldwide basis (Hitt, Ireland, & Hoskisson, 2012; Lucato et al., 2012), with the automotive sector being one of the key industries affected by this process—for example, due to increasing deployment of conceptions such as follow design, follow sourcing, and modularity (Lucato et al., 2012).

4.2.1 Sales growth

Continuous innovations over the past 50 years have contributed to growing the automotive industry by an average annual rate of 3% since 1964—which is roughly equal to double the rate of global population growth over the same period. However, for the past 20 years sales in North America, Europe, and Japan have been relatively flat, with growth originating from emerging markets—mainly China. Over the past 10 years, Chinese auto sales have almost tripled (from slightly less than 8.5 million cars and trucks sold in 2004 to about 25 million in 2014) (Gao et al., 2014). As predicted by IHS Automotive, more than 30 million vehicles a year will be sold in China by 2020, up from nearly 22 million in 2013 (Gao et al., 2014). Figure 4 demonstrates the growth of global sales for the period 1964–2014, while Figure 5 shows the growth increase for 2014 (as forecasted by Gao et al., 2014), 2015, 2016.

4.2.2 Authorities' role

Governments have been steering automotive development for decades. Primarily, they have focused on safety—for example, seat belts and padded dashboards, and later on airbags, automotive "black boxes," along with rigorous technical and environmental standards, such as requirements for emissions and

fuel economy. However, most recently, the automotive industry's success has strained cities' infrastructure and the environment, especially as urbanization has augmented (Gao et al., 2014).

Hence, even more intensively than before, authorities are now examining the entire automotive value chain (and beyond), with an eye towards externalities (Gao et al., 2014). The central aim is to address the social impact of automobiles across their whole life cycle, rather than merely focusing on the automobiles themselves (Gao et al., 2014). Energy issues are of course centrally placed, largely focusing on technological innovation towards environmentally friendly fuel (Hwang, 2014).

In any case, automotive manufacturers should expect to remain under regulatory scrutiny, with future emissions standards forcing the whole industry soon to adopt some form of electrified vehicle (Chen, Fu, & Wang, 2013).

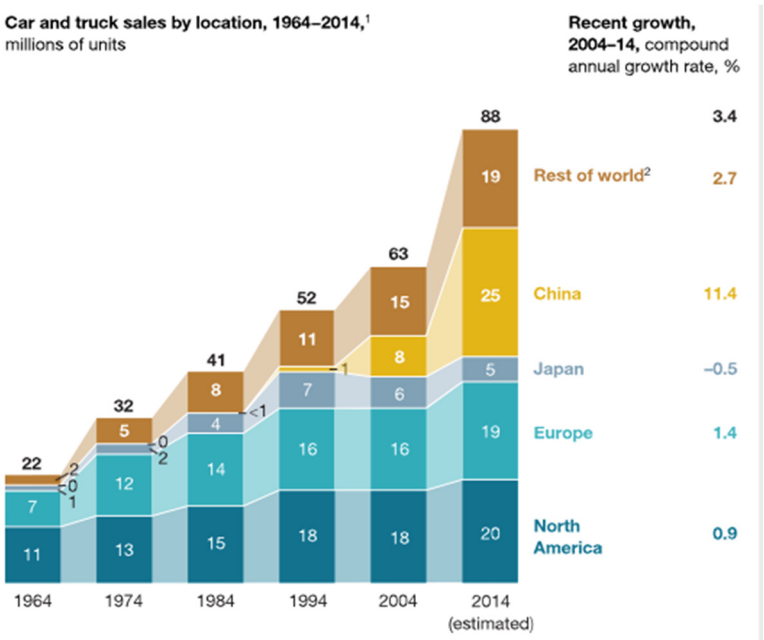


Figure 4
Global sales in the automotive industry have grown by nearly 3% a year for the past two decades, with substantial variation in regional growth.
Source: Gao et al., 2014.

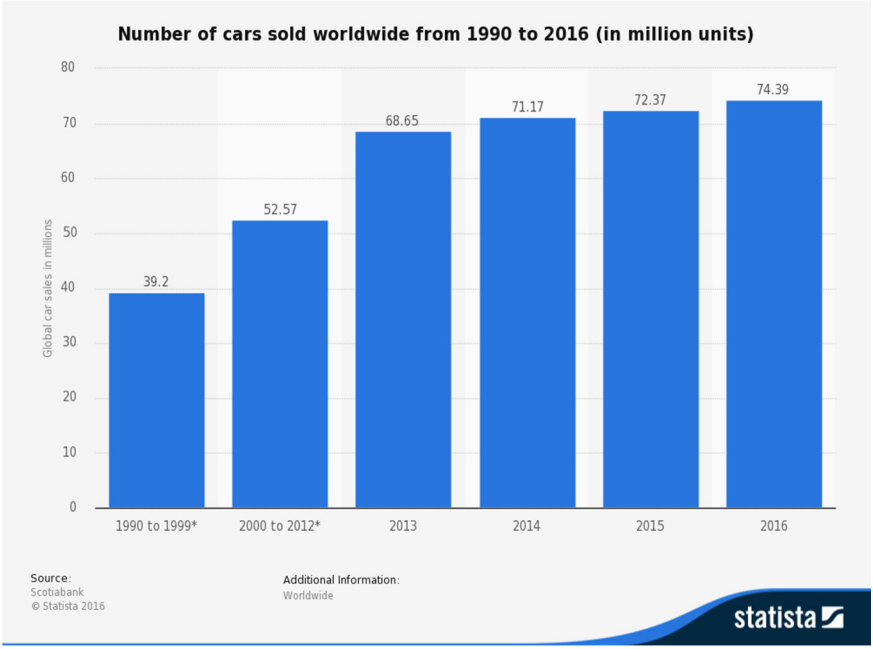


Figure 5
International car sales 1990–2016.
Source: Statista, 2016.

The abovementioned developments are likely to create an increasingly challenging environment for automakers, in which the industry's plans for growth could collide with regulatory priorities (Gao et al., 2014).

4.2.3 Suppliers' role

Besides the critical relationship of automotive manufacturers with authorities, the relationship with suppliers is crucial as well. As demonstrated by Barros and Arkader (2004), automaker–supplier relationships have evolved in the industry into a kind of cooperative model, manifested by long-term relationships and increased mutual dependence (Lucato et al., 2012).

Overall in the automotive industry, first-tier suppliers play an important role; they create long-standing partnerships with multiple automotive manufacturers for developing and supplying complete vehicle modules, and hence obtain

increasing responsibility in the development of large elements of the vehicle and their integration into the end product, which can have a very strong impact on the customer's quality perception of the final vehicle (Alaez-Aller & Longás-García, 2010; Franceschini & Maisano, 2014). In this setting of increased responsibility, long-term partnerships are built in order to ensure products are of high quality and reliability. To achieve this, manufacturers require multiple tests, even for modules with a relatively low level of customization (Franceschini & Maisano, 2014; Lu, Zhang, & Han, 2013). In other words, automotive manufactures form long-term relationships with suppliers so that they are both familiar with each other's products and techniques.

At the same time, in order to simplify design and manufacturing (though without compromising product customization), manufacturers and suppliers generally develop a reduced number of multifunctional modules/platforms (Franceschini & Maisano, 2014; Minhas, Lehmann, & Berger, 2011)—that is, progressive modularization (Lucato et al., 2012). As a result of such modularization, which has been further accelerated by the recent socioeconomic crisis, the number of first-tier suppliers has been drastically reduced today (Lucato et al., 2012). Suppliers have been forced to join forces through mergers and acquisitions, in order to establish highly specialized and efficient organizations that are able to serve a large number of manufacturers (Franceschini & Maisano, 2014; Schaede, 2010; Yeh, Pai, & Huang, 2013). This decrease in the number of suppliers has further driven new forms of relationships among manufacturers and their suppliers (Lucato et al., 2012), despite the fact that "outsourcing has been playing a strategic role in the automotive industry for many decades" (Franceschini, Galetto, Pignatelli, & Varetto, 2003).

4.3 Challenges in the automotive industry

The major challenges in automotive industry are related to uncertainty, the three primary types of which can be divided into state, effect, and response (Milliken, 1987). State uncertainty relates to perceptions of environmental unpredictability, while effect uncertainty is affiliated with ambiguity regarding how environmental changes will impact the organization. Finally, response uncertainty encompasses a lack of awareness of response alternatives and/or incapacity to predict the outcome of a given response (Milliken, 1987). The

industry is particularly suffering from very high levels of state and response uncertainties, which are primarily connected to environmental science, new regulations, technological developments, market developments, and policy responses (Rothenberg & Ettlie, 2011). Examples include both voluntary standards, such as the ACEA Agreement in the EU on emission reduction, as well as fuel economy regulations in a number of countries. The authoritarian environment is extremely complex and dynamic, but simultaneously of significant importance to the automobile industry, which makes the ambiguity around it a clear challenge for industry planners (Kolk & Pinkse, 2005; Rothenberg & Ettlie, 2011).

Taking the above into consideration, investments in R&D within the automotive industry embody a predominantly high risk. The task of choosing among competing technologies is "a treacherous business" in such periods of technological uproar (Rothenberg & Ettlie, 2011). Regulatory instability is particularly problematic for the automotive industry due to the long product-planning cycle, meaning that planning must include anticipation of future regulation—thus, current decisions are made with the realization that the regulatory frame might change, yet without having a precise view of what those standards will be. At the same time, "no single company possesses the market power to establish new standards and ensure success for new products" (Rothenberg & Ettlie, 2011).

4.4 Additional challenges

As if the abovementioned challenges were not enough, the automotive industry suffers from a number of persistent trends as well, making it particularly vulnerable to those uncertainties.

For instance, referring to both manufacturers and suppliers, product planning and R&D road mapping "have never been well integrated in most if not all firms in the industry" (Rothenberg & Ettlie, 2011). Surprisingly enough, the most recent trend towards modularization has only exacerbated this problem (Ettlie & Pavlou, 2006). The approach for a typical automotive manufacturer in order to hedge against uncertainty has been to focus R&D on model-year planning cycles, though these are usually as long as five years. On the contrary, Rothenberg and Ettlie (2011) stated that "the more effective these firms become

in integration, the more effective they will be at coping with both market and regulatory uncertainty."

Moreover, while a dynamic environment involving new technologies will clearly require new capabilities, which are actually very likely to undermine the existing competencies of companies, automotive firms do not seem to be very actively re-evaluating their existing strategies. Interestingly enough, the paradox in the industry is that the more successful these companies become, the greater the inertia (Rothenberg & Ettlie, 2011; Miller & Chen, 1996; Ragatz, Handfield, & Petersen, 2002). As Rothenberg and Ettlie (2011) concluded, "only persistent and widely recognized threats seem to move firms to action, and then it is often too late."

4.5 Standardization in the automotive industry

This section aims to elucidate how standardization is organized in the automotive industry—that is, which primary standardization organizations set the relevant standards and hence, in a sense, regulate the industry's future. The matter is explored on international, European (since both case companies originate from Europe), and even national (since both case companies are Swedish) levels.

4.5.1 International standardization

The most important standardization organ in the heavy-vehicle segment (and the overall automotive industry) is the ISO. ISO was the first general international standardization body ever created, with only the IEC (focusing solely on electrical and electronic engineering) and the International Standards Association (initially comprising a federation of national standards associations and dominated by the continental European countries) preceding it (Delimatsis, 2014). ISO, on the contrary, is not (and has never been) an intergovernmental organization; it is an independent, nongovernmental international organization with a membership of 161 national standards bodies. Through its members, ISO brings together experts to "share knowledge and develop voluntary, consensus-based, market relevant international standards that support innovation and provide solutions to global challenges" (ISO, 2016). The members are the primary standard-setting organizations in their respective

countries, and there is only one member per country. Individuals or companies cannot become ISO members.

ISO develops international standards by panels of experts, working within "technical committees." Each TC focuses on one specific matter, and hence encompasses relevant experts on that matter. The TCs are listed in numerical order, according to the order in which they were established. As quoted on ISO's homepage, the first TC was established in 1947 (TC 1, focusing on screw threads). The latest TC was created in 2012 (TC 269, focusing on railway applications). ISO's standardization interests are divided into 12 technical sectors, one of which is "Mechanical Engineering." Approximately 23 out of the total 44 TCs within Mechanical Engineering deal with issues that closely relate to the automotive industry. However, this number is much more limited for issues that are closely related to heavy vehicles specifically, with three primary TCs publishing international standards for the latter. It should be noted that other technical sectors are also relevant for heavy vehicles and the automotive industry in general, outside of the mechanical engineering scope. Prominent among these is the example of TC 17, which belongs within the "Ores and Metals" area and focuses on steel (cast, wrought, and cold-formed steel). Naturally, the work of TC 17 is highly relevant for heavy vehicles and other automotive products.

Other pertinent international standardization organs for the segment and industry are the IEC and the SAE. The IEC was founded in 1906 (and remains in place to date) as a nonprofit, nongovernmental international standardization organization focusing on international standards for electrotechnology—that is, electrical, electronic, and related technologies. IEC's members come from all over the world and can be quite diverse; however, they all represent the entire range of electrotechnical interests in their country and businesses. Today, IEC and ISO are considered "sister international standardization organizations" (IEC, 2016) and closely collaborate on a bilateral basis in a number of technical areas.

SAE was also founded in the early 1900s and comprises a US-based, but nevertheless globally active, standardization organization for engineering professionals in various industries; more specifically, primary emphasis is placed upon transport industries, such as automotive, aerospace, and commercial vehicles. SAE coordinates the development of technical standards and works through expert committees consisting of engineering professionals from relevant fields. SAE's network consists of more than 138,000 members all over the

world; however, membership is granted to individuals, rather than companies or agencies (as opposed to ISO and IEC).

4.5.2 European standardization

On a European level, the CEN and the European Committee for Electrotechnical Standardization (CENELEC) are highly influential and relevant. Both CEN and CENELEC are officially recognized by the European Union and by the European Free Trade Association "as being responsible for developing and defining voluntary standards at European level" (CEN, 2016).

CEN brings together the national standardization organizations of 33 European countries and provides a platform for the development of European standards. It supports standardization activities in relation to a wide range of fields and sectors. CENELEC, on the other hand, is responsible for standardization in the electrotechnical engineering field. More specifically, CENELEC prepares voluntary standards that help facilitate trade between European countries and support the development of a single European market (CENELEC, 2016). As mentioned above, the route for participating in the development of European standards is through national members. National standardization bodies send balanced delegations to represent concerned interests in the various standardization projects. Several areas of work of both CEN and CENELEC (which are often intertwined, as is the case for "Machinery") are relevant for the automotive industry. Other areas of interest comprise the "Transport" and "Materials" categories.

In fact, CEN collaborates closely with ISO, according to the terms of the Vienna Agreement, which covers technical collaboration between ISO and CEN and was signed in 1990. CENELEC works closely with IEC, according to the terms of the Dresden Agreement, which has been effective since 1996. At the same time, all of CEN and CENELEC's national members are also members of either ISO or IEC, which helps to ensure that the interests of European businesses and stakeholders are taken into account at an international level.

4.5.3 National standardization

In Sweden, standardization is carried out by three standardization bodies, namely the SIS, the Informationstekniska Standardiseringen (ITS) and the

Svensk Elstandard (SEK). SIS is responsible for business areas covered by ISO and CEN, ITS is responsible for all telecom standardization, and SEK is responsible for all standards concerning electrical, electronic, and related technologies. SIS and SEK are particularly important for the automotive industry, and both are nonprofit organizations.

The former, SIS, is an independent organization that was founded in 1922 and has members from the private and public sector; it is the market leader in standards in Sweden. SIS works closely with the Swedish authorities, the private sector, consumer representatives, and other stakeholders, and represents Sweden in international standardization within ISO and CEN.

The organization comprises two main areas: SIS, which develops Swedish standards and contributes to the development of international standards, and SIS Förlag AB, which is a wholly owned subsidiary of SIS that publishes and sells standards and handbooks and offers training and consulting services (ISO, 2016; SIS, 2016). SIS promotes Swedish participation in international standardization activities in order to give Swedish organizations the opportunity to influence the content of international standards (ISO, 2016).

SEK, on the other hand, is responsible for standardization in Sweden in the field of electricity and electrotechnology (that is, terminology, documentation, classification, measurements, safety, and performance of various kinds of electrical products or systems). SEK operates with the voluntary participation of Swedish authorities and organizations interested in participating in and influencing work on technical standardization in the area of electrotechnology. Furthermore, SEK coordinates Swedish participation in European and other international standardization work as a member of IEC and CENELEC.

5 Scania AB: A premium player

Scania is a global company within the automotive industry, with presence in more than 100 countries. Scania's core business is sales and services, alongside which it offers financial services in many markets. At the time of writing, Scania has approximately 38,600 employees, 12,000 of which are located within Scania's operations in Sweden—some 6,000 white-collar employees and 6,000 workshop employees in all. At Scania's headquarters in Södertälje, a total of 5,800 people work within sales, as well as administrative and other tasks.

Of the total number of Scania's employees, slightly less than half (namely, 16,000) work within sales and services in Scania's own subsidiaries worldwide. Another 12,400 people work in production units in seven countries (Sweden, France, Netherlands, Argentina, Brazil, Poland, Russia) and regional product centers in six emerging markets. The company maintains production units in Europe and Latin America. The headquarters is located in Södertälje, Sweden. Local procurement offices in Poland, the Czech Republic, the United States, China, and Russia supplement the central purchasing department in Södertälje.

Scania was listed on the NASDAQ OMX Stockholm stock exchange from 1996 to 2014. On May 13, 2014, Volkswagen concentrated over 90% of the shares and June 5 was the last day of trading Scania shares on the stock exchange. Scania thus became a wholly owned subsidiary of the Volkswagen Group.

Scania was founded in 1891. Since then, its ownership structure has often varied—that is, it has been Scania-Vabis, Stockholms Enskilda Bank, Saab-Scania, Investor AB, Scania AB, Volvo, Volkswagen, Deutsche Bank, Ainax, MAN, Porsche, and is today has been 100% owned by Volkswagen Group since the completion of its acquisition in May 2014. The history of Scania is outlined in greater detail in Appendix II.

Since its establishment, Scania has built and delivered more than 1.4 million trucks and buses for heavy-transport work. Today, Scania is one of the world's leading manufacturers of heavy trucks and buses. Industrial and marine engines is another important business area. According to the company's financial

statements, it has systematically concentrated its resources in the heavy-transport segment. Even during periods of sagging markets for trucks, Scania has shown good earnings. For more than seven decades (up to the time of writing), Scania has reported a profit every year.

Scania offers trucks, buses, and coaches, industrial engines and supportive services. Scania's products are outlined in more detail in Appendix II.

5.1 Scania's core strategy

Scania has retained a clear position over the years as the profitability leader within the heavy-vehicles segment. The company aims to deliver high-quality customized heavy trucks and buses, engines, and services. A very important objective for the company has been to provide the highest possible profitability for its customers, by means of high earning capacity and low operating costs throughout the whole life cycle of its products. The company aims to ensure continuous improvement of its products and services—and is highly successful at providing top-quality vehicles at competitive prices. As cited on the company's website (Scania, 2014), "Deviations from targets and standards are used as a valuable source of continuous improvement in Scania's processes."

5.2 Standards and standardization in Scania

Through this study, it was concluded that Scania employs a vigilant standardization management approach, meaning that it does not aim to lead in external standardization, or even highly influence it. However, company representatives are present in external standardization committees, although their primary aim is not to influence outcomes. Mainly, their objective is to remain updated on current standardization issues and trends. In other words, standardization management does not comprise an issue of strategic priority, but rather a hygiene factor; that is, a factor that is not utilized strategically, but cannot be eliminated either. Nevertheless, even in the case of Scania where standardization management is utilized vigilantly, the company makes an effort to remain informed on external standardization. That is, standardization work is not considered as bringing undesired uniformity among industry players.

However, Scania does not promote its own internal standards among competitors. Taking Scania's vigilant approach into account—that is, the fact that it does not aim to lead external standardization—the company adopts a tactic of protectionism; Scania's internal standards are not visible to external parties, but rather are kept secret. Only Scania employees and selected suppliers and distributors have access to the internal standards. In this sense, Scania's approach in relation to its internal standards is one of inimitability and immobility. This choice is justified in accordance with the company's overall standardization management approach. In other words, since Scania does not aim to establish particular specifications, but rather assumes an overseeing and watchful role, the company finds no reason to make its internal standards visible to external parties.

5.2.1 Centralized office for corporate standardization

As introduced in the preliminary theoretical framework, the existence of a centralized unit within the firm—which is responsible for tackling standards and standardization-related issues—is arguably important. Indeed, such a unit exists in Scania, namely Corporate Standards. Corporate Standards was established around the 1980s, and belongs today within Research and Development, and more specifically within Technology Development (Figure 6).

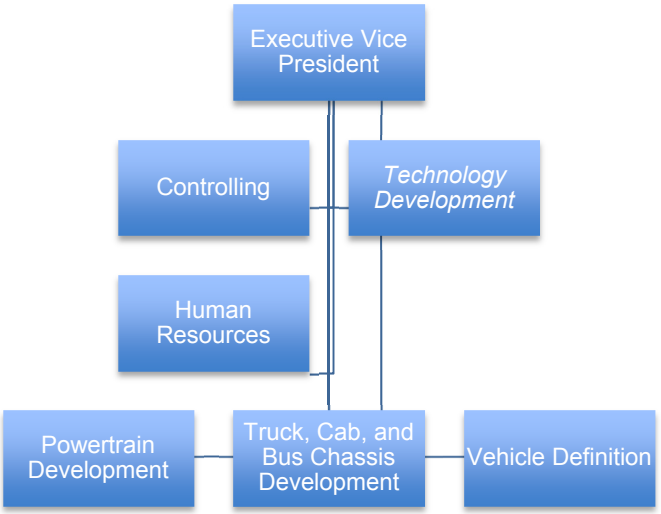


Figure 6
Research and Development Organization.

In Technology Development, Corporate Standards (or UTMS, as the unit is abbreviated due to its organizational position), stands within Materials Technology & Corporate Standards, as demonstrated in Figure 7.

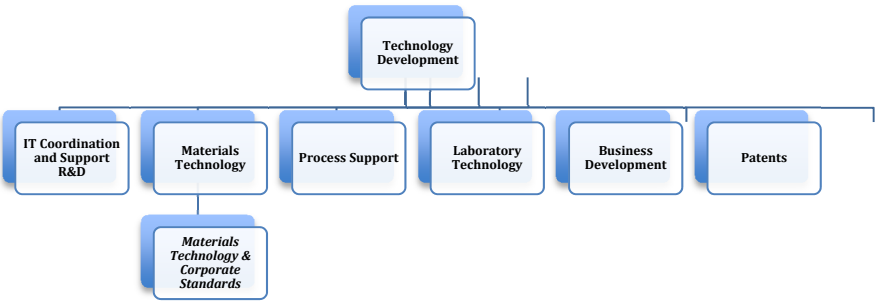


Figure 7
Technology Development Organization.

As this research project addresses corporate standardization and standardization management, a point of departure has been the company's standardization unit, since the unit's founding purpose was the management and organization of standardization activities. Nevertheless, the study will not be limited within the borders of the standardization unit department, as it is intended to address overall corporate standardization management.

5.2.2 The standardization unit in Scania

The standardization unit in Scania (which comprises a centralized office for standards and standardization) is strictly responsible for all corporate standards, meaning that the standardization engineers must be always involved in any standardization process. In that sense, they possess strict formal authority and are intended to be a coordinative function of corporate standardization management. The documents they deal with are always called standards, denoted by the prefix STD and then the number of the standard. Formally, no STD document can be created, updated, or deleted without UTMS taking part in it.

However, in practice it is often the case that employees in other departments write their own instructions, which they can call technical regulations, or even standards.

> Area specialist A: "It's often the case that people [within the company] write technical documents; PD, TB, TR, technical regulations. We have standards, and we also have special regulations. And it's very often that they go like 'yes, let's write a new TB.' And the TB is growing and growing, and should have been standardized long before it grew that much. They [employees within different parts of the organization] are writing a TB and putting a lot of time [into] that, while they could have asked the standards department or any one of us, and we could have told them to apply an ISO standard, or an existing Scania standard, instead of this very time-consuming technical requirement writing."

> Manager A, Corporate Standards: "There are the so-called 'position standards' for production. So people in production standardize their positions, how to work, what is the most efficient way, etc. And if that 'position standard' is used for more than one group, then it could be an STD document. But it's not! So, somebody has to create those position standards, some people are using them, some people are improving them, they are stored somewhere, and they are

> obviously used and are a benefit for Scania. And I'm not saying that everybody should sit within the group, but we could cooperate. We could lead all those processes and then have everything in one database that everybody can access."
>
> Standardization engineer A: "I think that's one of our main issues, and many possibilities for the future. To tell people that we are here, that we are part of the company. There is a Corporate Standards unit, meaning that we have the standards, and we have the team, that is taking care of the standards. There are some documents in the company that are perhaps called standards, but are not under our responsibility. So we are trying to catch up and make people aware. Since we are the central station for all standards, we make sure that every standard has the same design, is saved with us, we have the same quality, the same routine for sending out for feedback, etc. We offer some kind of a service related to standards. So, to answer your question, no, not everyone in the company knows that we exist. Which is a pity. But we are working on it."

The standardization unit was, since the foundation of the company, put in place in order to manage standardization-related issues—and formally, it is still supposed to do so. Hence, since it does not retain that control and purpose today, the question is where does standardization-related control lie in the company. Informally, it is the technical experts that manage this aspect (as described below). However, rather than being pre-decided, expert control rather emerged due to technical expertise and long experience, and subsequently experts' capability to handle standardization-related issues (particularly external ones), at the same time that the standardization unit's position in the company was gradually weakening.

> Former CEO: "It was a growing opinion in the company, instead of having it [the standardization department] centralized, we just pushed it out to the different operation areas. It was a management decision … You can say that instead of having central standards [that is, a centralized department], you go to local standards, where the activity takes place. You delegate that to the different operation areas."

In other words, the company's top management did not appear particularly interested in safeguarding the centralized power of the standardization department, but, on the contrary, saw value in decentralizing it to the different departments. The various local experts were given increasing independence and responsibility in regard to managing their own standardization areas, and did not necessarily seek the standardization department's assistance—which of

course aggravated the centralized unit's weakening since it ended up unable to fulfill even a coordinative function or get ahold of who was responsible for what.

Another aspect that intensified the abovementioned decay has been a human resources turnover—that is, experienced and qualified standardization engineers leaving the company and being replaced by newcomers.

> Area specialist A: "Now I am working with [name of current standardization engineer], who is new here. Previously, with the one I used to work with … we had a system of reviewing the standards with our key suppliers. We reviewed together the draft of the standards, while it was not finished yet. So then we could get their input as well. I haven't done it with [name of current standardization engineer] yet. But I used to do that a lot a year ago, with [name of previous standardization engineer]."

> Manager C: "It [referring to a series of standardization-related meetings that used to take place in the company] just faded away. Someone didn't call a meeting and then it was out of the calendar, and no one complained. We just had one less meeting."

Hence, as stated by the medium-level manager above, corporate standardization-related practicies just "faded away" along with changes in employees within the standardization unit (who included those who, for instance, called those particular meetings among the different parts of the organization). On the other hand, higher- and medium-level management's priority was not to protect such practices, since they did not deal with the task of assuring and enforcing the standardization unit's policies or control, mainly due to the fact that standardization efforts and activities are not a strategic priority for the company.

Accordingly, though the technical experts, who did remain in their positions during the aforementioned changes, could probably have promoted tighter collaboration with the newly formed standardization unit, they did not do so either. A major reason for this was that experts comprise very experienced personnel (regarding both standardization activities and the company per se), which indicated that they were capable of taking over the technical aspects of corporate standardization. Hence, they did not appear interested in promoting close collaboration with the newly recruited (and relatively inexperienced) members of the standardization unit, either due to inertia (that is, an aversion to committing time to efforts that were not demanded by higher management) or distrust (of the new unit's competences)—or both.

All in all, the technical experts are indeed perfectly capable of managing the external activities of corporate standardization, as well as contributing internally towards technical solutions. The downside of this setup is the rather strict focus on the technical aspects—that is, a lack of strategic utilization of corporate standardization—since the experts are operationally oriented, rather than strategic leaders.

Nevertheless, the company's higher management does not appear to prioritize corporate standardization or seem particularly interested or focused on the strategic potentials of it.

5.2.3 Position of the standardization unit

As far as the abovementioned inability of the standardization unit to retain control of overall standardization management is concerned, a commonly recurring theme (highlighted by standardization engineers, area specialists, and even managers), was the current organizational structure.

In particular, standardization engineers expressed dissatisfaction regarding the position and current standing of the unit within the organization, referring to the fact that UTMS is positioned at the lowest organizational level (within R&D). That is, the number of hierarchical levels often causes disturbance in the delegation of decisions and authority, especially due to the fact that managers above the standardization unit are not directly engaged in standards, causing additional uncertainty.

However, what is much more important in relation to this dissatisfaction—as also pointed out by specialists and managers—is essentially the current standing of the unit within the company in terms of power and visibility. Namely, a few decades ago the standardization department used to be bigger and stronger in terms of technological expertise—that is, in terms of the area specialists and technical experts within the standardization department. However, due to rapid technological advancements and thus increasing manufacturing complexities around the automotive industry over the past two decades, a huge number of technical experts have been employed in the company. These (now numerous) experts, who comprise critical resources for the company, were needed in the various technological areas and sites all over the organization, instead of being centralized within one department, namely the standardization department. In response to that challenge, Scania separated the technical experts from the standardization unit, while still aiming at close collaboration between them.

> Manager B: "So, [historically], the standards department was strong. If you were curious about what to use, or if you had a question, what is the best and so on, you would go to the standard[s] department and they would tell you what to use. … Today the standards department in Scania is not so much about knowledge of the content in the standards. They are more like writing the standards, they ask who will approve it and so on, more administrative."

After the separation, the standardization department was pushed into an internal role—that is, to a large extent pushed into an administrative role and exclusively dealing with internal standardization processes, while the technical experts managed external standardization. This happened because the technical knowledge and expertise was no longer located within the department, at the same time that regular contact and robust communication between the technical experts and the standardization unit failed to be fabricated over the years.

Subsequently, despite the fact that a number of interviewees characterized the current organizational structure as inconvenient (pointing out that it does not facilitate the different parts of the organization to cooperate in a timely and efficient manner), it is actually the lack of effective communication among them that truly leads to isolating the standardization department in a merely internal role.

Indeed, the number of hierarchical levels poses additional barriers in communication between the standardization department and the rest of the organization—for example, the upper-level decision makers. However, the true challenge is the lack of communication, and not structure per se. As mentioned in the previous paragraph, regular and solid communication flows between the standardization unit and the technical experts were not fabricated after the separation, which forced the unit into an internal role and consequently prevented Scania's standardization department from maintaining overall control of the company's standardization management.

5.3 Standardization management in Scania

Since the aim of the current project is to use both a deductive approach (guided by the preliminary framework), as well as an inductive one (also allowing the empirical material to "speak"), there are several phases to the presentation of empirical observations. Initially, a description of the functions and activities of

the standardization department is provided, as a kick-off into the company's standardization management. Subsequently, the descriptions open up for further accounts beyond the standardization unit per se.

5.3.1 Internal stimulus

As mentioned above, Scania's standardization management approach is a vigilant one, which also naturally extends to the activities of the standardization unit since standardization work is triggered by requests and questions within the organization, thus vigilantly, encompassing a problem-solving component.

That means that standardization work is ultimately connected to stimuli from inside the contemporary organization, referring to operational improvement but not further strategic advancement. Despite the fact that Scania is present on external standardization committees, internal standardization work does not at all appear strategically connected to these committees—that is, standardization work constitutes a hygiene factor.

> Manager A, Corporate Standards: "…Because we have always been working in the background, so to [speak]. And I don't think there is any strategic thinking."

However, even though the standardization department's role is primarily a problem-solving one, the standardization engineers make efforts to be proactive and offer real help within the organization.

> Area Specialist A: "Very important with the group here [that is, the standardization department] is that they are focused and a bit [proactive], not just sit here and wait to be contacted. Better be out, and push a little bit, that's important as well. They are joining us here and there [within the company]. That's [a] pro, for me. And they are getting better I think."

To provide a better understanding of how the standardization department manages its role, the following section provides a thorough description of internal standardization management in Scania in order to elucidate the triggers, processes, and decision points of the company's standardization work. In particular, these accounts clearly describe a vigilant standardization management approach.

5.3.2 Standardization triggers

In this section, the various "decision points" in relation to internal standardization are explained, forming a detailed picture of how standardization management is handled internally in Scania. As mentioned above, standardization work is triggered as a problem-solving mechanism. An important point here is that, according to informants in the study, there is no concept of binary adoption decision in the sense of examining particular standards and deciding whether they need to be adopted; on the contrary, standards-related decision making occurs after a need or a problem has been identified within the organization.

> Standardization engineer A: "The decision for the establishment or revision of a standard is coming from the company itself. When either an internal customer or a user comes with a need. It can be anyone, anyone in the company. And we are then taking the initiative and start working with the area specialists. We try to identify who could take the scientific responsibility for the content in the standard."

> Area specialist A: "We get an indication from within the organization, somehow. There is a need for standardization in the area. So, it is often built around a need. And we can trigger the standard ourselves; we might see a need, or maybe an internal customer, such as the design department, the designers, or the purchase department. They could say that they need to standardize this, an area."

> Standardization engineer C: "Usually it comes from R&D people. Someone comes in with a question or a problem. And if there is really a need, for many people, then we try to work on it. First we discuss with the experts. It might happen that they say 'this is already explained in an ISO standard, an international standard.' And they give it then a Scania number, saying that this standard is linked to the international one. Otherwise we will create an internal Scania standard. So the experts are the ones who decide if there is really a need, if it is something important. Based on their experience. Or it can happen that we get a question several times. In that case, we try to find someone who knows more about it, an expert or a team of experts."

Thus, the starting point of standards-related decision making is typically a request, raised openly by anyone in the organization and addressed either directly to the standardization unit or the area specialists working in different areas of the organization. A standardization request may be stimulated by some

disturbance in production, deficient products, or a great inflow of particular questions and misunderstandings. Furthermore, even the possibility of an efficiency improvement is considered a need within the organization. When responding to a request raised by any employee, the unit acts vigilantly towards resolution of a problem somewhere in the company, after advising the experts and area specialists for the respective areas.

5.3.3 Standardization decisions

The various stages of Scania's standardization decision-making, along with the challenges associated with them, are described in the sections below.

5.3.3.1 Pre-initiation decision

Following identification of a potential standardization need through a request or a number of questions, the company's centralized office for standardization—that is, the standardization unit—examines whether the particular request or need should be made into a standardization project. This is the first actual decision point for the unit, which indicates that *the standards-related decision making starts before instigation of the standardization project per se*. This stage comprises a vital decision, since the truly important projects for the company will not receive the attention they deserve unless effective prioritization ensues, and, furthermore, taking up unlimited standardization projects would be very costly for the organization. However, this "pre-initiation" decision-making, as well as the rest of the standardization process in Scania, is not actually determined by any sort of explicit factors; instead, the decisions are connected to each particular case.

> Area specialist B: "A standard is a compromise, but sometimes you cannot compromise on some things, because the use is so different, so it would be very expensive to have a standard in that case. You must have the feeling, when is it worth having a standard, can we say this is beneficial for Scania, or is it not?"

Indeed, those requests need to be examined case by case, specifically by personnel who possesses the technical knowledge to assess them and whose work will be most affected by the forthcoming standard. These personnel are no other than the various area specialists, who are the real decision makers; they assess the importance of a request and judge whether to initiate a process of standard

creation or revision. The standardization department is involved in the process, but mainly in terms of coordinating the work, rather than making decisions.

> Standardization engineer A: "It has happened in the past that the area specialist decided not to change the standard after a question. And that was based on a very long experience in the company. That is something I need to trust."

Thus, a request comes from within the company, from any internal customer or user, and it can be either be decided that this will be turned into a standard or not. In the latter case, a solution is found but is not formatted as a standard. This means that the document is not named STD (standard), does not fall under UTMS's authority, and is not intended to be implemented all over the company. An important reason for deciding not to make a solution standard could be its limited applicability, since a standard is supposed to be applied generally all over the company, or at least to the vast majority.

> Standardization engineer C: "So the experts are the ones who decide if there is really a need, if it is something important, or it would only serve two people, for example."

> Area Specialist B: "Perhaps we know that one department cannot use the standard, but the other 10 departments need it. So I will make a standard for the 10 departments. But I will not make a standard for one department, because then it's not a standard. Then they should make a document inside that department. It's not uncommon, on the contrary it's very common that you make a standard for 90% of the people, but 10% [are] outside the standard."

5.3.3.2 Initiation decision

In the case that pursuing a standard has been decided, a second round of decision making is initiated within the organization, often with cross-functional groups of discussion, which are the groups that work best due to the overall visualization and coverage of different areas. Furthermore, cross-functional groups from different areas of the organization are formulated in order to embrace various users' input and involvement.

In particular, instead of having a regular one-ended process where one gives input and develops an output, and where someone else is merely the end user (as visualized in Figure 8), a different approach is used in Scania's internal standardization management. That is, the final users are involved and contribute

towards development of the standard that they will eventually use (as shown in Figure 9).

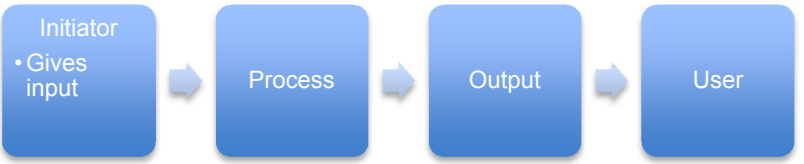


Figure 8
Regular one-ended process.

Figure 9 represents a virtuous example of users' involvement, contributing a diverse set of opinions and experiences. UTMS is part of the discussion, but mainly in terms of administrating it. The real expertise is once again contributed by the experts and area specialists, who take "scientific responsibility" for the content of the standard.

> Standardization engineer C: "To me, it is the expert that knows everything in the standard. So, it should be approved by the expert."
>
> Area specialist B: "It's very clear for me what I can do and what I can trust UTMS to do, based on experience. In my standards I make the decision with the knowledge I have."

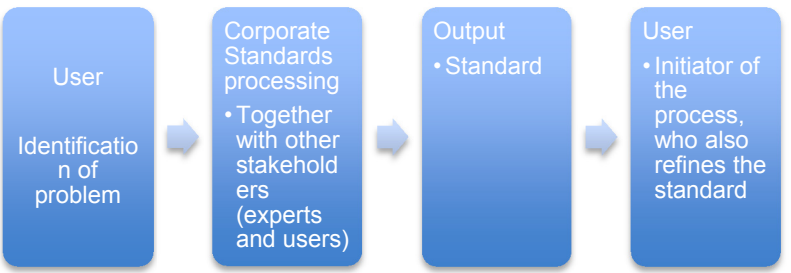


Figure 9
Internal standardization process in Scania.

Accordingly, standards-related decision making processes are conducted by three main parties, namely the experts and area specialists, the standardization department, and the internal customer that brought the need up in the first place. Ideally, additional future users of the forthcoming standard will also contribute during its creation.

> Area specialist A: "So we need to form a small group, with one of the standards coordinators [standardization department], and then maybe an area specialist—like ourselves. And then hopefully the internal customer as well, the one with the greatest need [for] the standard. So that is the minimum I think, those three parties—the need, the knowledge around the area, and the standardization administration."

As soon as these parties have agreed on the draft of the standard, the second decision-making point of the standard's development process arises: the decision that the draft of the standard can be sent for internal feedback.

5.3.4 Feedback round

The draft is then circulated within the company for a feedback round. This essentially aims to involve as many future users as possible—ideally all of them.

> Standardization engineer A: "When we change a standard, we send out a 'referral' for a feedback round. So, together with the area specialist, we try to identify people that are sitting [in] key positions, which might be affected by the standard, or by the changes in the standard. So we are sending [it] out to give them the chance to provide feedback. And also for us, to make sure that they had the possibility to give feedback before we publish the standard."

The standardization engineers—that is, the members of the standardization unit—in cooperation with the area experts account for the received feedback and adjust the standard draft accordingly before it is published in the internal network and becomes available to all Scania employees. Open and collaborative processes lead to more adequate standards, since problems are identified early and solutions are negotiated. Creating a standard that is intended to be used by thousands of people in Scania, who work in different areas and with dissimilar purposes, is far from a trivial task; it encompasses technical aspects, and thus has quality and cost consequences. Unless a standard draft is allowed to encompass ample feedback and hence be adjusted in different stages of standards creation—

even if that requires a number of reformations before its finalization—it cannot be expected to holistically cover the needs of future users.

5.4 Corporate standardization resources

The previous sections have provided general descriptions of how corporate standardization is organized and performed in Scania. The following section will focus specifically on organization resources, whose availability connect closely with the abovementioned accounts.

5.4.1 Financial resources

A characteristic feature regarding corporate standardization management in Scania is the pursuit of resource consumption minimization for the standardization department, which translates to a downsizing of the department's human resources per se, as well as cost cuts and spending holdbacks in regard to overall standardization management.

General cost cutting in the company has greatly affected the standardization work, with allocated resources being gradually reduced over the last few years. For instance, the standardization department's team (which is meant to be the primary team for managing corporate standardization), has been halved over the past few years. As of today, it consists of five persons—namely four standardization engineers and the head of the unit, who, at the time of the study, focuses on reorganization of the unit in order to improve its function and processes, taking into consideration existing practical constraints.

> Manager A, Corporate Standards: "One of our standardization engineers quit a few months ago and we didn't have any opportunity to replace her, since we were not granted a replacement for her. That means that from being six we have been down to five. And during that period two other persons have left the group. They weren't here physically, they were sitting in other departments, but actually from eight positions we are down to five. Which is very important. Because we were already too few since the beginning, when we were eight. We are so few."

> Standardization engineer A: "It would be a problem if we lost one more of our colleagues. I think one person less will mean that then we could not handle the work. That would be really a big problem."
>
> Manager A, Corporate Standards: "We are actually below minimum right now. If we lose another person, that is really a big threat. We have already said no to a lot of things. That we must do. We are really tight."

However, the lack of organizational resources addressed for standardization work was not only pointed out by standardization engineers. Managers also claimed that the current availability of financial means for standardization work is rather restrictive, towards a merely operative fashion (e.g., day-to-day work), as highlighted in the quotes below. On the contrary, utilization of corporate standardization in a more strategic fashion is quoted as having great potential for the company, but as being rather prohibitive taking into account the prevailing resource limitations.

> Manager D: "We've had cost limitations which have badly cut down the resources for standards and that is a threat."
>
> Manager D: "Because now we can only do the required work in order to keep up our knowledge base. But we should work strategically and we can't reach there if we don't have more people."
>
> Manager B: "They want to do it [work strategically], but they are not so many. So, they don't have enough resources to do it."
>
> Former CEO: "It was not [financial constraints] at all that led to the decision [of downsizing the standardization department] … It was that in a globalized world, being present to 90–95% outside of Swedish market, we couldn't continue to work with a centralized department. Not in a globalized world, with global markets, global presence."
>
> Former CEO: "We saw that we couldn't continue to work this way [with a centralized standardization department]. Because the product diversification was increasing enormously, and also the presence of the company in different parts of the world increased … And I would say that for all global companies it is impossible to work with the same [central] standardization department. You have to utilize working procedures and standards, the local standards and procedures."

As clearly expressed by the man who had been steering the company for 18 years, top management in Scania judged that a centralized standardization unit was not of high value, or even necessity, to the company, and hence reduced the unit's capacity. The abovementioned decision came a good three decades ago, but today availability and readiness of resources for standardization activities remains a challenge for Scania's standardization engineers. In fact, as resource demands for corporate standardization can be very high (considering personnel demands and frequent travel costs in order to attend external standardization committees), a crucial question is whether the firm is prepared to go along that road. Scania's higher-level decision makers for the last three decades do not appear willing in this regard (that is, allow slack and readiness for supplementary resource commitments in accordance with upcoming needs and maneuvers inside and outside the organization), as would have to be the case if corporate standardization was meant to be utilized "strategically." Instead, despite the fact that standardization work has by no means been completely eliminated in the organization, it is encircled by a minimization of resource consumption.

For instance, looking at Scania's participation in Swedish working groups (data from the Swedish Institute for Standardization), which is representative of the company's overall work with external standardization, it can be observed that attendance by solely one Scania representative is the most common situation (which can be sufficient if the aim is to keep an eye on the process, but not quite if the goal is to lead that process). This does not signal an ambitious drive towards influencing the ongoing standardization processes, but rather a vigilant one; that is, a company representative attending the external standardization committee mainly in order to oversee the work, rather than influence it. Yet again, however, resource minimization is not translated into elimination of standardization activities (even after the most recent cost cuts), which designates that in spite of not utilizing corporate standardization strategically, Scania perceives preservation of standardization work and overseeing as a necessity (as a hygiene factor, if not a strategic one).

5.4.2 Human resources

The abovementioned limitations in financial means translate into a downsizing of standardization engineers not only in numbers, but also in human capital—that is, workforce experience and familiarity with the area. Although the capabilities and capacity of the personnel are not compromised by their lack of

experience, it does challenge their everyday work and communication with the rest of the organization.

> Standardization engineer B: "[We need] more people, simply. Because at the moment as you see I have a very broad area, I have three major areas. So, if we want this group to be experts and have knowledge and develop, then I think we need to have more people and divide the areas so that we don't have [such] broad ones. I can do my job okay, within all these areas. But if the company wants me to be an expert, not only coordinate [the work], then I need to focus on one area."

> Area specialist A: "I think [the standardization department] has been a bit mishandled. The status [has] decreased a bit."

> Area specialist C: "[The standardization department] should be more involved in different areas. Maybe they are already, but I think the problem is also that it is more of an administration unit. They don't really have specific knowledge about different areas of the truck. I mean, they cannot write a standard themselves; they are dependent on experts around them."

Scania's standardization department is composed of a relatively inexperienced crew (in regard to the standardization arena and the company per se). Since the department's leader has had no previous standardization-related experience, such experience does not appear to have been prioritized when recruiting the other team members (judging by the configuration of the team, as well as indirect conversation with the manager).

> Standardization engineer A: "The thing is that I'm quite new in the standardization group…."

> Standardization engineer B: "I'm new at this job but I'm also new as an engineer in general."

> Manager A, Corporate Standards: "We have to know the external landscape better. But we don't so far, since we are rather new in the group. 1–2 years is no experience within the standardization area. A lot of people have been working in the area for 20–30 years and those people do know everything."

In addition, keeping in mind the aforementioned financial restrictions and the company's low prioritization of standardization work, it can be anticipated that the company's standardization department might not have access to experienced

and accomplished professionals within the field of corporate or international standardization. The most highly experienced and skilled individuals within each field (and therefore within the standardization arena as well) will most likely be expensive assets for a company to recruit (encompassing higher personal, as well as professional, demands, referring to the overall infrastructure around corporate standardization work). Since Scania's decision makers do not demonstrate a readiness to adjust to higher financial demands for corporate standardization in order to utilize it strategically, less experienced personnel fulfill the company's conditions and requirements. However, precisely taking into account the relatively limited experience and competence within the standardization arena, it is even more challenging for Scania's standardization department to be the core of overall corporate standardization management.

Besides the relative lack of experience within the standardization arena, the vast majority of the unit's members are new to the company, which signifies an additional lack of Scania expertise—that is, long experience within the company—as well. Although this is not a prohibitive factor for personnel contributions, it does pose additional challenges for the unit's visibility and influence over the company. This is not necessarily problematic for an organization's overall corporate standardization management, as long as control of the processes lies somewhere else in the organization. Particularly regarding Scania, where the standardization department is formally supposed to maintain control of the overall process (which is not the case in practice), a question that arises is where this control lies.

> Manager A, Corporate Standards: "Our experience in the standards group is very young, if you look at our group. Even though I have lots of Scania experience, I don't have so much standards experience. And that's also a challenge for the group, because my standardization engineers don't have much of Scania experience either. So we need to educate ourselves about the process of working with standards."

> Manager A, Corporate Standards: "The standardization department is very old. However, we as [personnel] are pretty new. And I think that the last years at least, we have had mainly an internal role."

Coordination of internal standardization management activities is indeed left to the company's standardization department. Nonetheless, external standardization is entirely managed by Scania's technical experts, most of whom are exceptionally experienced staff. Characteristically, experienced and

knowledgeable personnel (in regard to both standardization and the organization per se) are endorsed to partake in external standardization committees, contending that effective participation is not otherwise viable.

> Area specialist A: "[Standardization work] is based on experience, I think."
>
> Area specialist A: "It has differed, the last 30 years. Now we have the knowledge behind the standards."
>
> Area specialist B: "[I have] great knowledge of this company. Because I worked in this place, up in this hill, in R&D as we say, for 20 years."
>
> Area specialist C: "In my former position in Scania, in materials' technology, I was working with standards as well. And after that [the last 10 years] I [have been] the head of supplier quality assurance, regarding suppliers' deliveries according to our standards."
>
> Manager B: "I am the main [person] responsible for the core engine, so to speak. And I have been working in Scania for 26 years."

To sum up the above, the limited technical knowledge and expertise of the standardization engineers, pinpointed both by the engineers themselves and other parties of the company—that is, managers and area specialists—is stressed as an important deficiency of today's standardization unit. These limitations keep the standardization unit from obtaining control of corporate standardization management, and arguably inhibits their contribution since they are forced into a merely internal coordinative role. On the other hand, technical knowledge and expertise are possessed by the area experts, who participate effectively in external committees and completely manage Scania's external standardization management, at the same time that they contribute to the internal processes. Effective participation in standards setting and overall standardization management require a high level of competence—for example, technical and business expertise—otherwise the personnel would not be capable of handling the standards-related processes.

5.4.3 Technical experts and growing competencies

Carrying on from the above paragraphs, it is noted that standards-related experience in Scania is highly praised. That is, over a number of years, the company's veterans (for instance, the experienced technical experts) have

acquired valuable experience within the area of standardization—in contrast to the relatively inexperienced standardization engineers, whose inexperience has them facing a number of challenges, as described in earlier sections. More specifically in regard to standards and standardization, two types of human competence seem to be important in Scania.

The first type, which is purely organizationally oriented, resembles the experience and familiarity that follow any kind of activity after repeated execution—whether that activity refers to purchasing, production processes, or corporate standardization activities. In other words, that type of competence is predominantly organizational and not uniquely standards related.

> Area specialist B: "We have one process in the company, that is called Lessons-Learnt. After you do the work, you go for the Lessons-Learnt. What did we learn from this [standardization] project? And in that process you can have some kind of follow-up. What did we do right, what did we do wrong, what can we do better next time? It is very beneficial for the company [overall]."

The above description depicts the overall process of learning how to work with standards and standardization in a corporate setting; that is, appreciate from experience what works and what does not, what is important, and how to make the process of corporate standardization more efficient. That is precisely the type of competence that technical experts have acquired over decades (since they have been repeatedly managing standardization activities within and outside of Scania), and that standardization engineers lack (since they were not working with standards and standardization until a couple of years ago, when they were recruited by Scania).

One of the main reasons why the standardization department has not managed to maintain control of the overall corporate standardization management and comprise the core of it, despite organizationally being supposed to, pertains to the shortage of such experience and learning—which the technical experts did not undertake to pass on to the newly recruited standardization engineers. Certainly, it is not as simple as simply passing on experience acquired over years, but to some degree the technical experts could have done so by educating the standardization engineers on organizational practices and policies (namely, those practices that were left to "fade away" after the previous standardization team left the company). Added to that claim is the strong depiction (formed through the interviews and informal conversations with the interviewees) that the newly recruited team would have been more than willing to be educated by the more

experienced personnel; they appeared aware of their inexperience, but very open to and interested in expanding their knowledge.

On the other hand, the second type of competence observed in Scania is more uniquely standards related, and refers to the learning and experience that established standards enforce. That is, by creating, developing, and updating corporate standards, the company has built up company-specific technical knowledge, which is demonstrated and shared in the standards per se.

> Area specialist A: "Some standards of course are know-how and important information within Scania."
>
> Manager E: "In some [standards] we are building knowledge. The value of the company is not really in the buildings. The value, especially for us in R&D, [is] in our knowledge."
>
> Area specialist B: "The standards inform people how to do things. For those people that know exactly what to do, you don't need a standard. But mainly it's for the people that are unsure. That's a reason why standards are so important. Because the standard is not a document of rules, sometimes it is a document of education and training that is available [to] everyone."
>
> Area specialist A: "…for me it has always been a very important area to help with [standards], to build up knowledge. I think you see that in organizations that are very successful, they have standardized critical areas in a good way and in a very structured way."

An important distinction here is that such standards-related benefits can also be obtained by the company by simply adopting international standards, as long as the standards are applicable to the specific purposes and operations of the organization. That is a huge challenge for organizations, which, in order to reap benefits, need to properly adapt the international standard to their specific circumstances. On the contrary, when corporate standards are developed within those company-specific circumstances, they are likely to serve their organizational purpose more resourcefully.

What Scania (and many other organizations) endeavors to do is find a balance between those two situations, yet often leaning towards internal standardization. That is, while keeping informed in regard to international standardization (for instance, via regular participation in standardization committees), Scania's corporate standards might deviate from international ones. More specifically,

Scania's corporate standards either comprise adjusted international standards (adjusted to suit the company's needs), or standards developed wholly within the company.

5.5 Organizational culture

In concluding the section about resources and how they relate to Scania's corporate standardization management, organizational culture needs to be accounted for, since there two very strong cultural traits affect the company's approach towards standardization work. As mentioned in previous sections, these are the paramount modularization system and the "small company syndrome."

As far as the former is concerned, it is noticeable that Scania's internal modularity work undermines corporate standardization work, since it perfectly meets the company's standardization needs. The principles of the modular system fundamentally resemble standardization principles per se, while at the same time constituting a foremost cultural imprint of the whole organization.

> Manager D: "But we are known for our modular system and this is part of standardization work, which keeps the key parts down."
>
> Area specialist A: "You know, we have built up around the modular system, and we also have very few part numbers compared to our competitors. And it's a lot based on the modularization system. But also based on the standardization, of course. If you can standardize, to use only one instead of 70 different ones, then you decrease the part numbers, save administrative costs and manufacturing cost, maintenance cost, stock cost, and all of that. [The] modular system and standardization of parts is highly [necessary to] the core of the company to be successful."
>
> Standardization engineer C: "Usually in Scania if you talk about standardization, people will think about the modularization system we have in our trucks. It's a standard. We have three cabins and two different frames, and we can build lots of combinations. So that's what people think about, first. And this modularity system is one of the most important things Scania has. I think that's why it's in the ground of the pyramid [referring to the 'R&D factors pyramid']; we have to think more standardized because we gain a lot with this modularity system."

> Standardization engineer E: "Have you seen our pyramid in the reception, the 'R&D factors'? Standardized methods is one of our principles. We are famous for this modularization system; with a few components we can build many different trucks. So that's in the walls, as we say here in Scania."

Every one of the interviewees referred to Scania's modularization system as the unquestionable foundation of the company's operations, through which a small variety of shared components are used in all Scania products—from trucks, buses, and coaches, to industrial and marine engines. All Scania engines have the same cylinder architecture and today Scania coaches have a large number of chassis and powertrain components, in common with trucks. Likewise, all of Scania's truck cabs have the same interface with the chassis. In turn, the chassis is built up by a large number of frame components that are combined together in countless combinations. Scania set the foundation for modularization more than 50 years ago, and has been refining the system ever since. The key aspects, then as well as today, are standardized interfaces, limited components, and carefully defined steps for each line of components. This creates a specification system with vast variability, comprising few components and as many shared parts as possible (Scania, 2014).

Taking the above into account, it can be concluded that Scania has chosen to focus on a technologically superior modularization system—and hence deploy a merely vigilant (and insular) standardization management approach in combination with it. This choice is further elucidated when considering the broader contextual factors, and predominant corporate strategy, which are reflected upon in the following section.

However, another attribute that seems to work against corporate standardization management is the "small company syndrome." As discussed above, this forms a barrier for formal intraorganizational communication, since Scania's personnel (after decades of working in the organization) still perceive the company as small enough to be contented with informal communication. That barrier is predominantly cultural, and affects overall corporate standardization management, since the perceived need for corporate standards and standardization are equivalently underrated.

> Manager B: "But we are all engineers; they [engineers] like to find out new screws and new connectors, new ceilings, or whatever it could be … I think it is a lot of reasons. First of all, it has to do with history … But today in [the] engine development we are more than 3000 people. And who will see that we are using the standard parts?"

> Manager B: “Of course there are people thinking it’s just administration, saying: I don’t want to work in the way that somebody tells me, I want to do it in my way, I know best.”

Of course, Scania is not truly a small company. The reason why such cultural perceptions have not resulted in organizational chaos probably has a lot to do with the fact that Scania’s manufacturing scope is very limited, but even more importantly is related to the modularization system per se (which comprises Scania’s cornerstone and in essence encompasses standardization principles).

5.6 External interface

The previous section addressed corporate standardization resources, which comprise internally oriented focal aspects in close connection with a standardization management approach. Externally oriented ones are discussed below, specifically referring to external participation and protectionism of corporate standards.

5.6.1 External participation

External standardization in Scania (that is, participation in external standardization committees) is exclusively managed by the company’s technical experts—as the standardization unit solely handles internal standardization management, in terms of administrating the internal processes. Nevertheless, the standardization department is highly dependent on the technical experts, even for internal processes, since these experts possess the most relevant technical competence (as outlined in section 5.4.2 about human resources). External standardization work is entirely managed by the technical experts (or area specialists), who also participate in external standardization committees, where Scania is regularly present.

> Manager A, Corporate Standards: “Scania is participating in external committees, but this doesn't necessarily go through the standardization unit [but through the technical experts instead].”

External committees comprise a valuable information pool—that is, an eye "on what is happening within the standardization world," as stated by both managers and experts.

> Manager A, Corporate Standards: "… what is happening within the standardization world. Which is very important! The external committees are the way to know what is happening in the world!"
>
> Manager E: "…Very much collecting information and just to be in the discussion is very important."
>
> Area specialist A: "I don't know how much [the standardization department] work with the standardization organizations, like SIS and ISO, but I think that's quite important as well."

Regular participation in external committees is crucial for Scania, for reasons of information advantages and monitoring of competitors.

More specifically, important discussions take place within the setting of external standardization committees in terms of both technical and political aspects; that is, negotiations and decisions that will affect the future of the whole industry through international standard specifications are part of these debates. Individual firms cannot afford to miss out on those developments. Thus, firms retain the opportunity to prepare and adjust, if needed, in accordance with forthcoming international standards specifications. This means that they can direct their R&D, their production lines and other internal processes even before an international standard is released. This will of course not be the case for every standard, but by regularly participating in external standardization committees, firms become able to collect relevant information—and subsequently determine which processes and developments are crucial for their operations, markets, and forthcoming strategic plans. The organizations' experts, who attend the external standardization meetings and at the same time posses technical expertise and relevant experience, comprise the companies' external radars; they can understand the external circumstances and ensure that the organization will not be found to be technologically lagging behind or having missed out on vital information.

However, despite the fact that external focus and participation are arguably crucial for corporate standardization management, regular (and well-informed) participation is highly demanding in terms of organizational resources (travel costs and especially man hours), technical competence (in order to grasp the

technical aspects), interpersonal skills (in order to manage the discussions and the negotiations), and personal interest (so that the participants remain up to date and focused).

5.6.2 Protectionism of corporate standards

While Scania representatives participate in formal standardization, the company's internal standards and specifications remain generally undisclosed to external parties, with only Scania employees and suppliers being able to access them.

> Standardization engineer A: "Our standards are Scania internal documents. And some, around half of it, are open to suppliers. The suppliers sign a contract, saying that this is confidential information. Some of the information written in a standard is handed over to the people in the marketing organization that is taking care of the distributors [and] dealers."
>
> Standardization engineer B: "Our standards are secret, meaning that they are between us and the supplier. And no third party. So the suppliers of course have to see our standards in order to understand what we want and what are our requirements. But they are not allowed to give the standards to a third party."
>
> Standardization engineer D: "Everyone who works in Scania has a login, and has access to the standards. They are online in our intranet."

In other words, Scania chooses to follow a protectionism policy in regard to its corporate standards and specifications, which relates closely to the fact that the company made the decision (back in the 1940s) to produce strategic parts in-house. Subsequently, the company's dependence on external suppliers became limited. Since Scania does not need a broad pool of suppliers to be familiar with its particular specifications, and thus does not aim to establish these standards externally, it has the slack to protect its internal standards and keep them from being visible to external parties.

5.7 Internal interface

A result of Scania's decoupled standardization management (that is, internal standardization managed by the standardization unit, and external standardization managed exclusively by technical experts) is in essence a decoupling of internal and external standardization efforts. Further, such interrelation of (internal and external) standardization efforts is largely lacking due to the fact that serious attempts to exchange information (between the two main parties managing standardization) are not undertaken in Scania, resulting in unbalanced dynamics in Scania's internal interface with respect to corporate standardization. The intraorganizational dynamics will be addressed and elucidated in the following paragraphs.

5.7.1 Standardization-related information exchange

It was concluded in the previous section that the technical experts keep a close eye on the external world through participation in external standardization committees. With these committees serving as a vital source of information, exchange between the experts and the standardization department (who are the main party responsible for internal standardization processes) could be considered crucial. Nevertheless, such information exchange (among experts and standardization engineers) does not occur.

> Manager A, Corporate Standards: "We don't have contacts with those people [that participate in external standardization for Scania]. So we are not updated on what is happening within the standardization world. Which is very important."
>
> Manager B: "There is no plan. Because it is nothing like: we are changing the standard four times a year, for example ... And if it is important to reach out, and if my people are affected, I get the information from… somewhere! So it is not planned. And then I don't have any information. That's the problem, I think."
>
> Standardization engineer B: "Some of the information from external committees reaches us, but no… not really!"
>
> Area specialist C: "Yes, it is a discussion, but not a formal one."

Hence, the current situation within the organization, as described by the different parts (namely standardization engineers, management, and technical experts) is characterized by a lack of established structures of formal communication.

Specifically, as far as standardization-related communication is concerned, such formal structures seemed to exist previously (that is, before the standardization unit turnover), at least to some degree.

> Manager C: "We used to have meetings, but now the people [have] changed, so the way they work has changed, they haven't taken up all the previous ways of working. But a couple of years ago we used to have an annual meeting, where we were going through what should be done with the standards. So we had a kind of annual loop, where we were looking into the standards. So we put them in the calendar and we had an annual meeting. That was a good plan. But I haven't seen it the last [few] years. I don't know why. I think it is because the people in the standards department have changed. New people working there, and they have lost that process, at least this is my perspective. I don't see it anymore, I saw it a couple of years ago but not anymore."

Interestingly enough, then, as was also previously pointed out, formal structures of standardization-related communication, such as fixed meetings, were weakened or even lost in the recent organizational transition (from the previous standardization department to the current one). Despite the fact that it was not deliberately designed or decided by the upper-level management that formal standardization-related communication would gradually diminish, care in order to prevent this from happening was not taken. In the same vein, despite the fact that it was not explicitly decided that the standardization department should no longer retain overall standardization management control, this control was lost.

In particular, even if those outcomes could not have been initially forecasted, they could have been quickly diagnosed. However, they were not; or at least corrective measurements for this were not taken in the organization, which indicates that the isolation of the standardization department was not considered problematic for the company. The reason for that is the decoupling of Scania's strategy from corporate standardization. Although corporate standardization has by no means been eliminated or wholly neglected by the company, it does not substantially support the corporate strategy.

> Manager C: "So it comes from a need, it is very rare that a [higher-level] manager comes to us and says that we should implement this standard, this is mandatory, we have to use it. I have never seen that. Thus, the standard is driven by an organizational need in the lower level."

However, additional reasons for the lack of formal structures of information exchange relate to the overall organization, and not solely to standardization management per se. In many cases, streams of informal communication are seen as the primary and most effective means of information exchange in Scania.

> Manager C: "And then [employees and even managers] hope that people in the organization will talk to each other. There's no strict format you can really follow, it's not that you will pick up one wire and find everything you need. You have to know people, you have to know some areas. It is related to the way we work here, since we are in the same place. The ones using the standards are mainly sitting here. So you meet people, you talk to people, you see people. If I work on something, I know who are the other people here working with it. So, it spreads very easily. But if this company was divided in 10 different sites, one in China, one in Russia, one in [the] USA, then we would need another kind of process for this implementation, I guess. Here, we work like we are a small company. Everyone sits around the same coffee table, same restaurant eating our lunch. And this is a little bit how information also spreads in this small company—although it is a big global company. But we work like a small company in this aspect, I would say. So in a small company you do not need strict routines about how to spread information."

In other words, what can be observed in Scania is a "small company syndrome," meaning that its personnel and management rely on tactics (such as reliance on informal communication) that suit small companies. The roots of such a mentality can be traced back to Scania's organic growth, which has enhanced a coherent and strongly integrated culture. In that sense, Scania's employees (many of whom have been in the company for years or even decades) perceive themselves as belonging to a "Scania family." In such a context, it is not surprising that informal communication takes over; however, the practical truth is that the organically grown company has now reached tens of thousands of employees. At that size, established streams of formal communication are nothing other than mandatory. Most probably, in regard to crucial organizational areas—that is, those of strategic importance—that issue has been pinpointed (and resolved) long ago. However, as far as corporate standardization

management is concerned, a lack of established communication poses tangible and important challenges that substantially limits the role corporate standardization could potentially play in the company, since interrelation of combined efforts cannot materialize.

5.7.2 Interrelation of internal and external standardization efforts

Furthermore, the lack of established formal communication in regard to standardization activities does not facilitate the different parts of the organization to coordinate their efforts. Namely, the internal activities (managed by the standardization engineers) and external ones (managed by the technical experts) are isolated and decoupled from each other. This decoupling occurred in Scania because standardization-related information exchange was not safeguarded, but instead was left to "fade away" over the past few years, and hence information from different sources is not blended together towards overall and coordinated corporate standardization management.

> Area specialist A: "Communication is extremely important I think, so that you get the right areas standardized, instead of focusing on the wrong areas."
>
> Manager A, Corporate Standards: "We don't have the complete picture of Scania's participation in other international organizations, communities, etc."

More specifically, the technical experts who attend the different external standardization committees are not urged to share their input and insights intraorganizationally, either with other technical experts, or with standardization engineers, or with the decision makers themselves.

In particular, decision makers (at any hierarchical level or position) do not appear to accomplish (or even seek) integrated standardization-related information or an overall picture of the company's maneuvers within external standardization committees. In other words, decision makers do not really have a say in that respect; managing of external standardization is totally left to the free will and inclination of the technical expert that is participating in each committee. A main reason for this is that standardization activities are not attempted to be strategically utilized in Scania; hence, they do not directly concern the strategic leaders (decision makers). However, the decision to leave the total authority for external standardization up to the experts was not clearly made at a certain point in time, but rather gradually emerged, and relates to the

fact that technical experts are very experienced and highly trusted employees in the company; they have been gradually given more and more freedom to act as they judge best within the setting of standardization committees.

However, along this process, care was not taken to ascertain an interrelation of the experts' external efforts with the internal circumstances of the company (either by upper-level management or by experts themselves). Such interrelation could very well result in more coordinated corporate standardization management for Scania, where the different parts of the organization are aware of each other's actions and maneuvers, and hence make more well-informed decisions. That is not currently the case within the organization.

5.8 Firm-specific needs

In order to grasp the overall context in which Scania operates, and subsequently in which the company determines its standardization management approach, a number of key strategic dimensions need to be explained. Namely, product range and scope of activities, target market, and relationships with suppliers are assessed as playing a major role in regard to Scania's standardization-related choices.

More specifically, Scania delivers approximately 80,000 heavy-duty trucks per year, meaning that its products extend within a very specific size range (class 8 vehicles). Precisely due to this *limited scope of manufacturing*, the company enjoys the slack to utilize its sophisticated modularization system, which achieves high cost efficiency and lies in the heart of Scania's impressive profitability margins.

> Standardization engineer C: "Standards are related to Scania's competitiveness. If we think about this modularity system, the company is based on it."
>
> Area specialist A: "[The] modular system and standardization of parts is highly into the core of the company to be successful."
>
> Standardization engineer A: "When you follow your standard, and your standard parts, then the number of the parts is reduced. That gives a cost benefit. And that's a main issue when it comes to Scania' s modularization system, the LEGO system. You just have different modules, which you combine. That is also where

> you can use the standard, by reducing the number of the modules. And this is something the customer notices directly, in terms of cost."
>
> Manager D: "If you can keep the key parts low systematically, then of course you gain a lot. If you keep the number of parts down and have [an] effective modular system and still build a variety of vehicles then you save a lot. Those intersections need to be standardized and this is very strategically chosen, definitely."

The main justification for Scania's limited manufacturing scope pertains to its *target market*. Unlike most industry players, Scania has always concentrated on the heavy-transport segment, and has in particular been focusing on a *"niche" market*—which is the reason why it does not offer a broad product range, but only a certain size of class 8 heavy-duty vehicles. The company addresses its efforts to a specific market, encompassing high product quality—and consequently high product price. Hence, the company deploys a very focused, niche strategy, which certainly regulates its relationships with suppliers. That is, Scania is *not faced with a need to reach a broad number of suppliers*. Along with a limited manufacturing scope and a greatly modular system, Scania is focused on the in-house production of strategic parts—a strategic choice that was made as far back as the 1940s (Ambrutyte, 2014). Moreover, the company is mainly working with an established base of suppliers and changing suppliers is rare; each year, Scania phases out only three or four of some 200 suppliers (Ambrutyte, 2014).

Hence, since Scania is *not particularly dependent on a broad network of suppliers*[5], it does not have a special interest in diffusing its technical specifications; exploiting those specifications internally is already more than sufficient for pursuing the company's interests.

> Manager D: "If we would be more aggressive in that field, we could put up the demands for the heavy-duty commercial vehicles. But we do not do that."
>
> Manager E: "We are trying to be active. But we are not steering. We are following, you could say."

[5] Scania is quoted to cooperate with 200 suppliers, which is a comparatively small supply network—an average automotive manufacturer may cooperate with a few hundreds to a few thousand suppliers. As quoted in Volvo Trucks Annual Report for 2015: "We have around 43,000 Tier 1 contractors, of which about 6,500 supply automotive product components."

Still, keeping an eye on international standardization progress and developments is considered necessary; however, simply deploying a vigilant standardization approach functions well in accordance with the corporate strategy and the particular circumstances of the company. Namely, Scania comprises an organically grown company, meaning that it never acquired another industry player and hence did not face challenges of sudden changes in size, coordination, or supply needs. On the contrary, the company has gradually grown, also retaining over time its limited product offerings (niche products).

However, along with the aforementioned firm-specific characteristics, Scania takes a vigilant approach also due to the fact that it operates in a slow-moving, mature industry, where technological changes and innovations do not happen rapidly but, contrarily, emerge from long-lasting processes (for example, due to safety reasons and high capital requirements). Conclusively, in the case of Scania, standardization management comprises more of a hygiene factor, given the company's needs and strategy.

5.9 Summary of Scania's standardization management

Scania employs a vigilant standardization management approach that, despite a number of apparent organizational challenges and potential for improvements, makes sense overall in connection with the company's corporate strategy. The most characteristic features of Scania's standardization management are:

1) Vigilant approach,
2) Protectionism of internal standards,
3) Lack of formal structures of communication,
4) Decoupled internal and external standardization efforts,
5) Minimization of resource consumption,
6) Focus on modularization, and
7) Narrow relationships with suppliers.

6 Volvo Group: A global group

Volvo Group is one of the world's leading manufacturers of trucks, buses, construction equipment, and marine and industrial engines. The Group also provides complete solutions for financing and services. The Group is headquartered in Göteborg, Sweden, employs about 115,000 people, has production facilities in 19 countries and sells its products in more than 190 markets. In 2013, its sales amounted to about SEK 272 billion. The company is publicly held, with its shares listed on OMX Nordic Exchange Stockholm.

Volvo was officially founded on April 14, 1927, a few years after two visionaries—Assar Gabrielsson and Gustaf Larson—made the decision to start construction of a "Swedish car". A detailed account of Volvo's history is provided in Appendix II.

Throughout recent years, Volvo Group has undergone a number of international acquisitions. In April of 2010, UD Trucks (Volvo Group's Japanese subsidiary) presented a new range of Quon heavy-duty trucks. The latest Quon lineup has been developed to meet high levels of demand for both fuel economy and driving performance. It features newly developed engines and automated manual transmissions based on Group architecture, and maintaining the company's strategic focus on environmental friendly vehicles. In fact, as a partner of World Wide Fund for Nature (WWF) and being the world's first vehicle manufacturer to join the WWF's Climate Savers Program, Volvo Group's truck companies undertook to reduce the CO_2 emissions from vehicles manufactured between 2009 and 2014 by 13 million tons. Independent technical experts oversaw the results.

At the same time, as part of Volvo Construction Equipment's (Volvo CE's) objective of supporting customers in the growing BRIC (Brazil, Russia, India, and China) markets, it announced a strategic investment in its existing facility in Bangalore, India.

However, a new era for Volvo Group was to begin in the summer of 2011, after Leif Johansson, the president and CEO of 14 years, resigned in conjunction

with his 60th birthday. The Group has already seen two successors since then (only slightly longer than four years), namely Olof Persson in 2011 and Martin Lundstedt in 2015. Martin Lundstedt, the current president and CEO of Volvo Group, enjoys (unlike his predecessor) 25 years' experience in the automotive industry and specifically in the heavy-vehicle manufacturing segment.

6.1 Volvo Group's new era

In 2011, as soon as the new CEO, Olof Persson, came on board, Volvo Group went through an overall reorganization. A new functional approach was adopted, according to which the entire truck business (consisting of a number of different organizations within Volvo Group) started operating as a single business area. That is, all activities for truck brands were arranged within one organization, namely Group Trucks Technology (GTT), by remerging 3P (product development, product planning, purchasing) and Power Train. 3P and Power Train were one company in the past as well; in 2000, they were separated and over the years evolved into two disparate organizations, with very dissimilar ways of working.

> Manager D: "For example, the purchasing departments in 3P and Power Train had different approaches, strategies, and so on. And if you have a supplier to whom Power Train asks for these specifications one day, and then 3P comes the next day with another purchaser and have slightly different way of working ... then it becomes confusing for the supplier."

The decision to remerge the two companies related to the fact that it had proven an enormous challenge to keep them coordinated in terms of strategies, ways of working, and even technical specifications and requirements. In order to deal with that problem, the rationale behind the new organizational structure was to support faster decisions and coordination within the whole corporate group, as well as increased efficiency and improved cost control.

Moreover, such a structure was intended to better serve the whole (increasingly globalized) Volvo Group, which has, during recent decades, been involved in a series of international acquisitions—for example, the Canadian Prévost in 1995, the French Renault trucks and American Mack trucks in 2000, the Japanese UD trucks (former Nissan Diesel) in 2007, and the Indian Eicher trucks in 2008.

Since 2011, the focus has shifted to function and operation, and the goal of the new structure is to help coordinate and utilize opportunities and areas with unexploited potential. The different brands had optimized their business before they were acquired by Volvo Group, but separately; they had been producing trucks for a long time, but under different strategies and qualities, and were optimized independently. Under Volvo Group ownership, the different brands were organized to operate as a unified company for purposes of cost efficiency—for example, purchasing and production.

> Manager F, Corporate Standards: "[It's cost efficient] to do one thing at one place instead of the same things in different places; engines are a good example. Many factories were making engines; one group designs one engine and another group a different one and so on. The idea is that we can just make the brake system in one place and use it in lot of products in the whole Group."

> Manager B, Corporate Standards: "…you buy a company for the synergy effects—for example, [to] save money due to economies of scale. It is extremely expensive to develop new engines [that comply] with the legal requirements on emissions; we need to produce a lot of engines. So the idea is to reach synergy effects; for the whole Volvo Group, we have the product development under GTT [Group Trucks Technology]. And the same goes for purchasing."

> Manager F, Corporate Standards: "If you have one purchaser at Volvo, one at Renault, and one in Mack, then all these people buy the same product and this is not an efficient way to do it. A more efficient way is to have one purchaser, buying screws from one supplier for all different companies."

Hence, the vision of organizing the whole Volvo Group into one company was intended as a more efficient way to conduct business—for example, through shrinking the different support functions together, instead of having parallel, mirror organizations in the different brands, as had been happening thus far.

However, despite the aggregate function of the entire Group and the intended cross-functional collaborations, the different brands were to retain their identities and brand positioning.

> Manager D: "The customer is supposed to be able to distinguish between Renault or Volvo, they need to look different in regard to their features. It needs to look and feel like a Volvo or Renault. But on the other hand, you need to have as much as possible commonality. It's a balance."

Discovering this balance is no trivial task, and Volvo's current standardization work is very much focused on a forward-looking equilibrium of commonality and uniqueness within the Group's broad product range. The following paragraphs further clarify Volvo's strategic outlook on standardization work.

6.2 Standards and standardization in Volvo

Through this study, it can be concluded that Volvo employs an assertive standardization management approach, meaning that it aims to influence, and even lead, standardization processes—for example, by influencing international standards. The company's strategic intention is to sketch standards specifications that serve its own interests. That is, standardization is being used strategically towards the company's interests. However, for the pursuit of such an approach, very close interrelation of internal and external standardization efforts is very much required. Precisely in the context of such close interrelation, the overall corporate standardization management of Volvo takes place as a virtuous cycle in which internal and external standardization efforts constantly feed each other. That is, information from inside the organization is constantly blended with external information—for example, brought into the company by experts who actively participate in external standardization committees. This integration of information and efforts of Volvo's strategic inquiries can be described as internal processes being initiated and adjusted in accordance with the external circumstances and developments. However, strong organizational awareness (that is, internal, company-specific information) is highly prioritized as well. Hence, by carefully considering both internal and external information, the company's objectives in the external standardization arena are outlined. Standardization management comprises an issue of strategic priority for Volvo; it is utilized *strategically,* as a valuable tool for support and pursuit of the corporate strategy.

Volvo's strategic use of standardization management demonstrates a balance of openness and uniqueness. The company has chosen to be open regarding the outcomes of internal standardization, meaning that not only is the company willing to adopt common international standards alongside its competitors, but it does not protect the outcomes of costly internal standardization processes per se. The company's competitiveness does not suffer due to this tactic. On the contrary, from a strategic point of view, diffusion of the firm's internally

developed solutions and specifications among other market players (even competitors) significantly supports Volvo's strategy. The wider establishment of its internally developed requirements, which comprise responses to the company's particular needs and are directly connected with its prerequisites, constitutes an effective way to meet those needs in the best possible manner. Hence, leading the development of international standards, and consequently adopting openness policies, serves and supports the company's overall strategy.

6.2.1 Centralized office for corporate standardization

Volvo's standardization unit (which is a centralized office for standards and standardization) was established by the founders of Volvo AB (Gustaf Larsson and Assar Gabrielsson) in 1944. From the time of its establishment up to 1995, the standardization unit, which is referred to as Corporate Standards, was organized centrally within Volvo AB (the main company, named today Volvo Group AB). Then, during 1995–2011 it had an expert function within Volvo Technology AB—which is one of the organizations into which Volvo AB was split in 1995 for tax reasons.

Since 2011, when the last big reorganization Volvo Group occurred, Corporate Standards has comprised a function for the whole company, organized within Advanced Technology & Research at GTT. Specifically, GTT is the organization responsible for designing the trucks. However, despite belonging within GTT, Corporate Standards supports other parts of Volvo Group as well—that is, Volvo Construction Equipment, Volvo Buses, and Volvo Penta (included in Volvo Business Areas), along with all other brands of the Group (Renault, Mack, UD, and Eicher). In other words, all segments that produce parts (that is, are related to production) are "customers" of Corporate Standards—meaning that they are supported by Corporate Standards, and use their standards and address their needs to them. Only Volvo Financial Services remain outside the scope of the Corporate Standards unit, since Volvo Financial Services is not a production organization. Figure 10 shows the position of GTT within Corporate Standards.



Figure 10
Volvo Group Organization.
Source: Volvo Group Annual Report (2011).

As this research project addresses corporate standardization and standardization management, the point of departure has been the company's standardization unit—since the unit's founding purpose was management and organization of standardization activities. Nevertheless, the study is by no means limited within the borders of the standardization department, as it intends to address overall corporate standardization management.

6.2.2 The standardization unit in Volvo

As mentioned above, the standardization unit has been part of Volvo since 1944, and was established at that time by the founders of the company. Since then, it has survived a number of reorganizations, the latest of which was the major reorganization of 2011. Standardization work is seen as an integral part of the company's values and mindset—and as such, it has been protected during market downturns, even at times when cost cuts have been urgent. Assuring the required resources for the standardization unit are available in times of economic turmoil can be a challenging task, but Volvo has regularly protected the unit.

> Manager A: "Markets go up and down … and then someone from the standardization department comes and says that he/she needs to go to meetings all over the world ... lots of traveling costs. When will we have the result? Well, maybe in 3–4 years we will have a new standard and then a few years after that we will see the results. Perhaps people decide that they don't have the resources for that at the moment. So, I think that it's very important to protect those standardization people."

Throughout its long years in existence, the standardization department has built up a history of vigorous activity, both within the company and externally, in national and international standardization committees. Even today, the standardization unit's efficient functioning can be crucial for the whole organization.

> Manager F: "This is the way we push: we can start developing a Volvo standard for how we work internally, but in the end we need an international standard on this."

> Manager F: "…for example, before [examples of established standards] were used, it was such an ineffective situation! It becomes a terrible situation for everyone, for the whole organization!"

Volvo's foundation for standardization—that is, its Standardization Policy, is driven by the company's mission to interlink standardization with strategy. The Standardization Policy describes the general rules that apply to the Group's standardization dogma and is available through the company's online database.

As principally stated in the company's Standardization Policy document:

> "To the highest possible extent, Volvo Group standards shall enforce international standards [such as ISO]."

> "Volvo shall participate in development of international standards, in areas that will have an impact on Volvo and where Volvo can have an influence on the content of the international standards. Volvo's contribution to the world in external standardization committees shall be characterized by active participation and Volvo group coordination."

On the company's policies, the manager of Corporate Standards stated:

> Manager B, Corporate Standards: "So that's where it starts … which means that if there is an international standard that is applicable, we should not develop a

> Volvo Group standard, because that would be just waste. And we can say the main principle is that we can enforce international standards."

Conforming to the standardization policy, the four pillars around which Volvo Group builds its standardization action are: (1) international standards, (2) active participation, (3) strategic impact (proactive attitude), and (4) company coordination. Indeed, as performed in practice as well, the company's corporate standardization management and focus revolve predominantly around those stated principles. Volvo's standardization unit consists of the company's centralized office for standards and standardization, which truly maintains authority and responsibility for overall standardization management; thus, the standardization department comprises *the core of Volvo's corporate standardization management*. Corporate Standards undertakes the challenging (but vital) strategic role of a technological and industry overseer.

6.2.3 Standardization crisis as a turning point

One reason why the standardization department has become such an integral part of the company is related to a nearly fatal crisis that occurred over a decade ago, and that powerfully demonstrated the significance of a well-functioning standardization unit. Namely, around 2004–2005, when new emissions regulations (Euro 4 legislation) triggered standardization work for emissions and systems to measure them, Volvo neglected to follow up on the standardization work that was ongoing, besides the issue of the regulation itself, which resulted in the company missing out on crucial information and almost being locked out of game due to these overlooked critical developments.

In the end—perhaps due to the fact that a standardization department was in place—the company managed to catch up with the advances. However, the challenge was enormous, a major redesign of the products was required, and the crisis could have been disastrous for the whole corporation. Had the company not managed to act quickly and escape a technological lockout, its products would soon have failed to comply with current demands of the clientele and the company would have been driven entirely out of the market.

The lesson was learned, and it was clear this could not happen again. It was deemed necessary to safeguard important/strategic areas by being aware, well informed, and, above all, involved. Currently, Volvo's approach to remaining

well informed about the state quo of the industry and the upcoming trends is through active involvement in standardization work.

6.2.4 Position of the standardization unit

The standardization department is positioned within GTT, as mentioned above, in Advanced Technology & Research. This organizational structure can be rather confusing for the rest of the Group, as it incorrectly signals that the unit is only concerned with standardization issues related to R&D—instead of realizing that Corporate Standards is actually an overall corporate function—that is, a function for the whole organization, indiscriminately. The rationale for having Corporate Standards where it is relates to the fact that Advanced Technology & Research was a separate organization until 2011, and shared some common activities with Volvo Group—such as the corporate standards library. Thus, following the most recent big reorganization in 2011, standards-related activities were organized under Advanced Technology & Research. From an organizational point of view, it would be tricky to have a small group like Corporate Standards organized independently within the giant Volvo Group organization. However, due to Corporate Standards' established standing and visibility within the company, confusion, or other issues due to structural inconvenience per se, do not seem to occur.

In addition, a much more important change in regard to the unit's current standing within the organization, which took place three decades ago, relates to personnel expertise. The standardization unit used to be bigger, incorporating technical experts within it—that is, encompassing much more technical knowledge and expertise. However, due to vast technological advancements during the past three decades, and thus increasing engineering complexities, a critical mass of people have been employed in the company, and could not remain centralized in the standardization unit but needed to be dispersed throughout the organization. A number of new technologies have emerged, and the product itself (that is, the truck) is very technologically advanced in comparison to previously. Hence, nowadays massive amounts of technical knowledge are encompassed in the organization, which of course comprises a critical resource and is required in various technological areas and sites, instead of being centralized within the standardization department.

> Manager F: "It is necessary to work the way we work today, because we cannot have this technology in corporate standards. There are very new technologies,

> that we need to have a critical mass of people, and we can't have that area inside corporate standards. The development of trucks is so extreme if you compare to how it was in 1944. Today we have computers, so much technology; we can't have that knowledge within the department."
>
> Manager B: "The experts should be out in the business."

In response to that challenge, Volvo separated the technical experts from the standardization unit, realizing that they ought to be dispersed throughout the organization and closer to technology development and usage. Nevertheless, as far as corporate standardization management is concerned, the technical experts collaborate closely with the standardization unit (which administers and controls overall corporate standardization management). In other words, the structural (formal) separation by no means denoted a real (that is, functional) separation. The experts comprise vital parts in any standardization process (since they are the ones that possess the technical expertise), regardless of the fact that they are not seated within it (as is also the case in Scania). Precisely for that reason, it can be concluded that what really allowed the standardization department to retain control of overall standardization management and persist as the core of all processes, even after "losing the experts," is the fact that contact was nurtured between the standardization department and the experts, through formal communication flows.

> Manager F, Corporate Standards: "So there are may be more people that are involved in standardization, but not within the central department [Corporate Standards]. We are using a lot of knowledge outside the department. Before, the experts were within the department. But now, for example, we are using expert forums."

For such formal structures of communication to be set up and sustained, both the standardization unit and upper-level management played an important role. The standardization unit, which consists of very experienced personnel within the field of corporate standardization, realizes the importance of ongoing contact with the various users throughout the whole organization (and hence collecting up-to-date technological information from the various areas). The higher management, on the other hand, contribute to maintaining such standardization-related communication by holding regular meetings in which they ask both parties (the standardization unit and the technical experts) to report back to them. Subsequently, executive managers are explicitly involved in

the prioritization of upcoming standardization work. User involvement and communication flows will be further discussed in the following sections.

6.3 Standardization management in Volvo

In the following sections, detailed accounts of Volvo's standardization management will be provided in order to explain the overall picture of standards and standardization-related functions and activities. Henceforth, the emerging empirical concepts will be discussed, along with the guidance of the preliminary theoretical framework.

6.3.1 Dynamic strategic cycle

The company's standardization management can be briefly described as a dynamic strategic cycle (of internal and external activities). Explicitly, through participation in international standardization committees, Volvo is aware of the external environment and collects systematic evidence on underlying conditions. Volvo participates and is involved in external standardization work, first of all, to gather and analyze data about the external environment—that is, collect information and monitor the industry.

This information is then brought into the company and utilized in internal decision making.

> Manager A: "Often, higher management has to discuss and decide on issues that have been brought in after participation in external committees."

> Manager D: "So we are working right now on adapting an internal standard to make it more similar to the European standard. Otherwise, sooner or later there will be lots of confusion. Those changes are not invented by us, we wouldn't have come up with them. They were triggered after participation in the external committee."

That is, external standardization work is taken into account in strategic decision making for future action by the company—always in conjunction with internal information, such as the company's strengths, weaknesses, and interests. Subsequently, Volvo's standardization cycle is fueled via the tight integration

(and cyclical feedback loop) of internal and external information. Efforts are explicitly focused on endorsing integration of such internal and external information, to guide corporate standardization management and decision making. More detailed descriptions of standardization-related decision making in Volvo are provided below, with particular focus on demonstrating the various "decision points," along with the particular challenges faced throughout the process.

6.3.2 Standardization triggers

Volvo's standardization work is triggered either by problem-solving requests, initiated anywhere in the organization, or by early-phase research, which encompasses a forward-looking strategic perspective. Hence, standards-related decision making occurs after a malfunction or a forward-looking need is identified within the organization. No binary adoption decision, in the sense of examining particular standards and deciding whether they need to be adopted, takes place—at least as far as Corporate Standards (which deals with the vast majority of standards in the company) is concerned.

However, a binary adoption decision is possible in the company in the case of management standards (which are not production standards, and thus are not under the responsibility of the standardization department), for reasons of certification and signaling. In that case, standards are looked upon from a very different perspective, and certain requirements need to be fulfilled in order to attain certification. The managers of Corporate Standards criticize this approach, since the intention should be kept to meeting company needs in the best way.

> Manager B, Corporate Standards: "We do not work with management standards in Corporate Standards, we work with technical standards. But if you go to the quality management department and talk about ISO, they look at it from a different perspective. Because, in order to have the certificate, they come to standards which they need to fulfill. But to be honest, this is completely wrong, because that was not actually the intention. The intention was and is to keep good order and transparency in the company and work with the right processes."

> Manager F, Corporate Standards: "…but this is not our business at all. We do not monitor if there is a new standard released in that area and pick. Instead, the origin goes from the company, technically."

In other words, it was very clearly expressed that the major lens through which standards and standardization are looked through in Volvo is one of technological prioritization; more specifically, resolving technical issues and strategically promoting pioneering technical solutions.

The standardization unit organizes and prompts energetic involvement of various users. The prospect of raising any kind of request directly to the standardization department (which comprises a key starting point of internal standardization processes in the company) signifies that users' opinions are not overlooked, but are accounted for throughout the development process.

> Manager F, Corporate Standards: "The users are also included in this process. So we, as Corporate Standards, just make the document together with the users. The people that will use the standard are involved in the process."

All members of the organization enjoy such an opportunity, which is considered a vital element of the company's standardization management. In all standardization processes in Volvo, users' involvement is encouraged, in terms of specifying their needs and aligning the standardization work to their purposes. Different users are invited to give their input in order to identify problems and negotiate solutions and standard specifications.

6.3.2.1 Raised requests

As mentioned above, raised problem-solving requests comprise the most common starting point of any technical standards decision making; anyone in the organization can raise such a request and address it directly to the standardization unit.

> Manager F, Corporate Standards: "We don't create standards without a request from the organization. We are not sitting here and [doing] our thing; there is a request coming from someone in the organization. Everyone in the organization can raise that question."

That request may be prompted by some malfunction in the production or any kind of need that has emerged in the company. When responding to a request raised by any employee, the unit acts to resolve the problem.

Furthermore, besides emerging technical problems, a different type of request raised for standardization work can relate to the need to adapt an internal standard to an international one, in order to avoid future conflict or confusion; this demonstrates the forward-looking character of standardization work in the

company. In this way, not only are current malfunctions resolved by the standardization department's work, but potential future ones are proactively managed.

6.3.2.2 Early-phase research

Alternatively, standardization work can be triggered by early-phase research, which serves to identify emerging needs of the company. In this case, the unit is again called upon to act proactively.

> Manager B, Corporate Standards: "From early-phase research, you outline the requirements; what you need in order to have this [project] happen. So of course you look what standards exist that you can use, but perhaps there are no standards from ISO already in place; they don't randomly look where to develop a standard, there must be a need and that need comes from early-phase research. The drivers usually are powerful companies, which are in early phases writing down requirements and things that could be standards. And a way to push our desired requirements further is to start developing a Volvo standard … and later push [in the external standardization committees]."

Materialized research for new products traces upcoming needs and requirements, motivating future standardization. From there, standards development driven by early-phase research reveals impending linkages to innovation and potential innovation enhancement (which, from a strategic point of view, might even be substantially more critical than the cost-related advantages and implications of standards and standardization). Of course, that is not an easy task, as being in a position to identify and pursue new opportunities comprises a significant challenge, and requires good internal and external knowledge and experience, as well as strategic readiness to steer and support such initiatives. Volvo manages this challenge by involving competent personnel in the different roles (so as to absorb new information), and furthermore by enjoying inclusive organizational support—in terms of resources, for instance—in order to pursue this role. Further discussion on resources will be provided in a later stage.

6.3.3 Standardization decision-making bodies

Following the identification of a potential standardization need, either through request or early-phase research, the standardization unit needs to examine

whether this particular request or need should be spun into a standardization project. This "pre-initiation" decision making, as well as the other standardization processes, are not determined by any explicit factors, but are based on the particular circumstances, with each standardization decision constituting, to a large degree, a distinct, as well as tacit, process. This lack of explicit or structured factors could pose a great challenge to the organization; for instance, due to the considerable uncertainty.

However, this is overcome through the company's various standardization decision-making bodies, composed of members from all over the organization, which facilitate the standardization decision-making process and essentially prioritize standardization-related action items in connection with the corporate strategic plans and pursuits. More specifically, a Technology Committee (TC) and several Technical Advisory Groups (TAGs) are involved in the process. The TC consists of high-level managers and could be considered as the principal standardization decision-making body in the company; overall, it is responsible for the rules for standardization stated in the company's Standardization Policy, and formally decides on new standards.

If the TC approves initiation of a standardization project, then the TAGs (which consist of technical experts) appoint working groups to deal with the development or updating of the standard. The most relevant experts are searched for within the company to formulate the working group that will conduct the detailed, specialized work required for the creation of a standard. This working group is the second (and most important) standardization decision-making body. Content-wise, the experts conduct the real decision-making, since they possess the required detailed knowledge and technical expertise. On the other hand, the standardization unit itself focuses on management of the document, making sure that the process is followed and documented as proposed in accordance with the company's policies. As long as the process is conducted appropriately, the standardization unit trusts the experts' input and conclusions reached, and thus approves the context of the standard according to the experts' suggestions. Without the experts, the standardization unit claims it would be "unable to do anything."

6.3.4 Intraorganizational feedback

At the end of the standards development process, when the standardization group decides that the draft of the standard is ready, the draft is sent out to a list

of selected people within the company for feedback. Representatives from the whole company are included in the list; all business units and different geographical areas receive the standard proposal for a feedback round. The draft remains available for comments for a period of four weeks. The intention behind this process is to receive as much feedback as possible before finalization.

A challenge here could be to ensure that employees become involved—that is, that sufficient feedback is provided—however, interestingly enough, the opposite challenge is often the case for Volvo's standardization engineers; that is, the amount of feedback received from the rest of the organization is vast. Nevertheless, the standardization unit welcomes even a challengingly substantial amount of feedback, since by having more users involved and some flexibility in the process, the quality of the standard is improved markedly.

In particular, instead of having a regular one-ended process where one party gives input (for instance, the standardization department) and develops an output, of which another party is merely the end user (as depicted in Figure 11), a different approach is used in Volvo's standardization processes. The final users are involved in and contribute to the development process of the standard they will eventually consume, and could thus be characterized as "prosumers," as shown in Figure 12.

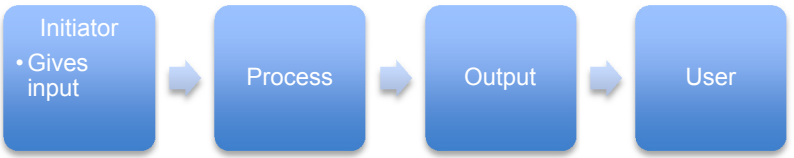


Figure 11
Regular one-ended process.

The process model shown in Figure 12, besides illustrating the users' involvement, also portrays a noteworthy flexibility in the standardization process; users' opinions and feedback are accounted for, nonetheless possibly altering the draft of the standard before its finalization. The company encourages dynamic interaction between the various users and participants

during creation of a standard, with the aim of enhancing the standard's quality and consequent stability.

Henceforth, after the feedback has been taken into account and the draft has been adjusted, the third decision point in the process signifies the end of a regular standardization process within the company, with the release of the standard. However, despite the fact that slack for feedback is provided at an earlier stage, a common situation is that plenty of additional feedback (even more than that of the regular feedback round) comes after the standard is released. Even people who have been involved in the standardization process often return following release of the standard with supplementary comments and suggestions.

That could of course be seen as a challenge in the process, or at least as inefficiency; despite the standardization unit's efforts to make the necessary adjustments before the release, with the new feedback it needs to be revised again. The standardization unit does not appear capable of eliminating or confronting such a situation. Surprisingly, however, the managers of the standardization department see this encounter as a rather indispensable part of the process, since creating a standard can be a very complex, highly detailed procedure. Users can validate precisely what they want from a standard only after they have actually used it.

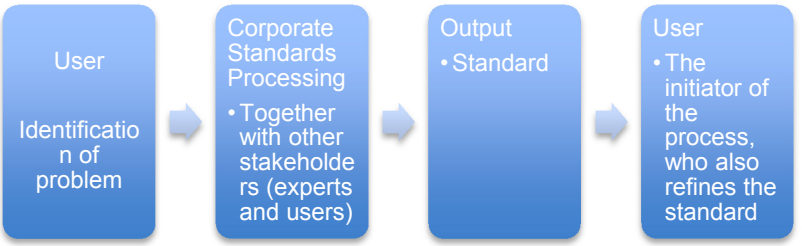


Figure 12
Internal standardization process in Volvo Group.

Therefore, since the final objective is to provide a standard of the highest possible quality and applicability, even a number of revision rounds, where necessary, are welcome—along with users' continuing involvement and the standard's flexibility throughout the various stages of the standardization

processes within the company, such lively interactions are vital for the success and stability of corporate standards.

Having provided a detailed description of corporate standardization management in Volvo, a number of concepts emerge, some of which are in agreement with the preliminary framework, while others being added after the empirical observations. These concepts (or aspects of corporate standardization management) will be presented in two categories, namely internally oriented and externally oriented.

6.4 Internally oriented aspects

Internally oriented aspects of corporate standardization management refer to standardization-related organizational resources (both financial and human), as well as organizational awareness. These aspects were found to play a crucial role in regard to Volvo's standardization management approach. Corporate culture is also discussed, though clear evidence that it has played a role in Volvo's corporate standardization was not obtained.

6.4.1 Financial resources

The standardization unit, which is supposed to be the core aspects of corporate standardization in Volvo, employs 18 persons—though these people collaborate closely with a vast number of people and teams all over the corporation, such as different managers, experts, users, and even external bodies, such as suppliers and competitors. Together, they formulate several working groups, which undertake the various standardization projects.

> Manager E: "We have one of the [biggest] standardization departments [in comparison to close competitors]. That says something!"

More specifically, a considerable number of technical experts are closely engaged in internal and external standardization work, communicating regularly with the standardization department and subsequently representing the company in standardization committees. In support of this point, an examination of data from the Swedish Institute for Standardization demonstrates that multiple

Volvo representatives participate in different standardization committees, in order to increase the company's chances of influencing external standardization.

In other words, a combination of costly mechanisms are deployed in Volvo, in order to allow the company to pursue its assertive standardization management approach (that is, via a large standardization unit, vast networks all over the organization, and multiple company representatives in the various standardization committees).

> Manager E: "[Many] resources [are] required. Standardization requires a certain long-term mindset. Committing resources today, for effects that will be materialized in a number of years."

> Manager B: "…the financial resources to send people around in the world, it's expensive. And [companies] need their experts in the home arena."

> Manager E: "… you can already see cost cuts; for instance, we used to have global meetings, where people from all different Volvo companies were meeting once a year. Those physical meetings were cut for cost reasons and now they are mainly held through Lync."

Hence, despite resource demands for corporate standardization being very high (considering personnel demands and frequent travel costs), a characteristic feature regarding Volvo's standardization management is its readiness to commit the required organizational resources (such as personnel and travel costs for committee participation, and internal coordination as required for each standardization pursuit, depending on the differing demands of each project) for standardization work.

> Manager B: "We also have the TAGs, which are meant be the collectors of the experts' opinions within Volvo Group, and then those opinions could be brought by the experts up into the international arena, saying that this is the Volvo point of view. That is very difficult in practice, because it takes time and when you acquire new companies [as Volvo Group has been doing in recent years] it becomes very complicated because it's tricky to get hold of all the experts out in companies all over the world and what they know and don't know, but that is the way it should work. And most of the time it does work like that."

> Manager F: "So, actually, you could even say that there isn't a cost limitation. Of course, you want to be as efficient as you can, but it is just necessary. Because if we are working as a group company in many, many countries in the world,

> which means that we have thousands of suppliers in different areas, of course they need to know how we make our drawings, how we weld … they have to understand how the parts have been weld[ed] to understand Volvo's requirements, because otherwise they can't support us."

A major reason why Volvo's decision makers appear willing to provide a facility and readiness for resource commitment (in accordance with upcoming needs and maneuvers inside and outside the organization) pertains to the fact that corporate standardization is utilized "strategically." That is, corporate standardization is utilized to support the company's overall strategy through an assertive standardization approach. Volvo is very active in external standardization groups, committing plenty of time and resources to influencing national and international standards—as is imperative for an assertive approach. The company would not be able to successfully employ an assertive standardization management approach—that is, influence and drive international standardization—unless serious efforts are made and sustained (for which financial means are a necessity).

6.4.2 Human resources

The abovementioned readiness to commit financial resources translates into human capital as well—that is, workforce competence. A highly experienced workforce manages standardization work, both internally (via the standardization department) and externally (via experts).

> Manager F, Corporate Standards: "We have long experience, which we have built through many years. We have very experienced staff, with lots of long experience. So, there is good knowledge about how to work with our standardization areas. We also [have] people who have been there for many years, involved in standardization."

To some degree, the competence of the standardization workforce has regulated how standardization has been shaped and is managed within the company; a characteristic example is the nurture of regular information exchange between the standardization department and the rest of the organization, which plays a significant role in overall standardization management. Intraorganizational communication flows are supported by higher management (through regular meetings), but also hinges upon the competence of the standardization

department's personnel, who have proven themselves capable of maintaining overall control of corporate standardization management.

The standardization department has maintained close collaboration with the organization's technical experts (through formal communication and regular meetings), who possess the technical expertise and represent the company in the external standardization committees. Without such close connections with experts, the retain of overall corporate standardization management could not have been possible, since input from the external environment is mainly gathered by the technical experts/company representatives.

Equivalently, the technical experts' competences relate to their capacity to maintain an ongoing external focus as well. Considerable technical expertise is required in order to ascertain that the representatives do not get overwhelmed by the ongoing standardization process, but rather manage to keep up with it and focus on the most relevant (for the company) issues.

> Manager D: "Usually [the participating companies] put the old ones, close to retirement, very experienced people in those groups [external standardization committees]. Very knowledgeable people [work] in the groups."

Hence, the standardization department's competence and experience within corporate standardization, along with the technical experts' elevated technical expertise, play a substantial role in Volvo's corporate standardization management. The company's choice to employ an assertive approach could not be successfully realized without competent and experienced people (in their respective roles) managing standardization.

More specifically, two types of human competence seem to have played a major role in Volvo's corporate standardization management. The first type is predominantly organizational and not uniquely standards-related. That is, it refers to the know-how and experience in regard to familiar activities (that is, after repeated execution); this is organizationally oriented competence that illustrates the overall process of how to work with standards and standardization in a corporate setting (namely, what works best, what is important, and how to make the process of corporate standardization more efficient). This comprises competence that the standardization unit possesses based on the number of years for which they have managing standardization activities within the organization.

> Manager B, Corporate Standards: "We have some expertise, but that is due to long experience."

Manager B, Corporate Standards: "… we don't have to reinvent the wheel."

Specific examples of previous "bad decisions," which have also educated personnel (in particular the standardization unit, who have managed corporate standardization over many years), are cited in the following quotes.

> Manager B, Corporate Standards: "When Renault trucks was acquired and introduced, in early 2000, Corporate Standards, together with the other stakeholders of course, made a decision to take a new number series for all standards developed together, in common with Renault trucks. That was a very, very bad decision. Because then it becomes very complicated by having multiple number series. After a few years we could not work like this any more. Acquired companies need to adopt what Volvo has in place. So that was a very bad decision. But we learnt a lot; when you have a new company, you need to be early on saying that this is what you need to use, you need to start implementing the existing Volvo standards. We will not change them, unless you have a better proposal."

> Manager B, Corporate Standards: "And also a very bad decision was to change the number of the standard when it was updated. That was a very bad decision because then you have to change all drawings, and that created a huge mess. We have changed this decision now and we are still using the old Volvo numbers when we update the standards. This was one of the biggest mistakes we have made."

In other words, the standardization department consists of employees that have been present in good and bad times of corporate standardization management, are aware of the history, have been present (or actually involved) when standardization-related decisions have been made, and know precisely why those decisions were made and why they did not work well. All these attributes in practice benefit the company in today's standardization management.

On the other hand, in terms of the second type of standardization-related competence observed in Volvo, it is more uniquely related to standards and refers to the education that established standards enforce. That is, by creating, developing, and updating corporate standards, the company has built up company-specific technical knowledge over the years, which is demonstrated and shared in the standards per se.

> Manager D: "We have learnt through hard experience and many mistakes through the years."

> Specialist A: "We learn from the past. We develop. [The standards] are knowledge streams. They are based on a lot of experience of many years."

In fact, even the wide application of standards within the company comprised an outcome of gradual organizational learning, many decades ago. At a time when the company was experiencing intraorganizational inefficiency due to the extensive use of different parts and tools throughout the production line, internal standards were developed in order to embody "in-house" solutions, and establish them to avoid further inefficiency or repetition of problem-solving processes.

Hence, throughout a long learning process, the use of standards and standardization has become ingrained in the company, at the same time that a tremendous amount of technical knowledge has been built up over the years, and is demonstrated in the standards per se. The aforementioned need for efficient utilization of standards and standardization has not diminished with the passage of time—on the contrary, the standards system and culture have developed progressively within the company. Specific examples of such ingrained knowledge, which is retained timelessly through the standards, are provided below.

> Manager D: "One example right now, there's a working group working with [a] precipitation hardening steels standard. And there is demand in the old standard that we don't understand, we think it should be the other way around, it's strange, we think. But we don't know why. So we need to invite a retired colleague to see if he knows why that demand was there before. Because there might be some kind of experience in the past that we don't know about."

> Manager D: "And there was another example [in] the case [of the] hardening standard, which was revised last year. There was a question about one demand, so we called a retired colleague and asked. So after all, we had this demand because of some components' failures. He told us that there is a report written about this. So we have all reports from the last 60 years gathered in a database and we could look into this report from the '80s. So we realized that was a good demand and we should keep it. So, there is a lot of experience."

In other words, when very competent and experienced employees leave the company, years of work and experience could leave with them—unless established standards retain and transmit acquired knowledge. Volvo (like many other organizations) has realized and repeatedly benefited from this through an extensive system of internal (and often also external) standards for procedures

and products/materials. However, despite the workforce's long experience (referring in particular to the standardization unit, but also to the technical experts and managers in the various areas), a major challenge for the whole Volvo Group has not been tackled yet. Specifically, since 2011, when Volvo Group was wholly reorganized by the new CEO and all truck businesses began to operate as an aggregate organization, cross-brand standardization management was not sufficiently examined . That is, applying the right level of common standards among different brands (in order to accomplish synergy effects), yet without "destroying" the brand variations, continues to be an issue—despite combined efforts of the standardization department and brand managers.

> Manager B, Corporate Standards: "The challenge for a company doing this [integrating different brands towards synergy effects] is brand management. Because you want to keep your brands, you want to have the synergy effects but you also want the customers to buy the brands. And what is the brand, why do customers choose a Volvo, or why do they choose a Mack? There is a reason for that and that is about brand. So you don't want to make all your brands look the same … so, brand management is a difficult part. Which means that you need to have commonality to a certain level where you make the most money, and then brand management needs to take over and make the rest diverse. What is important for the customer for each brand? That is very, very important to get ahold of. What is not important for the customer for a certain brand must be common. Or could be common, because then you can make money. Do the customers care about the screws in the chassis? No, they don't, as long as they are there and keep things together and safe! So there we can have commonality. But there are other features which make a Volvo different from a Renault or a Mack."

> Manager B, Corporate Standards: "The borderline between commonality and brand management is tricky. And that is a [problem] since the new organization after 2011."

As expressed in the above quote, the challenge of cross-brand standardization relates to the fact that commonality through the use of common standards for different brands, for the sake of efficiency and scale economies, must not limit brand differentiation—especially as long as the corporation's strategy is to maintain those various brands for targeting different markets. For instance, on the one hand it is reasonable to utilize the same material standards for a number of brands (thereby achieving substantial economies of scope and scale), while on the other hand applying the same (high-quality) materials for Volvo Trucks to

the low-cost Eicher Trucks, which target the Indian market, will demolish the whole idea of target market differentiation. Corporate Standards is the main department responsible for looking into this issue, which has proven to be more challenging than previously expected (that is, in 2011 when the reorganization took place). In other words, even though very experienced personnel are managing corporate standardization, and a well thought-out (assertive) approach is employed, the "fine balance" in regard to Volvo's cross-brand corporate standardization remains under scrutiny.

> Manager F, Corporate Standards: "I think that [cross-brand management and standardization] is very, very difficult. I have had meetings with brand managers and I sense that we [Corporate Standards] are the ones pushing for commonality, wherever commonality can be driven … otherwise we are out of the market, since the product becomes too expensive to develop. Brand managers drive this issue from the opposite perspective, that we must distinguish each brand from the other. Where do we meet?"

This challenge is well acknowledged (by higher management and Corporate Standards), and efforts have been made to address it, since the standardization unit remains a corporate function responsible for all brands embodied in the Group.

In any case, in order to identify the relevant issues and information (both internally as well as externally—that is, within the setting of external standardization committees), an additional organizational competence is required; namely, strong organizational awareness. That concept will be further explored in the following section.

6.4.3 Organizational awareness

Organizational awareness comprises a concept that was not discussed in the preliminary framework but was empirically unearthed from the empirical material, and designates extensive knowledge of the organization's circumstances, strengths, and weaknesses—and, foremost, its interests.

In order for Volvo to be able to deploy an assertive approach—that is, endorse preferred standards specifications and lead the standardization process in accordance with the company's interests—its interests need to be very clearly known among the company representatives. The representatives of the company must be well prepared and determined about the company's needs and

preferences when they join a standardization committee (that is, they must have high organizational awareness).

> Manager B, Corporate Standards: "Opinions could then be brought by the experts up into the international arena, saying that this is the Volvo point of view. That is very difficult in practice, because it takes time."

> Manager E: "We are very active, we are doing a good job in that respect. We have a good idea of what we want to do, where we want to go. We don't know exactly how competitors work, but rumors have it that we are very competent!"

For that reason, Volvo's personnel engages in dynamic internal standardization efforts—that is, allowing for reflection on the external circumstances in conjunction with internal ones—and advances its inside knowledge and experience. Following the enhancement of intraorganizational awareness, Volvo can then bring that experience to the context of international standardization and retain leading participation in external committees that will give it an opportunity to impact, or even direct, the international standards for its own benefit.

> Manager B, Corporate Standards: "This is a way [in which] we push: we can start developing a Volvo standard for how we work internally, but in the end we need an international standard on this. There must be a need and that need comes from early-phase research. The drivers usually are powerful companies, which are in early phases writing down requirements and things that could be standards."

> Manager B, Corporate Standards: "Suddenly there is a way of doing something and everyone goes like that. And people don't always know where it comes from, but if you dig down, it's probably some company that has put a lot of effort in[to] making it available very cheap or pushing very hard in some standardization areas to make their solution the standard."

Thus, an active external role is combined with an in-depth organizational awareness, in order to manage Volvo's overall standardization effectually. That is a focal point that precisely characterizes an assertive standardization approach—that is, Volvo's approach. Since the company aims to influence and lead external standardization, a surfeit of internal groundwork needs to take place in the company in order to clearly define its standardization objectives. Unless those objectives are clearly and carefully defined in advance, an assertive approach cannot be successfully carried out. More specifically, unless the company's objectives are clearly defined and communicated to representatives in the various

standardization committees, they cannot coordinate in terms of influencing the standardization work, and hence their chances of success are arguably reduced. In addition, unless the standardization objectives are carefully defined (in accordance with the company's specific interests in regard to each standardization negotiation), even if the representatives' efforts succeed, this will not support the company in practice. In both cases, plenty of organizational resources (that have been committed to deploying an assertive standardization approach) are basically wasted.

In Volvo, in order to ensure that the company's interests are being served effectively and in a coordinated fashion, an overall organizational awareness is highly prioritized. Internal and external standardization efforts are very closely interrelated, and particular efforts are conducted regularly by various organizational teams in order to ascertain holistic organizational awareness and an overall organizational synchronization. Those teams are primarily the standardization unit, the technical experts, and the upper-level decision-makers.

6.5 Organizational culture

Finally, the aforementioned long-term experience of working with standards and standardization in Volvo is, to a large degree, an outcome of the company's consistent commitment to standardization over the years—that is, a long-standing standardization culture.

> Manager B, Corporate Standards: "We have also put [in] a lot of [standardization-related] effort inside Volvo group, for many years. So, if you compare the standardization departments in Sweden, for example, [ours is large]. And if you look 25 years back, we have been a much bigger department. Volvo has almost driven standardization in Sweden. There is an organization called Standtek, which is a group of people that meet and discuss standardization, and Volvo has been the leader of that activity also, for many years. So we have … spent a lot of time in standardization."

Overall, Volvo demonstrates a strong standards and standardization culture and a high prioritization of standardization work—which of course links back to its long years of interest in standardization, and involvement in the arena. The company's standardization engineers and management appear to take pride in

the foundation of Volvo's standardization unit by the founders of the company per se, which dates back more than 60 years.

> Manager E: "[There have been] no failures whatsoever [referring to the standardization department], always provide good help."

> Manager A: "I have not gone out and checked how we are doing in comparison with competitors. But from what I have heard from the president of SIS [representing the overall opinion of SIS] when she visited us a year ago, and from other channels as well, is that we are very good and doing a good job."

Historically, the company has been involved in standardization since its foundation; nevertheless, a standardization crisis in 2004 served as a turning point, contributing to a change of mindset in the organization. Henceforth, corporate standardization was approached as a proactive mechanism as well as a problem-solving, mechanism one, a solid Standardization Policy was put in place, and management began to safeguard standardization-related processes (such as by conducting formal meetings and ensuring hierarchical involvement in decision-making).

Furthermore, the company's current intense focus on standards and standardization is more straightforwardly connected with its overall strategy than in a purely cultural respect; that is, a strong standardization culture is continuously nurtured and supported in Volvo primarily because it serves its corporate strategy. This claim will be further explained in the following section.

> Manager B: "I think when you grow like we have done, if you compare with Scania you can see that Scania [grew] from one plant to three big plants [organic growth]. Volvo buys companies [acquisition-driven growth], which means that we have many differences among those companies. But to bring all that together is much more difficult than if you come from the same culture, then you have the same way of working. We don't have that. Renault trucks had their own way of working, Mack trucks as well. And standardization is about coming together and optimizing that use of knowledge. It takes a lot of time and effort."

Therefore, the prevailing standardization culture has to date been cultivated in the integrated organization to "resolve" the cultural and organizational incoherence among the different companies that constitute Volvo Group today (after a number of international acquisitions). Since the various companies have

not grown their knowledge base together, and taking into account that a major driver for those acquisitions has been volume efficiency and synergies, utilization of common standards within the whole group facilitates meeting this goal. The following section provides a more detailed discussion in regard to Volvo's corporate strategy and the implications for corporate standardization management.

6.6 Externally oriented aspects

The externally oriented aspects of the standardization management approach are external participation (in formal standardization committees) and openness (in regard to internal specifications and solutions—for example, revealing them to external parties). Involvement in external standardization committees is key for Volvo representatives in terms of keeping themselves updated on the development of new phenomena outside their corporation, and thereby using this information for the rapid identification of risks and opportunities in the external environment. In addition, active involvement in external standardization processes is a means of influencing formal standards towards the particular conditions and specifications that best suit the company's products and strategies, through contributing to those processes and offering solutions (that is, openness about internal specification and standards).

6.6.1 External participation

As mentioned above, Volvo representatives actively engage in external standardization committees in order to collect relevant information about the external environment by watching trends and developments in the industry.

> Manager B: "…what is interesting is to know about technology trends and bring that back into the company. Where it is going. It is important so that we release products that are accepted in the market."
>
> Manager A: "So we are out there listening [to] what happens and [we] adjust towards what is new and give updates to our internal organization."

> Manager B, Corporate Standards: "Participation in external standardization can [allow us to provide] input on new ideas and technical challenges."

The challenge of keeping up with technological progress, and, even further, remain in a position to pursue new opportunities in accordance with industry trends, is to some extent handled by Volvo through participation in external committees. Participation is a means of keeping an eye on the competition, observing, and understanding competitors; that is, representatives are essentially detecting what is happening outside the company, and henceforth introduce this (external) information to the company.

Thus, in combination with internal information, ensured by regular information exchange among the different parties possessing and managing internal and external information (that is, technical experts, standardization engineers, and management), a picture is formed regarding the company's interests and how future actions are to be planned—such as which standardization areas are critical for the company, how the company will strategically plan forthcoming participation, and in which standardization bodies it should be active.

This effectual prioritization (which lies at the heart of Volvo's assertive standardization management) is associated with the company's active engagement in a number of external standardization committees, where standards specifications are contemplated and new knowledge is often created through participants' negotiations, allowing a direct monitoring of other industry participants—namely, competitors.

> Standardization engineer A: "We are involved in standardization on [a] national level but also on [an] ISO level, internationally. So in that way we know what competitors do. So, indirectly we are aware of that."

Hence, through participation in external standardization committees, Volvo keeps a careful eye on competitors and general industry trends, in order to remain capable of pursuing its assertive standardization approach. Explicitly, since the company aims to be a step ahead technologically and lead standardization work towards favorable specifications, it cannot miss industry trends and technological evolutions. On the contrary, it needs to be as aware as possible of the competitors' technological status. A resourceful way to do this is through regular participation in the arenas in which the various industry players conduct discussions and negotiations about the future of the industry; namely, the national and international standardization arenas.

6.6.2 Openness regarding internal standards

After their release, almost all of Volvo Group's internally developed standards (up to approximately 90%, as stated by the managers of Corporate Standards) are published online and remain externally visible. Instead of protecting the standards behind passwords, anyone can find them on the company's website just by typing in the document number.

The tactic of publishing internally developed standards aims to disseminate them and thus facilitates efficient coordination with other market participants, for the benefit of everyone. Only a very small number of internal standards are not externally visible by typing in the document number; these standards exclusively address intraorganizational application, meaning activities that the company conducts internally and whose disclosure would not contribute to the coordination with other market participants.

> Manager F, Corporate Standards: "This 10% of standards that are not available are internal documents of how we are handling things inside the factories. We don't want to show how we are handling [such] things … for example descriptions [of] how we paint, how we deal with safety, and so on. Those things are internal, just for Volvo Group; we don't want Scania or any other company to see how we've solved that problem inside the company. Documents that we just need to have inside the company, then we don't put outside the company. But if they are documents that [will] be used by our suppliers, then we put them out."

Furthermore, the managers of the standardization unit claim that it is important to distinguish between the activities that companies conduct purely internally and would rather keep secret (potentially retaining a unique approach then), and those that are addressed outside the company, such as communication with suppliers, where the company does not attempt to differentiate, but cooperates and coordinates with others, even competitors. On top of those base requirements, there is still plenty of space for competitors to differentiate and make their products unique, while industry coordination through the diffusion of common standards benefits industry players through great cost savings. That is particularly true (and of immense importance) for Volvo, in accordance with its corporate strategy, as will be further elucidated in later sections regarding the company's overall strategy and hence the role that standardization management plays.

Openness differs from external participation since it specifically concerns the contribution to the standardization process—that is, being open in regard to internal specifications and solutions and introducing them into discussions and processes, as well as allowing internal specifications and standards be accessible by external parties (for example, by not protecting them with passwords). On the other hand, external participation does not concern the contribution to the process, but mainly attendance, and subsequently taking information in. In other words, together, those two aspects represent "inside-out" and "outside-in" traits. It is important to distinguish between these, since external participation (outside-in) is an important trait of corporate standardization regardless of approach, while openness (inside-out) becomes important once participants aim to lead and shape standardization outcomes. That is, both external participation and openness regarding internal standards are crucial elements of Volvo's assertive standardization management approach.

6.7 Internal interface

Resulting from Volvo's well-linked standardization management is an effective internal interface (with respect to corporate standardization), where internal and external standardization efforts are closely interrelated. This becomes possible solely due to the regular communication and information exchanges among the different parties managing overall standardization, which are safeguarded by fixed standardization-related meetings in which those parties meet and make decisions.

6.7.1 Standardization-related information exchange

As pointed out above, an interesting fact regarding Volvo's standardization management that the different parts appear to coordinate and exchange information well. The basis of such well-orchestrated information exchange lies in the establishment of formal structures of communication, including regular face-to-face meetings.

> Manager B: "And we also have the TAGs, which are meant be the collectors of the experts' opinions within the company."

> Standardization engineer A: "In each advisory group [TAG] we have four meetings a year. Face-to-face meetings are very powerful, and make the whole process more efficient."

The various TAGs involve representatives from various parts of the company, which means that input from the different areas of the organization is regularly integrated.

Hence, since communication and information exchange among the different parts is ensured, an important task that is fulfilled in those meetings is to prioritize the urgency of different standardization-related issues. Well-informed decisions are made there, since integrated input and information are provided, but those decisions are also automatically communicated to the various parties (since they are made during the meetings).

> Manager D: "But there is a wish list of standards that should be improved and these TAGs are good, because there we can prioritize."

Another standards-related decision-making body in the company, which also holds regular meetings, is the TC, which consists of high-level managers. In that committee, *standardization-related matters are discussed by upper-level management in close connection with the company's strategic objectives*.

> Standardization engineer A: "[Standardization-related issues] could be determined on several different levels. Up to quite [a] high level, the TC consists of high-level managers, like the manager that is responsible for the whole development within Volvo Group. That is the second level below the CEO."

The existence and activity of the TC indicate a number of significant things in relation to Volvo's corporate standardization management. First, formal communication is again designed and planned; upper-level management receives information from other standardization-related parts of the company (such as the standardization department and the technical experts) and then exchange input and opinions among each other as well. Hence, standardization-related communication is ensured within the organization. Secondly, it is indicated by the organizational and communicational structure that standardization-related matters are indeed approached through a strategically oriented lens and potentially as a strategic tool towards the interests of the organization; how standardization issues will be prioritized and materialized is up to the higher managers to decide. Hence, finally, higher-level managers are explicitly involved in standardization-related decisions.

> Standardization Engineer A: "[Higher-level managers] want to [be involved in standardization-related decisions]. Because they are managers, they want the power! Most of them want to be involved. And that's great, actually, because they have lots of knowledge and also lots of power. So it is a good combination. And since they think it's important and they are involved themselves, then of course they do help with the establishment of the standard within the organization. Thus, this makes the process efficient."

Interestingly, then, standards are referred to as a form of "power" in Volvo, receiving interest and attention from upper-level management. The standardization engineers feel supported and often facilitated in their job by management (in regard to nurturing structures of formal communication and close collaboration with the organization's experts, who posses the technical expertise as well as input from the external environment, since they are the ones participating in external standardization committees). More specifically, regular communication flows between the technical experts and the standardization unit were built up and nurtured after organizational separation of the former from the standardization department. This regular information exchange has allowed the unit to maintain overall control of corporate standardization management—that is, both internal and external processes.

The reason why such formal communication flows were set up seems to be twofold. It relates to the competence and experience of the standardization team, who have worked with corporate standardization for many years and thus realize how to proceed in this setting and which activities to safeguard, thereby maintaining close contact with the technical experts (that is, technical expertise and external information constitute crucial elements of corporate standardization management).

> Manager F, Corporate Standards: "We have long experience, which we have built through many years. We have very experienced staff, with lots of long experience. So there is good knowledge about how to work with our standardization areas."

The second reason—and most decisive one—has to do with support that the standardization unit enjoys from upper-level management. Through the meetings and personal participation, management signals (and even enforces) that standardization issues should receive attention.

> Standardization engineer A: "For instance, there is someone working with polymers cost efficiency right now, going through the purchasing prices for polymers and comparing the prices and costs for the US market with the costs we

> have for the same things in Europe. And there are huge differences. That's something that we have tried to change, make them in the US use the same suppliers and the same products as we do in Europe, but until now they have just said that it will not work. Of course we have tested those things, otherwise we wouldn't implement them in the trucks produced in Europe, so it's just a matter of being lazy! But now the directives have come from the CEO, so no question that it will be finally changed ."

In other words, it is often the case in the organization (and arguably could occur in any other organization) that unless higher-level management accentuates a standardization-related issue, the staff will shirk the effort to implement or perform it. Reasons for this can differ; employees either try to avoid efforts and changes that have not been ordered by higher management, or perceive that as long as higher management has not requested them they are not vital for the organization. A combination of these justifications is also possible. However, Volvo's higher management does ensure that standardization issues are prioritized in the organization, by being involved and also by directly transmitting this message when necessary (as in the abovementioned example).

6.7.2 Interrelation of internal and external efforts

Subsequently, in the aftermath of regular exchange of information as described in the previous section, a close interrelation of internal and external standardization efforts is fueled in Volvo, which allows the company to use standardization assertively—and hence strategically—since preferred specifications are pushed into formal standards.

In that sense, a close interrelation is vital in order to tackle the challenge of identifying the value-potential issues for the company, and subsequently ascertain that the organization's interests and strategies are served through its standardization management, both internally and externally. Unless internal information (from inside the organization) is regularly and effectively integrated with external information (from outside the organization), coordinated standardization efforts cannot be sustained.

> Manager : "There are different standardization committees, national and international ones. This Excel sheet [that is available intraorganizationally] shows that in all these committees we have experts from Volvo Group. You can see perhaps 100 names here. They are not situated within Corporate Standards, of

> course. They are experts in these areas but through this document an expert from one part of Volvo Group can easily find another expert working in the same area and discuss internally a solution, how to vote, etc. So that they can collaborate and find each other around the world to discuss."

Predominantly for Volvo's assertive standardization management approach, a close interrelation of internal and external standardization efforts is central, functioning as a perpetual cycle for the firm. That is, once strong organizational awareness has been accomplished—in other words, a clear comprehension of the company's interests (which will be discussed in a later section)—assertive representatives will put effort into pushing the company's benefits externally—that is, via external standardization committees. However, at the same time, through their participation in external committees, the representatives grasp the external arena and feed this information back into the organization, hence adjusting and directing the internal standardization efforts in accordance with emerging opportunities.

> Manager C: "I try to form a picture for myself. Considering the information we have from the external environment and the one from inside, what is the picture I form regarding the company's interest?"
>
> Manager A: "Information is collected from external committees, and is utilized in internal standardization. Often, higher management have to discuss and decide on issues, without being absolutely clear where they come from. Most likely they are brought in after external participation."

For such a cycle to function, the interrelation of external and internal processes are close and uninterrupted in Volvo; unless external information is fed to the organization, this virtuous circle cannot be sustained. The interrelation of internal and external standardization is very much present in Volvo's everyday standardization management. The experts maintain constant communication with the standardization department, which is also in methodical contact with the rest of the organization—that is, managers and decision makers—in order to report back to them and ensure a dynamic incorporation of standardization management with the overall strategic intentions of the organization. Hence, as depicted in this section, a close interrelation of internal and external factors can only be sustained when internal information is well grasped (strong organizational awareness), and at the same time the organization is familiar with the external standardization arena (through external participation). Volvo regularly participates in formal standardization committees and subsequently

safeguards a dynamic standardization-related dialogue in the organization, which finally enables close interrelation of the various efforts.

6.8 External interface

The previous section detailed the internal interface, which focuses on intraorganizational dynamics; that is, elements primarily within the organization. However, for Volvo, which aims for assertive standardization management and to influence standardization outcomes, interorganizational dynamics are of major importance as well—that is, external interfaces. Specifically, precedence and cultivation of buying coalitions comprise elements of the external interface that were assessed as central in the empirical study.n

6.8.1 Precedence

Essentially, Volvo's strategic utilization of corporate standardization lies in the company's assertive participation in formal standardization committees, where it attempts to influence upcoming international standards in the direction that best suits its interests.

> Standardization engineer A: "If you are involved in international standardization and you are driving it, then you set the specifications that you want, the ones that suit your production and products best."

> Manager A: "I think it's important if we can standardize [that is, lay out in an international standard] what we want. If we already have a solution then of course we are pushing the Swedish or European standardization to take that standard. Then of course it will be a benefit for us, compared to our competitors, if we manage to push for the standard we want. So Volvo is pushing towards its benefit. I think we are quite good [at] pushing what we want (in the different external committees), in different areas. Volvo has been [at] the forefront."

In other words, along with remaining updated on industry trends, Volvo's primary goal is to influence external standardization processes and establish particular specifications in accordance with the company's preferences. By diffusing the company's specifications and requirements for components, they can be met at a lower cost; thus, through assertive participating in international

standardization work, Volvo endeavors to promote precisely those specifications that best suit its products and strategies.

> Manager B: "We need to be able to source materials, and we need suppliers worldwide to fulfill our requirements in the cheapest possible way, without endangering quality. Which means that if these requirements are spread internationally, or even become … international standards, it makes it much easier for us. We don't have to change... competitors need to change! So, it's about following the standards or setting the standards."

> Manager F: "[referring to a Volvo employee] who is the chairman in the ISO group, and then we say that we are making our drawings that way in Volvo. And then the rest of the world are doing it that way. We can have an advantage from that, because then every company can read our drawings and understand them. This is very beneficial when we go to a supplier, with our Volvo standard."

> Manager F: "If you are second in the market it is very difficult to take the lead. If you are first out there and you show what you are doing, you don't need to hide what you have. I think that is exactly how you can see standardization: make it open and be first, then you can take [the] lead."

> Manager D: "As I said, that's my experience also from the European work. That the ones who are participating are very knowledgeable. I really think it's about knowledge. If you don't know an area, you have nothing to say about the standard."

Hence, Volvo aims to proceed with its preferred specifications and adjustments (introducing them early) in order to effectively deploy its assertive approach, since being able to act quickly within the standardization game increases the company's chances of successfully launching them.

Specifically, precedence is important when a company pursues an assertive standardization strategy—that is, a strategy of promoting particular technological specifications. Offering a technological solution quickly to an emerging problem or challenge during an external standardization process considerably increases the chances of "locking in" that solution—that is, the company's favored solution.

6.8.2 Cultivation of buying coalitions

Finally, a major reason why Volvo wishes to lead formal standardization and is willing to commit a great amount of resources to this goal is its need to source materials, and hence access suppliers who are able to deliver them.

> Manager F, Corporate standards: "We buy a lot of components outside the Volvo Group, because we basically design the trucks and we assemble them, but all the components, or 90% of them, are made outside Volvo. Maybe we make the engines, but even then, most of the components used are also bought from suppliers."

> Manager B, Corporate standards: "Sourcing suppliers. It's easier to find suppliers that can fulfill our requirements. That's one of the benefits."

Particularly for Volvo, which (*1) manufactures and delivers hundreds of thousands of products every year* (approximately *250,000 units per year*, rendering Volvo Group the third largest trucks and buses manufacturer in the world as of 2015 [Carr, 2015]), (*2) operates in a number of countries* (production facilities in 19 countries, as of 2014, [Volvo Group, 2014]), and (*3) places great emphasis on quality assurance and safety* (core values [Volvo Group Annual Report, 2014]), it becomes even more important to communicate effectively with a large base of suppliers, who are also familiar with Volvo's requirements and can deliver on them reliably.

> Manager F, Corporate standards: "…because if we are working as a group company in many, many countries in the world, that means we have thousands of suppliers in different areas. Of course the suppliers need to know how we make our drawings, how we weld … they have to understand how the parts have been weld[ed] to understand Volvo's requirements, because otherwise they can't support us."

> Manager C: "[That is a need for us] to develop a standard in this way, to be able to purchase from several different suppliers."

As Volvo standardization personnel and management see it, a secure and efficient way to ensure that a broad range of suppliers are familiar with specific requirements is having those requirements and conditions specified in standards, which the majority of industry players then uses in their transactions with suppliers—that is, formal standards that have resulted from consensus formal standardization processes.

Specialist B: "Since we have the same supplier base, and if the suppliers and we—as the suppliers' customers—have the same view on the standard, everything is much, much easier."

Manager F, Corporate Standards: "[Since] we have the same supplier as Scania or Mercedes, it is better for all companies to have the same processes outside to make it cheaper."

Specialist B: "And we want to harmonize, to get the benefits of one common process and interface the suppliers."

In other words, through its assertive standardization management approach, Volvo tries hard to cultivate buying coalitions—that is, coalitions of customers (including Volvo and its competitors) who use the same formal standards—and in that sense train their suppliers to serve the various customers effectively and efficiently. For some companies (like Volvo), this is more important than for others, which justifies why the former would push harder for it, as well as why Volvo prefers its internal specifications to be pushed into formal standards.

Manager F, Corporate Standards: "[We need standardization] because the other way is that we have to describe for every supplier what is the way that we make drawings, [weld], what are the dimensions [and] tolerances, etc. Through standards we show the way of working; if the supplier wants to support Volvo with a part, they need to follow the standard in every area."

Manager C: "But the standard could define the basic requirements and by that we can purchase sensors from many different suppliers and we can take one supplier and if we want to change we can take another one, because they are fulfilling the same standard when it comes to the base requirements."

Manager B, Corporate Standards: "We need to be able to source materials, and we need suppliers worldwide to fulfill our requirements in the cheapest possible way, without endangering quality. Which means that if these requirements are spread internationally, or even become an international standard, it makes it much easier for us. We don't have to change... competitors need to change!"

Manager F, Corporate Standards: "We can have an advantage from that, because then every company can read our drawings and understand them. This is very beneficial when we go to a supplier with our Volvo standard."

The following section will investigate further the specific circumstances within Volvo Group that justify its selection of an assertive standardization management approach.

6.9 Firm-specific needs

In order to grasp the overall context in which Volvo operates, and subsequently determines its standardization management approach, a number of key strategic dimensions need to be considered. Namely, product range and scope of activities, target market, growth strategy, and relationships with suppliers are assessed as playing a major role in regard to the company's standardization-related choices.

6.9.1 Size and scope

Volvo Group is a one of the largest truck manufacturers in the world; the company delivers on average more than 200,000 heavy vehicles per year and offers a broad range of light to heavy-duty vehicles, with a great variety in size, weight, and horsepower. As many as 10 series of trucks and five series of buses and coaches are provided, reaching vehicle sizes from class 1–4 up to class 8.

However, such product variation generates a tremendous scope of manufacturing activities, leading Volvo to face considerable cost challenges. One way to mitigate costs is of course through standards, which closely relates to, and in fact justifies, the company's high prioritization of corporate standardization. For Volvo, the standardization department comprises a strategic tool, or "muscle," given the company's strategies and needs.

More specifically, Volvo's broad product range (and thus need for extensive use of standards and standardization for cost mitigation) relates to the company's target market.

6.9.2 Target market and growth strategy

Volvo Group deploys a "global" strategy, with sales in 190 geographical markets, focus on further global expansion, and access to broad markets all over the

world, embracing an emphasis on emerging markets such as Asia. Its increasing presence in emerging markets comprises a predominant feature of Volvo's growth strategy (Ambrutyte, 2014). However, in order to gain access to those markets, Volvo is required to take into account their particular needs and objectives, which basically translates into an availability of lower-cost products and hence adjustment of its product offerings. In other words, along with offering a broad product range, Volvo finds itself facing a need for major cost reductions in order to capture the emerging Asian markets, leading the company to search for economies of scale and scope—which again links back to its extensive utilization of standards and standardization.

Hence, Volvo, which intends to capture emerging markets but at the same time to retain its premium brand, pursues a horizontal, acquisition-driven expansion approach. This strategic direction was commenced in the 1970s when the merger with Renault took place, with the aim of achieving economies of scale (Ambrutyte, 2014). During the past decade, international acquisitions such as Renault Trucks, Mack, UD Trucks, and Shandong Lingong Construction Machinery (SDLG)[6] have been realized in order to provide the company with access to different market niches, from high-quality/expensive trucks to lower-quality/cheaper trucks. With the intention of increasing market coverage, Volvo is leveraging its brand portfolio to address various aspects of customer buying behavior.

> Manager D: "You can't make a cheap Volvo with [poor] quality, then you would ruin the brand name. Though it doesn't need to be bad just because it's cheaper; it's just simpler. But you can't make a simple Volvo. Then it's better to acquire a brand name that already exists and make those simpler trucks in that market. China is an important market, for example."
>
> Manager F, Corporate Standards: "Especially now, with the new market in Africa, where we plan to sell the lower-cost truck, cross-brand standardization is a big challenge. We have been making the best trucks in the world, but now we want to make cheaper trucks as well. What shall we change then? Shall we change our requirements, or shall we use other standards? That is a major challenge."
>
> Manager B, Corporate Standards: "Driving cross-brand standardization at the right level is very tricky when buying companies. What is to be standardized and

[6] Volvo heavily invested in SDLG (initially in 2006 and then again in 2007) in order for SDLG to double its output for Asian markets. In other words, this was not a complete acquisition, but could be considered a partial one.

what [is] to be unique, where is the borderline between corporate standards and brand management? Brand distinction vs. commonality and standardization is a very tricky thing when you have a multi-brand company."

Nowadays, the company is "realigning itself from being a decentralized brand-by-brand organization, to delivering on a brand portfolio perspective" (Volvo Group Annual Report, 2014). Under those circumstances, Volvo is urged to utilize corporate standardization in order to prompt multi-brand coordination and cost efficiency. Through corporate standards, the multi-brand company aims at boosting economies of scale and scope (which are urgently needed due to the company's broad product offerings) in order to attain such breadth of cost-efficient, and at the same time premium, products, through corporate standardization management.

A final reason why corporate standardization is prioritized so highly in Volvo relates to its relationships with suppliers, which are shaped in accordance with the company's needs.

6.9.3 Relationships with suppliers

As pointed out in earlier discussions, Volvo manufactures and delivers a great variety of products. This means that Volvo requires access to a number of suppliers, and aims to ensure its pool of suppliers are very familiar with the company's standards and specifications and produce large volumes, thus achieving lower costs. In that context, it is relevant for Volvo to adopt an assertive standardization approach and spread its standards specifications; that is, diffusion of its standards to enable easier coordination with a number of suppliers and subsequently boost cost efficiency and quality. Volvo is increasingly delegating development of complex parts to suppliers (Ambrutyte, 2014), which highlights the company's intention to work closely with suppliers.

Hence, the strategic rationale is for the company to benefit from the diffusion and establishment of its technical standards among other market participants, including suppliers, business partners, and even competitors. Communication with suppliers is much more efficient when Volvo Group's specifications and requirements entail well-known standards that are espoused by other firms as well.

Manager B, Corporate Standards: "It's easier to find suppliers that can fulfill our requirements, that's one of the benefits if your requirements, your standards, are

well-known among suppliers. We don't want to change our requirements since they are connected to our product. But also we don't want to have to train suppliers. A well-known standard makes it easier."

Manager F, Corporate Standards: "So we actively work internationally, to make sure that we have the same language, to make sure that the drawings are understood. That's a basic rule for standardization, that we need to have the same way of showing what we want to get [from] the product."

Furthermore, the adoption of common component standards by a number of firms leads to the production of those components in greater volumes, resulting in suppliers' economies of scale, which benefits Volvo Group with lower component prices. Taking the above into account, Volvo is not hesitant to even enhance cooperation with its competitors towards the creation of mutually adopted standards—which encompasses a well-thought-through strategy of simultaneously embodying elements of cooperation and competition (that is, deployment of a coopetitive strategy in regard to standards and standardization).

Consequently, other companies can also take advantage of the abovementioned lower prices, which provides justification for other market participants to embrace and adopt Volvo Group's internally developed solutions as part of widely adopted industry or international standards. Enjoying economies of scale by following international standards is arguably a more effective strategy than generating solely intraorganizational economies of scale, due to network effects within the whole industry. For instance, the cost and quality effects on suppliers' deliveries, following commonly accepted standards can greatly increase due to the dynamic magnitude of the whole industry. Through a prudent pursuit of internal and external standardization, Volvo is capable of strategically generating economies of scale within the company and the whole industry—which increases the chances of success of an assertive standardization management approach.

Lastly, such concentration of suppliers on producing greater amounts of a smaller variety of components allows them to focus their capabilities and improve them. This can be a driving force towards a greater degree of specialization (for instance, among suppliers, or more broadly among any firms), leading to higher quality along with lower costs.

Standardization engineer A: "So, just by increasing the volumes [manufactured by the supplier], we can decrease the cost."

Accordingly, as the use of mutual standards increases compatibility among the different parts of the value chain and allows them to collaborate effectively, commonly adopted standards hold the power of serving as "loose contracts" or established agreements among various market participants—and hence lead to smoother, more straightforward (industry-wise) business transactions, in an era of high technological uncertainty and interdependence. Subsequently, Volvo does not hesitate to promote and enhance its tactic of jointly adopted industry standards, which function as depositories of knowledge on how partners (such as manufacturers and suppliers, or coopetitors, in broader terms) can efficiently work with each other.

6.10 Summary of Volvo's standardization management

Overall, Volvo employs assertive standardization management, which well suits its corporate strategy and company needs. The approach encompasses a virtuous example of corporate standardization, with well-thought-through practices and choices, and an upright integration of all different elements—that is, the various mechanisms and responsibilities among the different parts of the organization. The company's strategy is well served under this standardization management approach, and is, as a matter of fact, fundamentally materialized through dynamic standardization as an indispensable strategic tool. The most characteristic features of Volvo's standardization management are:

1) Assertive approach,
2) Formal structures of standardization-related communication,
3) Strong organizational awareness,
4) Close interrelation of internal and external standardization efforts,
5) Active engagement in external standardization,
6) Openness regarding internal standards,
7) High resource commitment,
8) Inclusive relationships with suppliers.

7 Cross-case comparison

In this chapter, the empirical material from the two case companies, namely Scania AB and Volvo Group, is briefly compared in regard to the two companies' corporate standardization management approach. The aim of this comparison is to identify and make explicit the similarities and dissimilarities between these two cases of corporate standardization management.

7.1 Factors determining SMA

Many of the dissimilar choices made by Volvo versus Scania in regard to standardization management, with the primary one being the fundamental approach (discussed in detail in this chapter), can be linked back to the overall corporate strategies followed by the companies. Namely, Volvo and Scania appear to differ in some major strategic dimensions, such as their target market, product range, scope of activities, intended relationships with suppliers, growth strategy, and size.

7.1.1 Size and scope of manufacturing

Volvo is a much bigger company than Scania, on average delivering more than 200,000 heavy vehicles per year, while Scania's deliveries amount to 2.5 times fewer vehicles—that is, approximately 80,000 units per year. Nevertheless, what is much more important is the range of those vehicles.

Volvo offers a broad range of light to heavy-duty vehicles, with a great variety in size, weight, and horsepower. Characteristically, the company offers as many as 10 series of trucks and five series of buses and coaches, reaching vehicle sizes from class 1–4 up to class 8. Such a variant product offering generates a tremendous scope of manufacturing activities. Scania, on the contrary, produces

only heavy-duty (class 8) trucks. Moreover, it has fewer series than Volvo, that is four series of trucks and two series of buses and coaches.

In other words, Scania's range of products, and subsequently scope of activities, is far more limited than that of Volvo, which provides Scania with a great cost advantage due to the limited number of modules, and hence scope of manufacturing. This scope limitation allows Scania to utilize a sophisticated modularization system, which achieves high cost efficiency and has made Scania the heavy-vehicle industry leader in terms of profitability (Ambrutyte, 2014).

Volvo, on the other hand, faces a far greater challenge related to costs resulting from its broad range of models and sizes. A way to mitigate costs is through standards, which relates closely to, and in fact justifies, the company's high prioritization of corporate standardization. In Volvo, the standardization department comprises a strategic tool or "muscle," given the company's strategies and needs. In the case of Scania, standards are more of a hygiene factor, as discussed in earlier sections.

7.1.2 Target market

The main justification for the two companies' abovementioned disparities in product scope—and hence standardization prioritization and approach—is their target markets.

Unlike most industry players, Scania has always concentrated on the heavy-transport segment, and has been focusing on a "niche" market—which is why it does not offer a broad product range, but only a particular size of class 8 heavy-duty vehicles. The company addresses its efforts to a particular market encompassing high product quality—and consequently high product price. Hence, the company deploys a very focused, niche strategy.

Volvo, on the other hand, deploys a more "global" strategy, with sales in 190 geographical markets, focus on further global expansion, and emphasis on emerging markets such as Asia. Its increasing presence in emerging markets comprises a predominant feature of Volvo's growth strategy (Ambrutyte, 2014). However, in order to gain access to those markets, Volvo is required to offer lower-cost products and adjust its product offerings accordingly. As quoted in Scania's Annual Report (2013) with respect to major emerging Asian markets, "demands for vehicles of western standards is relatively low in several of these

markets." However, in accordance with its niche strategy, Scania does not intend to adjust its products to those standards, unlike Volvo.

In other words, along with offering a broad product range, Volvo finds itself facing a need for major cost reductions in order to capture the emerging Asian markets, leading the company to search for economies of scale and scope—which again links back to its extensive utilization of standards and standardization.

7.1.3 Growth itinerary

Consequent to the two companies' target markets are of course their growth strategies, with Volvo opting to expand horizontally and Scania choosing to grow organically.

Volvo, which intends to capture emerging markets but at the same time retain its premium brand, pursues acquisition-driven expansion. This strategic direction was commenced in the 1970s, but particularly during the past decade, international acquisitions such as Renault Trucks, Mack, UD Trucks, and SDLG have provided the company with access to new brands and new markets. With its aim of increasing market coverage, Volvo is leveraging its brand portfolio to address various aspects of customer buying behavior. Nowadays, the company is "realigning itself from being a decentralized brand-by-brand organization, to delivering on a brand portfolio perspective" (Volvo Group Annual Report, 2014). Under these circumstances, Volvo is urged to utilize corporate standardization in order to prompt multi-brand coordination and cost efficiency. Through corporate standards, the multi-brand company boosts economies of scale and scope, which allow a broad offering of cost-efficient yet premium products.

On the contrary, Scania has not chosen to grow through international acquisitions, but rather has done so organically. Taking into account the company's dissimilar strategy and focus on a niche market, it does not face the same needs as Volvo—which in fact extends to corporate standardization as well, providing additional justifications why standardization is prioritized so much more highly in Volvo. Namely, while in Scania it comprises a hygiene factor, Volvo's strategy is fundamentally materialized through standards and standardization as an indispensable strategic tool. This reasoning will be better illuminated in the following section.

7.1.4 Relationships with suppliers

As already pointed out in earlier discussions, Volvo manufactures and delivers approximately three times the units that Scania does, with a far greater variety of products. This means that Volvo is faced with a need for wider access to a number of suppliers, and aims to ensure its pool of suppliers are very familiar with the company's standards and specifications and produce large volumes, thus achieving lower costs. In that context, it is relevant for Volvo to adopt an assertive standardization approach and aims to spread its standards specifications. Diffusion of the company's standards facilitates coordination with a number of suppliers and subsequently boosts cost efficiency and quality. Volvo is increasingly delegating development of complex parts to suppliers (Ambrutyte, 2014), which highlights the company's intention to work closely with suppliers.

Conversely, Scania's dissimilar circumstances and choices have led to different approaches regarding its interaction and relationship with suppliers. The company focuses on the in-house production of strategic parts, a choice made back in the 1940s (Ambrutyte, 2014), which means that it does not aim to push through particular specifications. In that sense, Scania does not need to engage in assertive standardization management and diffuse its technical specifications, since it does not aim to reach a broad number of suppliers. Moreover, the company mainly works with an established base of suppliers and changing suppliers is rare; each year, Scania phases out only three or four of some 200 suppliers (Ambrutyte, 2014). Finally, also taking into account the limited range of models and sizes, Scania is able to effectively utilize a modularization system, hence keeping its technical specifications exploited internally instead of aiming to spread them externally. Simply deploying a vigilant standardization approach—that is, keeping an eye on international progress and developments—functions well in accordance with Scania's corporate strategy.

7.2 Standardization management approach

This case study consists of two examples of dissimilar standardization management, as well as dissimilar strategic intentions within this. Volvo employs an assertive standardization management approach, while Scania employs a vigilant one. Standardization management approach is a crucial element of corporate standardization, and in fact determines subsequent choices

of the companies, since particular actions and decisions become common sense, depending on the selected approach. More elaborate descriptions of what each approach represents have been provided in the previous chapters; however, as a brief reminder, the assertive approach signifies that an organization aims to influencing external standardization processes, while a the approach encompasses a focus on remaining up to date on current standardization issues and trends (and potentially reacting to altered circumstances), though without aiming to necessarily influence these processes per se. Hence, Volvo's management and standardization personnel have explicitly chosen to actively engage in formal standardization committees and potentially drive the processes in order to eventually influence the standardization outcomes (that is, the emerging formal standards). On the other hand, Scania's management has chosen to participate in external standardization committees, but without the aspiration of leading them or influencing the outcomes. For Volvo, corporate standardization management comprises a strategic muscle, while for Scania it comprises more of a hygiene factor. The circumstances that justify each choice, as well as the consequences that come with each, will be further elucidated in the following sections.

However, first, some contextual conditions will be discussed and compared (namely, organizational structure of standardization, post-separation eras and organizational cultures), in order to set the background for comparison of the two cases' current standardization management approach. The comparison will then move on to the specific aspects of the standardization management approach for the two companies.

7.3 Organizational structure of standardization

Despite the companies' dissimilar standardization approaches, a major similarity between them is the way their standardization departments are structured organizationally, referring to the structure of the departments per se, but also the positions of the departments in the company; in both cases, the host organizations are the R&D segments. That is, the standardization work is conducted under the umbrella of R&D, which demonstrates a corporate association between standardization and technological developments.

In both companies, the standardization departments used to be bigger and stronger in terms of technological expertise—in other words, encompassing area

specialists and technical experts within the standardization departments. However, due to rapid technological advancements and thus increasing manufacturing complexities around the automotive industry over the past three decades, a huge number of technical experts have been employed in the companies. These (now numerous) experts, which comprise critical resources for the companies, were needed in the various technological areas and sites all over the organizations, instead of being centralized within one department (namely, the standardization department). Responding to that challenge, both Scania and Volvo separated the technical experts from their standardization units, though still with the aim of close collaboration between them.

Interestingly enough, both companies made the same choice (the aforementioned separation) independently and simultaneously, essentially realizing at the same time that it was necessary to have this massive technical knowledge in different parts of the organization. However, despite the common decision, after the separation things evolved differently in the two companies.

7.4 Post-separation eras

As far as Volvo is concerned, the separation was not real in a functional sense; the standardization department continued working very closely with the technical experts, even though they were not sitting in the department. Very close contact was nurtured, and robust communication flows were built between the standardization department and the experts, which allowed the standardization department to retain control of overall standardization management and remain at the core of all processes. Altogether, the standardization department still enjoys vigorous communication flows with the overall organization, despite its large size and complexity.

On the other hand, the post-separation era looked different in Scania. Unlike in Volvo, such regular contact and robust communication flows between the standardization department and the technical experts was not fabricated in the years following the separation. Instead, the standardization department focused on an internal role, which to a large extent pushed it into an administrative role and led to it exclusively dealing with internal standardization processes, while the technical experts manage external standardization.

7.5 Organizational culture

Both companies appear to have developed a strong standardization culture over the years; however, they are currently employing dissimilar standardization management approaches. Clear connections between the overall standardization management approach and culture were not outlined during the data collection stage. Rather, a much stronger association with the strategic intentions (assertive or vigilant), and subsequently the availability of financial resources and competence, was depicted.

On an abstract level, organizational culture could perhaps play some role in the ultimate allowance of organizational resources into the standardization department, and subsequently the standardization strategy, though this decision can be more straightforwardly coupled with corporate strategy than with corporate culture.

7.6 Resource commitment

Resource availability and readiness to commit organizational resources plays a leading role in a firm's standardization management, with demands reaching considerably high levels.

7.6.1 Financial resources

Availability and readiness of financial means comprises a key feature that essentially distinguishes an assertive standardization management approach from a vigilant one—taking into account the amount of human and capital resources required in order to pursue assertive standardization. For standardization initiatives to be sustained, resource demands can be very high, and a crucial question is whether a firm is prepared to go along that road. The empirical observations within the two companies exposed how the organizations' standardization approaches and strategic intentions connect with the amount of resources engaged in standardization work.

On the one hand, Volvo is characterized by resource availability for standardization work, and a readiness to commit the required resources in order

to accomplish its strategic aims. Very competent and experienced people (who comprise human organizational resources, though their availability and commitment towards standardization work also relates to monetary resources) lead and comprise the standardization department. Furthermore, a considerable number of technical experts are closely engaged in internal and external standardization work, communicating closely with the standardization department and subsequently representing the company in standardization committees. Multiple Volvo representatives join the work of different standardization committees in order to increase the company's chances of influencing external standardization.

On the other hand, Scania does not show an equivalent readiness to commit significant resources to standardization work. The company's competent and experienced technical experts do participate in external standardization committees as well, though this participation is much lower (in terms of number of staff) compared to Volvo's. Only one Scania representative generally participates in external standardization committees. In that sense, as also fits Scania's standardization management approach, its representatives are there mainly in order to monitor the situation, rather than influence it. Hence, the company appears to value external standardization work, at least to some extent, since some resources are still committed to external standardization participation, though in a primarily vigilant fashion. In other words, a keen eye is kept on standardization trends, but with the proviso of minimizing resource consumption.

7.6.2 Human capital

Organizational resources (which play a significant role in corporate standardization management) are also translated into human capital—that is, workforce competence. The competence of the standardization workforce in each company regulates how standardization is practically managed and how well the different roles operate.

As far as Volvo is concerned, a very experienced and competent workforce manages standardization, both internally (via the standardization department) and externally (via experts). Regular communication flows have been established between these parties, and the standardization department has managed to retain overall control of the situation.

Scania's standardization department is composed of a relatively inexperienced crew (in regard to the standardization arena and the company per se), which is part of the reason why the standardization department has been forced into a merely internal role. Since the department's leader had no previous standardization-related experience, such experience was evidently not prioritized when recruiting the other team members. However, taking into account the relatively limited experience and competence within the standardization arena, it becomes even more challenging for Scania's standardization department to be the core of overall corporate standardization management—as Volvo's department manages to do. Nonetheless, external standardization is managed by Scania's technical experts, most of whom are exceptionally experienced staff. In both companies, only experienced and knowledgeable personnel (both in regard to standardization and the organization per se) are endorsed to partake in external standardization committees—suggesting that effective participation is not otherwise viable.

In addition to arguably higher levels of standards-related competence in Volvo, the company has exploited long-standing experience over a number of years, towards the development and advancement of its contemporary standardization management. Through challenges and mistakes, and by being attentive to them, Volvo has learnt how to manage standardization in the most effective and suitable (for the company) way possible.

On the other hand, the newly recruited and less field-experienced personnel of Scania's standardization department are basically in the process of uncovering corporate standardization management, and subsequently "learning the lessons on the way." For that reason, they are facing challenges that Volvo's old-timers do not, such as ending up in an isolated internal role due to a lack of solid and regular communication with the organization's experts. However, Scania's standardization engineers have noted their intention to gradually establish more regular contact with the technical experts (who manage external standardization); in other words, that lesson was learnt and is likely to progressively advance the company's standardization management by establishing better interactions.

7.7 Organizational awareness

Organizational awareness—that is, extensive knowledge of the company's circumstances, strengths and weaknesses, and interests—is highly prioritized in Volvo, where internal and external standardization efforts need to be very closely interrelated (in order to successfully deploy an assertive approach). Hence, since Volvo aims to endorse its preferred standards specifications and drive the standardization process in accordance with the company's interests, those interests need to be very clearly renowned among the company representatives. This means that holistic organizational awareness is essential in order to ensure organizational synchronization.

On the contrary, Scania's vigilant approach allows it to get away with (that is, deploy its selected approach successfully) considerably lower overall awareness. More specifically, the standardization department that manages internal standardization is not well aware of the company's objectives and efforts in the external standardization committees. The experts who manage external standardization, on the other hand, focus mainly on their external role. They are somewhat better informed about the internal situation (as they partake in internal standardization processes), but in a fragmented fashion. Since management and control of those two functions—that is, internal and external standardization—are clearly separated in Scania, holistic organizational awareness is not featured.

7.8 External participation

Regardless of the standardization approach, both companies employ watchful external participation in formal standardization committees in order to ensure that they avoid a technological lock-out. That is, an alert focus on external standardization work is apparent in both companies, which regularly participate in order to collect important, relevant information, as well as monitor competitors. The organizations' experts who attend external standardization meetings acquire knowledge of the external circumstances and ensure that the organization will not be found technologically lagging or having missed vital information; this consists of a key task in the companies' corporate standardization management.

More specifically, for Scania's vigilant approach, information advantages and monitoring of competitors are required in order to ensure that the company is not technologically surpassed by competitors, but sustains the capacity to "react"—that is, adjust, if needed, based on industry developments and forthcoming standards. On the other hand, Volvo, which aims to be a step ahead technologically and lead standardization work towards favorable specifications, can not only not overlook industry trends and technological evolvements, but must be aware, to the highest degree possible, of its competitors' technological status. In other words, both companies participate regularly in external standardization committees, though with slightly different objectives; Volvo aims to participate and influence outcomes, while Scania aims to participate and remain up to date on the progress and outcomes.

7.9 Openness regarding internal standards

Due to the dissimilar standardization management approaches selected, the two companies enjoy the slack to adopt dissimilar openness tactics regarding their internal standards. While a vigilant standardization management approach allows a policy of protectionism—that is, of protecting the company's internal standards—an assertive approach is better supported by an openness policy, which means that the company's standards are not equivalently protected.

Volvo, which employs an assertive approach and aims to push through and establish particular standard specifications, adopts a strategy of openness; that is, its internal standards are not protected but remain visible online, as long as one searches using the number of the standard. This means that the company's standards are potentially visible to external parties, and even competitors. However, this is justified in the sense that the company's objective is to influence international standards to its benefit. The result is a fine strategic balance of openness and uniqueness, since the company's distinctive characteristics and interests aim to be supported and served through acts of openness.

Scania, which employs a vigilant approach and does not aim to lead external standardization, adopts a strategy of protectionism; that is, Scania's internal standards are not visible to external parties, but rather kept secret. Hence, Scania has made a different choice than Volvo in that respect, with the former choosing openness and the latter opting for protectionism. Like Volvo, Scania's choice is

justified in accordance with its overall standardization management approach. That is, since Scania is not aiming towards an assertive approach of establishing its particular specifications, but rather an overseeing and vigilant one, the company finds no benefit from making its internal standards visible to external parties.

7.10 Interrelation of internal and external efforts

A close interrelation of internal and external standardization efforts is apparent in Volvo's assertive standardization management, and boosts a virtuous circle across the internal and external environment. The experts maintain constant communication with the standardization department, who are also in methodical contact with the rest of the organization—that is, managers and decision-makers—in order to report back to them and ensure dynamic incorporation of standardization management with the overall strategic intentions of the organization. As far as Scania's vigilant standardization management is concerned, such a cyclical interrelation of internal and external efforts is not present—since communication flows are not well established between the standardization department (who manage internal standardization) and the experts (who manage external standardization). Without robust communication, information from different parts of the organization is not blended together.

As demonstrated in a previous section, despite the fact that Volvo and Scania have been structured in a very similar way and have gone through comparable structural changes as far as corporate standardization is concerned, their post-separation eras look very different. A result of those dissimilar situations is the presence (in Volvo) and lack (in Scania) of formal standardization-related communication between the standardization departments and experts, respectively. More specifically, despite the fact that both case companies employed a similar organizational structure, with the technical expertise placed outside the standardization department, only Volvo's standardization department has managed to develop and nurture well-functioning communication throughout the whole organization, and hence retained control of the overall process. That is, Volvo's department is in control of overall standardization—both internal and external processes—and in fact fuels a close interrelation of internal and external standardization efforts, which allows Volvo

to use standardization strategically. On the contrary, such information exchanges do not take place in Scania, meaning that the standardization department does not maintain close contact with the technical experts, who manage external standardization and participation in committees; hence, the standardization department does not retain overall control. As an outcome of this incapacity, Scania's standardization department solely manages internal standardization. This lack of coordination does not allow Scania to utilize standardization management strategically, in the way Volvo does.

Concluding, as long as close interrelation of internal and external standardization efforts is present in the organization (as primarily facilitated by effectual communication among the different parties), the separation of experts from the standardization department does not pose any challenge for the coordination of standardization strategies—as is the case in Volvo. On the contrary, lack of such information exchanges leads to the decoupling of internal and external efforts—as occurs in Scania.

7.11 Precedence

As clearly described above, along with an assertive standardization management approach comes the primary goal of influencing external standardization processes and establishing particular specifications in accordance with the company's preferences. In that sense, Volvo aims at leading standardization via early establishment of its preferred specifications and adjustments, since being able to act quickly within the standardization game increases the company's chances of successfully establishing such standards. Hence, precedence is important when a company pursues an assertive standardization strategy—that is, a strategy of promoting particular technological specifications (such as in Volvo Group)—but is not really on the agenda for a vigilant approach (such as Scania's).

7.12 Cultivation of buying coalitions

Finally, by influencing standardization outcomes and driving the consensus standardization processes, Volvo Group aims to cultivate buying coalitions (that is, boost an isomorphism of buyers' demands through the establishment of common formal standards). Justification for this strategy lies in the company's extensive need to source materials and hence be able to access a plethora of suppliers who can reliably deliver those materials (these specific needs will be elaborated on in the coming section). However, it can already be stated that Scania does not face these same circumstances (as also discussed in section 7.1), and hence finds no benefit from cultivating such buying coalitions.

To close this chapter, Table 5 summarizes the cross-case comparison in order to draw a clear and straightforward picture of the comparative analysis of the two cases.

Table 5
Cross-case comparison summary.

Main	**Scania** ***Vigilant SMA***	**Volvo** ***Assertive SMA***
Size (product deliveries)	≈ 80,000 units/year	≈ 200,000 units/year
Scope of manufacturing	Limited (niche)	Broad
Growth itinerary	Organically grown	Acquisition driven
Supplier relations	Narrow	Inclusive
Organizational structure	Functional separation	Functional separation
Organizational culture	Long-standing focus on standardization	Long-standing focus on standardization
Resource commitment	Restricted	Available
Organizational awareness	Relatively low	Relatively high
External participation	Regular	Regular
Openness regarding internal standards	Protectionism	Relative openness
Interrelation of standardization efforts	Decoupled	Coupled
Precedence	Irrelevant	Essential
Cultivation of buying coalitions	Eventually beneficial but not pursued	Desired and pursued

8 Analysis

This chapter commences with a discussion about the choice of theory in light of the study's findings. It elucidates the reasons why particular theories (such as TCE) have been downplayed, despite being discussed in early chapters as relevant for theoretically approaching the topic of corporate standardization, as well as why other theoretical lenses (such as resource dependence theory) have been considered more suitable for analyzing the findings and incorporating them into the field of strategic management. Along with resource dependence theory, a coopetition perspective—which was introduced in the first chapter as potentially fruitful for increasing understanding about CSM—has indeed proven useful. The following paragraphs discuss the above in more detail. Subsequently, the empirical findings are analyzed and compared to the preliminary framework. Each factor demonstrated in the preliminary theoretical framework is now discussed through the lens of the empirical findings of the study. In addition, a number of supplementary factors are presented and elaborated, as they provide new, empirical insights (in comparison to the preliminary theoretical framework). These supplementary factors are presented in italics. The analysis of findings commences with a discussion about the standardization management approach, denoting its importance as the major and foremost choice in regard to CSM. The internally and externally oriented focal aspects, in close connection with standardization approach, are elaborated on, respectively addressing (1) resource commitment and *(2) organizational awareness* on the one hand, and (3) external participation and *(4) openness* on the other. Subsequently, internal and external interfaces emerge from the firm's corporate standardization activity, namely *(5) interrelation of internal and external efforts*, *(6) precedence* and *(7) cultivation of buying coalitions*. These concepts and their associations are presented and clarified in the following sections.

8.1 Contemplating theory in light of the findings

In the first chapter of this thesis, the theory of TCE (Coase, 1937; Williamson, 1975; 1988; Rossignoli & Ricciardi, 2015) was determined to be relevant for the problematization of corporate standardization due to its concern with the "make or buy" decision. This applies to inquiry of firms' decision making in regard to whether they would be better off engaging in standardization activities themselves, or refrain from those (long and costly) activities and simply buy the standards (for a much lower cost) as soon as they have been finalized. As discussed above, TCE focuses on how firms are compelled to reduce their transaction costs when interacting with each other.

However, throughout the empirical study and analysis of the material, it was uncovered that motivations for firms' interaction with each other (which is especially applicable in the case of corporate standardization) extend far beyond the need for reduction of transaction costs. In fact, they reach issues such as power differentials and power asymmetries due to transaction/resource dependencies (or in other words, due to some players experiencing higher dependencies than others, within the same competitive arena). Due to the existence of such power differentials and dependencies, organizations seek ways to manage and control the critical aspects of their "business network interactions" (Rossignoli & Ricciardi, 2015) in pursuit of their goals. In light of the above, resource dependence theory (Pfeffer & Salancik, 1978, 2003), which shares similarities, as well as differences, with TCE (both of which are discussed below), is appraised as an alternative and more appropriate theoretical perspective from which to approach the findings of the study in hand.

In illuminating the similarities and differences between the two aforementioned theories, it is essential to start with the fact that both TCE and resource dependence theory consider interorganizational relationships (IORs), and address why firms interact with one another—albeit with different justifications (Rossignoli & Ricciardi, 2015). In line with TCE, organizations are motivated by the need to minimize transaction costs (Williamson, 1975, 1988), whereas, in resource dependence theory, organizations are motivated by the need to control the resources that are critical to them (Pfeffer & Salancik, 1978, 2003). In addition, while in TCE the unit of analysis is the individual transaction (viz. seeking to conduct each transaction in the most efficient way possible so that transaction costs are reduced), in resource dependence theory the unit of analysis is the organization per se, with particular focus on its resource dependencies and

ways around these dependencies. Nevertheless, these theories are systematically considered by the literature to be complementary (Carter & Hodgson, 2006; Peters, 2014; Rossignoli & Ricciardi, 2015), primarily due to the fact that they often postulate "opposite predictions in similar cases," as reasoned by Rossignoli and Ricciardi.

According to resource dependence theory, competitive environments are uncertain due to the scarcity of resources, unforeseeable changes, as well as persistent efforts and actions of organizations to control those resources that are critical (to them and their competitors, most likely) beyond their organizational boundaries (Rossignoli & Ricciardi, 2015; Pfeffer & Salancik, 2003). Since organizations are not self-sufficient but are contingent on others (that is, other organizations) in order to fulfill their resource demands for growth and even survival, organizations' decision makers are pressured to forge interactions and sustain relationships with other organizations—especially those that possess complementary resources (Pfeffer & Salancik, 2003). If organizations were able to create all the resources they require for their survival and growth, they would not have to invest in such external relationships; however, in reality they must aspire to regulate the external environment in which they operate by pursuing targeted strategies (Rossignoli & Ricciardi, 2015). Firms' managers and stakeholders are to some extent able to "enact their environment" (Hill & Jones, 1992), which they attempt to do in order to reduce their dependence on resources they do not possess, or players they do not control (Pfeffer & Salancik, 2003).

One strategic pathway for regulating and enacting the external environment is through inducing steady interorganizational relations based on cooperation and coordination, with the aim of controlling environmental uncertainty (Rossignoli & Ricciardi, 2015; Pfeffer & Salancik 2003; Alter & Hage 1993; Thompson 1967). Hill and Jones (1992) pointed out that "actors with a high stake will demand more comprehensive incentive mechanisms and governance structures," which could be translated into the idea that actors with higher dependencies will require (and instigate) more comprehensive incentive mechanisms and governance structures. Such mechanisms and structures are easily identified within voluntary standardization committees, where several organizations (which are, in fact, primarily competing with one another) decide to come together and coordinate their efforts towards generating common standards. In these arenas, competing players demonstrate cooperative behaviors, often encompassing disclosure and sharing of technical knowledge and information. Although a TCE perspective could capture a portion of these organizations'

motivations for such collaborative behaviors, such as aiming at future reduction of unnecessary transaction costs in association with technical incompatibility and communication with customers and suppliers (through the establishment and use of common technical standards), this theoretical approach does not fully uncover the reasons why different corporations appear to demonstrate different SMAs (as presented in more detail in the following section)—provided that reduction of transaction costs is an imperative need for all organizations. However, in light of the varying degrees of (resource) dependence across organizations, it is understandable why some players are more highly invested in actively engaging in standardization activities, and particularly in streamlining them towards specific outcomes (for instance, directing corporate decision making and efforts towards demonstrating an assertive SMA, as opposed to a vigilant one). As argued by Pfeffer and Salancik (2003), and cited by Rossignoli and Ricciardi (2015) in elaborating on resource dependence theory, "the decisions made by the internal organization reflect the pressures of the external environment." Along these lines, as manifested in the empirical material of this study, organizations' particular needs, and subsequently higher degrees of resource dependence (due to a number of factors, as also outlined later in this chapter in connection to overall corporate strategy), illuminate the choice to engage in standardization activities, as well as how firms' standardization work varies (both intraorganizationally and in interorganizational settings). The necessity to reduce uncertainty in regard to specific sets of resources (those that the organization is highly dependent on and does not easily control) urges the organization's internal decision makers to create stable and more predictable "negotiated" environments (Rossignoli & Ricciardi, 2015)—for example, through standardization activities.

Finally, the coupling of resource dependence theory with coopetition theory completes the picture of CSM, bringing in the idea of "win–win strategies" (Brandenburger & Nalebuff, 1997), where the negotiation outcomes comprise "winning outcomes for all those involved" (as described by Chopra in Brandenburger & Nalebuff, 1997). Resource dependence theory focuses on the increase of one party's power through IORs, implying that the other party's power has been diminished or decreased. However, in the context of standardization settings, one party's assertive influence on the standardization progress (for the sake of influencing the outcomes and hence reducing resource uncertainties and dependence) does not automatically decrease the other players' endowment. On the contrary, the coopetitive associations at play in standardization settings bear potential benefits for *all* parties involved (in terms of knowledge creation, knowledge sharing, coordination benefits, supply

externalities and so on)—and even parties not involved in the process per se (as soon as the standardization outcomes become openly available and accessible).

This first section aimed to provide a clear-cut overview of the theoretical connections and contributions of the study. Each factor of the revised theoretical framework is discussed in the following sections.

Table 6 provides a summary of the similarities and differences of TCE and resource dependence theories.

Table 6
Summary of similarities and differences; transaction cost economics and resource dependence theories.

Main reference	*TCE* (Williamson, 1975;1988)	*RDT* (Pfeffer & Salancik, 1978;2003)
Focus upon	IORs	IORs
Unit of analysis	Transaction	Organization
Focal dimension	Asset specificity	Resource dependence
Focal concern	Reduction of transaction costs	Reduction of environmental uncertainty and others' power over the organization
Firm objective	Organization of transactions	"Regulation"/organization of external environment
CSM-relevant problematization	"Make or buy" decision	"Why variance exists in the SMAs of different organizations"
Complementary value of Co-opetition for CSM		Simultaneous benefits and "win-win strategies" (Brandenburger & Nalebuff, 1997)

8.2 Standardization management approach

SMA conceptually comprises an empirical account that has not been introduced in previous studies, most likely due to the fact that standardization management is not a specifically established research topic to date. However, SMA comprises a crucial element of standardization management, in fact encompassing the foremost choice that an organization ought to make before becoming involved in corporate standardization, since the selection of SMA determines a number of

subsequent choices; particular actions and decisions become more commonsensical and relevant, depending on the selected approach. For instance, decisions regarding availability of organizational resources (financial and human) towards corporate standardization ought to be connected with the selected SMA. In addition, decisions regarding external participation in formal standardization committees must relate to the company's selected SMA, or decisions concerning tactics of openness or protectionism of the internally developed standards and specifications ought to make sense in regard to the deployed SMA. These choices, or decisions, will be further discussed throughout the rest of this chapter, but first it is worth mentioning that Grossmann et al. (2015) highlighted the concept of "standardization strategy," delineating it as "the definition of how a company will position itself with regards to internal and external standardization activities, which includes the application of standards as well as the participation in standardization committees and the development of own standards." Unfortunately, though, the authors did not go any further in terms of discussing or explaining their idea of what a "standardization strategy" is; strictly speaking, they merely defined it, and rather loosely. Furthermore, encompassing all aforementioned elements in the definition of standardization strategy (that is, "internal and external standardization activities," "application of standards," "participation in standardization committees," and "the development of own standards") renders the concept excessively broad and inexact. On the contrary, SMA delineates explicitly the deliberate corporate choice in regard to the firm's attitude and intentions with, specifically, formal external standardization. Of course, a number of consequent choices are closely connected with SMA as well (for example, the abovementioned ones, among others), as will be elucidated later in this chapter.

The two main alternative SMAs that were unearthed in the empirical material considered in this study have been labeled as assertive and vigilant. These are formulated in different ways inside the organization, and are expressed dissimilarly outside of it as well. A major variance between these two SMAs is that they are meant to support dissimilar strategic intentions. Namely, an assertive standardization approach signifies that an organization aims to highly influence external standardization processes (as Volvo is trying hard to do), while a vigilant approach encompasses a focus on remaining updated on current standardization issues and trends (and potentially reacting to altered circumstances), though without aiming to necessarily influence those processes per se (that is, as Scania approaches external standardization). The two companies appear, as seen in this comparative case study, to share a number of similarities in regard to their standardization management, which then are seen

as necessary components of CSM, regardless of approach. No matter what the specific strategic intentions regarding standardization, or the specific characteristics and needs of the firm, several specific components have been deemed as necessary, or at least highly beneficial, to nurture; namely, organizational awareness, external participation, and interrelation of efforts. On the other hand, a number of factors emerge as necessary for Volvo's standardization management, but not so much for Scania's—namely, resource availability, internal standards' openness, precedence, and cultivation of buying coalitions. Hence, a number of factors have been identified that relate directly to the SMA (more specifically to the assertive approach, which is also the more demanding one). In other words, in addition to the necessary components of CSM (that is, necessary irrespective of approach), the assertive SMA encompasses a few more necessary factors compared to the vigilant approach. Finally, a number of factors were uncovered as noncritical for neither of the identified SMAs: organizational structure, organizational culture, and timing. These aspects did not appear to play a decisive role in CSM in Volvo or Scania (as will be elucidated in following sections). However, it is important to stress that the aforementioned discussion—as well as ones that follow in the remainder of this chapter—refer primarily to the automotive industry, in which both companies of this comparative case study operate. Potential applicability of the study's findings to other industries will also be discussed later, but until then the discussions apply largely to that specific industry alone.

Coming back to the discussion about SMA, as mentioned above it comprises a deliberate standardization-related corporate choice, hence relating to managerial discretion; higher-level management (in collaboration with standardization personnel) ought to take into consideration the firm's needs and circumstances and subsequently decide upon the selected approach. That is, managers (and standardization personnel) enjoy the slack needed to adapt their CSM by maneuvering its various aspects and elements. For instance, at one end managers can plausibly opt for an absence of CSM—that is, intentional ignorance of standards and standardization—though this is not viable within a number of industries (including automotive, as outlined in earlier chapters). Today's complex and globalized economies call for some sort of coordination (Tamm Hallström & Boström, 2010), rendering it unrealistic for companies to completely ignore internationally established standards. On the other hand, management might opt for a vigilant SMA, which by no means denotes that corporate standardization is ignored. Company representatives are present in formal standardization committees, yet they play a more passive role, as is the case for Scania's representatives. They aim to keep up to date on the status of

standardization progress, but not necessarily to influence the outcomes. In other words, a vigilant approach is still an active one (as opposed to an absence of CSM), since it encompasses involvement in external standardization and regular updating on advancements therein. Specifically, CSM comprises more of a hygiene factor (Herzberg, 1974)—that is, it is not highly prioritized in the organization, but is not eliminated either. Alternately, management might select an assertive SMA, meaning that the organization aims to also influence, and even lead, standardization processes; for example, influencing international standards, as is the case for Volvo's representatives in the external standardization committees. In that case, CSM is highly prioritized in the organization (that is, is a motivation factor [Herzberg, 1974]), as demonstrated by the way in which overall corporate standardization is managed in the company—for instance, through availability of organizational resources streamed towards internal and external standardization, important efforts towards organizational awareness and interrelation, presence in standardization committees, and so on.

Nonetheless, a very important point of clarification here is that there is no definitive normative approach. The company should rationally select the most suitable approach—that is, the one that supports the overall corporate objectives—and maintain consistent choices in relation to the other factors of CSM. On the contrary, it is immensely important to make aggregate choices that are consistent with each other—since, as mentioned earlier, different approaches come with different subsequent choices as well. An additional component for consideration is that the two approaches are highly asymmetrical; namely, it is much more challenging to carry out an assertive approach than a vigilant one (due to higher demands in deployment of the former), and it is also much easier for an assertive player to switch to a vigilant one than vice versa.

Namely, Scania's corporate circumstances and needs are very well supported by a vigilant SMA (as will be further discussed in the following section). In that sense, the company has not become worse off from not deploying an assertive approach—which would be much more demanding—especially since a vigilant one sufficiently supports its strategic goals and intentions. On the other hand, in regard to Volvo, it is worth carrying out the much more costly and demanding assertive approach, since this is the one that best fits and supports the company's needs and intentions. In other words, alignment with corporate strategy (and its specific goals) is the primary etiological justification for selection of an SMA. However, although there is no normative approach, there is normative execution (of each approach). That is, once a corporation has decided to deploy an

assertive management approach, for example, that decision ought to be followed consistently for each and every component of CSM. Once Volvo decided to go with the assertive approach, it had to support a readiness and availability of resources, and to promote organizational awareness, assertive external standardization, openness, etc. Shortcuts on any of the abovementioned components will simply sculpt the path for failure, since they are interlinked and support each other. To provide a few examples, deployment of an assertive approach while at the same time utilizing protectionism of internal specifications would be an unwise combination, since on the one hand the company aims to promote internal specifications to become formal standards and bears that cost, while on the other it bears additional costs towards protecting those internal specifications. Simply put, this would not make sense. Additional examples will be provided in later sections, and each part of the corporate standardization framework will also be discussed in more detail. However, a general picture of what SMA is about has been, to some degree, portrayed already.

8.2.1 Theoretical positioning of SMA

In regard to the positioning of SMA, since it is closely related to a firm's attitude and intentions with regard to formal external standardization, where a number of industry players come together in order to reach consensus-based decisions, it is interesting to look at it from an IORs perspective. More specifically, standard setting (that is, formal external standardization) comprises an interesting setting of IORs that shares common characteristics with the types of IORs discussed in literature (examined later on), though extant research does not accurately depict any of them.

Claims that standard setting should be approached as an IOR have been made by Barringer and Harrison (2000) and Mellewigt, Madhok, and Weibel (2007), who pointed out that a basic theme framing IORs is the rationale of such relationships emerging among firms in order to create value by combining resources and sharing knowledge (Doz & Hamel, 1998). Considering that standard setting carries out precisely the same rationale—that is, bringing together different firms, which share their diverse knowledge base and together create standards (with value then created through standards, in terms of safety, coordination, efficiency, and so on), standard setting also needs to be accounted for among the types of IORs.

Oliver's (1990) literature review discussed six types of IORs covered in existing literature, namely trade associations, voluntary agency federations, joint ventures, joint programs, corporate-financial interlocks, and agency-sponsor linkages. While Barringer and Harrison's (2000) literature review named trade associations, joint ventures, and interlocking directorates as well, it added, alliances, network structures and (research) consortia. Although network structures and consortia might seem relevant types for the classification of standard setting, they are not; Barringer and Harrison (2000) defined them both as "tightly coupled forms of organizing," meaning that the participant organizations are "linked together by formal structures and may involve joint ownership." This, of course, is not the case in regard to the participants of formal standardization. Furthermore, consortia are discussed as "specialized joint ventures," and network structures as "constellations of businesses" where "each participating firm is permitted to focus on its specialty, leaving secondary activities to members that specialize in those activities" (Bluedorn, Johnson, Cartwright, & Barringer, 1994). None of these descriptions can be assigned to formal standardization either, since participating firms are not connected with ownership structures and do not formally divide standardization activities into "primary" and "secondary" ones. On the contrary, all participating firms join standardization committees on the basis of their familiarity with the task and aim to collectively reach standardization-related decisions.

Altogether, none of the above types of IORs appropriately depicts formal standardization, while a number of common characteristics clearly show why such a depiction should be considered along the aforementioned types of IORs. Foremost, every IOR is founded on a voluntary basis (Oliver, 1990); that is, no organization is mandated to participate, but does so voluntarily, as is the case in formal standardization. To explain why organizations form such relationships, Oliver highlighted a number of "critical contingencies;" namely necessity, asymmetry, legitimacy, reciprocity, efficiency, and stability (Oliver, 1990). Oliver pointed out that even the presence of one critical contingency could suffice to instigate an IOR. Yet, the latter three contingencies (reciprocity, efficiency, and stability) come into sight as prevailing justifications for organizations to participate in formal standardization (both for firms engaging in an assertive SMA and those deploying a vigilant one). The following paragraph aims to elucidate these claims.

Specifically, "reciprocity" refers to "the purpose of pursuing common or mutually beneficial goals or interests" (Oliver, 1990), and emphasizes cooperation and coordination among organizations. Indeed, as expressed by the

interviewed company representatives of both Scania and Volvo, the climate prevailing within formal standardization committees is one of voluntary cooperation, where consensus processes take place for the benefit of all participants. More specifically, within the frame of formal standardization the various organizations collaborate in a mutually beneficial fashion, albeit with each organization's specific interests kept in their representatives' minds, in order to develop voluntary standards that may coordinate their actions and efforts in regard to specific objectives—for example, standardization of material specifications. Then, "efficiency" addresses an internal, rather than external, emphasis—however, organizations might enter an IOR in order to "pursue reciprocal inter-organizational benefits" and subsequently improve their own efficiency (Oliver, 1990). Correspondingly, organizations might partake in activities of formal standardization with the aim of enhancing internal efficiency by learning from other participants and eventually adopting developed standards to augment efficient conduct of activities—for example, through process or product standards. Finally, organizations may establish relationships in order to amplify "stability" (or predictability), as "an adaptive response to environmental uncertainty" (Oliver, 1990; Pfeffer & Salancik, 1978), such as via the establishment of mutually adopted standards and the cultivation of buying coalitions, which will be further discussed in later sections. Uncertainty stimulates organizations to form IORs in order to achieve stability and predictability (Oliver, 1990). Similarly, the necessity to develop technological standards in order to manage technological uncertainties might lead organizations to coordinate their efforts towards standard setting.

All of the abovementioned motives were cited by a plethora of interviewees from both case companies, encompassing standardization engineers, company representatives, and management members. That is, organizations might enter formal standardization interorganizational settings for reasons of pursuing mutually beneficial goals, enhancing internal efficiency, and/or managing environmental uncertainties. In any case, each participating firm will (or at least ought to) enter this IOR with a selected SMA—that is, with a predecided attitude and strategic intentions regarding their presence there. Although the selected SMA must comprise the outcome of certain (organizational) antecedents, and consequently ought to determine a number of (again, organizational) choices, SMA comprises an equally interorganizational concept (and not a concept that is merely connected to the individual organizational). Rather, SMA becomes meaningful within the setting of an interorganizational network—namely, formal standardization—since it denotes the attitudes and intentions of the firm in relation to other firms participating in the

standardization setting. That is, standard setting ought to be considered along with other types of IORs, and the SMA specifically denotes participants' ways of being and functioning within this setting; for instance, acting assertively or vigilantly within formal standardization.

8.2.2 Corporate strategy: Factors determining SMA choice

As presented in the previous section, the choice of SMA—that is, assertive or vigilant—comprises a key decision in regard to CSM, although it can be altered in the future if the organization's circumstances change. The factors and circumstances that are most closely linked to the firm's overall corporate strategy—that is, (1) scope of manufacturing, (2) scale and growth itinerary, and (3) suppliers' relations—outline its varying needs in connection with standardization management, and hence determine the standardization approach.

8.2.2.1 Scope of manufacturing

Scope of manufacturing refers to the range of products and components manufactured by the firm (Chandler & Hikino, 1990), and comprises a prevailing dimension that determines the necessity, and hence prioritization, of standardization management in a corporation. A broad range of manufacturing activities, in the case of a variant product offering, generates important cost disadvantages, as well as increased chances for manufacturing errors (Powell & Arregle, 2007). This challenge can be mitigated through standards and standardization, elucidating a company's decision to strategically prioritize standardization work, and subsequently deploy an assertive SMA despite the demanding prerequisites for it. In addition, in the case of a broad manufacturing scope, the manufacturer must accordingly obtain access to a wide range of materials and parts. In other words, the manufacturer arguably appears to be dependent on a broader set of (external) resources, which increase the external uncertainties and at the same time burden the company with an onerous and more challenging job for safeguarding those resources (compared to the demands and resource dependencies of a manufacturer with a more limited scope). Due to these higher chances for errors and broader resource dependencies, corporate standardization may comprise a strategic tool for firms managing a broad scope of manufacturing.

The case of Volvo is represented in that description, since the company offers a broad range of products, from class 1 to class 8 trucks and buses. More specifically, class 1–8 encompasses three significantly different size categories of vehicles, with each one requiring dissimilar components and processes. Use of modular systems becomes challenging or even impossible in those terms, and cost disadvantages become apparent. What Volvo needs, in this case, is a set of established standards that will make everyday work more manageable throughout the whole corporation. Along these lines, Powell and Arregle (2007) discussed "the axis of errors," meaning that firms' performance is affected by "avoidable errors" and "failures to attend to the activities." Certainly, all firms (no matter how successful or unsuccessful they are) make mistakes, and these errors may endure and be repeated for decades (Powell & Arregle, 2007). It is easily deduced that the broader the scope of manufacturing, the higher the opportunities for "a litany of avoidable corporate mistakes" (Powell & Arregle, 2007; Finkelstein, 2004; Lowenstein, 2000). However, as Powell and Arregle (2007) stated, managers do have the opportunity to remedy those errors. The authors did not specifically discuss how, but mainly focused on the fact that "the persistence of error is a strategically significant empirical phenomenon," despite those errors comprising solvable problems (Powell & Arregle, 2007). As can be seen from the empirical study, Volvo relies upon standards and standardization as a way to mitigate solvable mistakes and increase the quality of deliveries. Especially in the case of variables such deliveries, the company's broad scope of manufacturing increases the chances of faults and corporate standardization thus comes to light as a "motivation factor"—that is, a factor that is of high prioritization and strategic importance. Furthermore, precisely due to its broad manufacturing, and hence variant, needs in materials and components, Volvo could use an established set of standards (for example, material standards and/or specification standards) in order to safeguard its access and facilitate communication with suppliers for the procurement of those components. Considering also the fact that Volvo prefers to have access to components that suit its own preferred specifications and requirements (so that it does not have to adapt its whole manufacturing system according to what is "available"), it serves the company well to influence standardization work towards its own preferences and specifications.

On the other hand, in the case of a more limited scope of activities, lower prioritization of corporate standardization is viable, since it enables higher modularity, and consequently higher control of components and activities (Ambrutyte, 2014). Scania has limited its product offerings to class 8 trucks and buses, meaning that the company manufactures and produces only heavy trucks

and buses (the largest class category). By limiting its scope of manufacturing and focusing exclusively on the production of same-size vehicles, Scania enjoys tremendous opportunities of modularity. In that sense, there is much less of a need to play a leading role in external standardization (that is, leading and influencing it) than seems to be the case for Volvo (which seeks to reverse its challenges and cost disadvantages by establishing formal standards). Hence, for Scania, corporate standardization comprises more of a hygiene factor—that is, it is not completely eliminated (since Scania is present in formal standardization committees and utilizes formal and internal standards), but is prioritized less in the organization, which follows a vigilant standardization approach. This vigilant approach comes with considerably lower organizational demands, as expressed in previous paragraphs.

A major determinant of a company's product range, and subsequently scope of manufacturing, is the specific target market. Most likely, as long as a broad market is targeted, an equivalently broad product range will be offered; this leads to an extensive need for standards and standardization in order to mitigate costs by searching for economies of scale and scope. Specifically, Volvo offers a broad range of products precisely because it aims to cover the overall market for trucks and buses, meaning the different segments in regard to product size and cost. Conversely, a more focused niche market strategy, such as the one used by Scania, generates a markedly lower scope of activities, correspondingly decreasing the urgency for such economies. Scania is very outspoken regarding the fact that it focuses on serving a very specific niche market—that is, luxury heavy vehicles of recognized, superior quality. Although it cannot be claimed that economization resulting from standards and standardization does not benefit a company that targets a niche market, the need is certainly much less pressing in comparison to the case of a broad manufacturing scope.

8.2.2.2 Scale, and supplier relations

Another corporate dimension that eventually impacts the necessity for corporate standardization is corporate size (in terms of product deliveries, which exponentially increases the resource needs in materials and components), along with the organization's intentions with respect to relations with suppliers. The latter refers to the corporation's choice to focus on working with a limited and unchanging number of suppliers (as in the case of Scania), or aims to access a broad pool of potential suppliers (as per Volvo).

In the former case—that is, where a corporation focuses on working with a limited number of suppliers or commits to producing strategic parts in-house—

no benefit is found from diffusing particular technical specifications through assertive standardization management. Ambrutyte (2014) took up a relevant discussion, noting that "with development predominantly in-house and good knowledge of the supplies required, no complex parts from suppliers are needed. This contributes to loose controls in relationships." Since the 1940s, Scania has focused on in-house production of strategic parts (Ambrutyte, 2014), while it also mainly works with an established base of suppliers. In other words, Scania is neither particularly interested in "managing" its suppliers' relations, nor facing any sort of challenges that would call for specific attention in that direction. In fact, the company is not particularly dependent on its suppliers since it produces critical parts in-house, and also works with a limited scope and scale of manufacturing (in essence meaning that a limited base of suppliers is sufficient for supplying the company).

On the contrary, in Volvo's case, supplier relations are much more critical for the company, since the broad scope and large scale of manufacturing renders Volvo vulnerable to much higher supply uncertainties and dependencies. Hence, if wide access to a broad pool of suppliers is preferred, with those suppliers ideally being very familiar with the company's standards and specifications, then an assertive standardization approach is more applicable—and aims to establish preferred specifications and the cultivation of buying coalitions. In that context, diffusion of the company's standards stipulates easier coordination with a large number of suppliers, and subsequently boosts cost efficiency and quality—which Brandenburger and Nalebuff (1997) called "trade-on." As Brandenburger and Nalebuff (1997) claimed, it is absolutely possible to end up with increased quality yet lower cost, and this is what they characterized as value creation through "trade-ons." They specifically referred to the "quality revolution," in which "people learned that redesigning the manufacturing process—rather than reworking defective items—led to quality improvements and cost savings at the same time," continuing that high quality in fact equals low cost. Although they did not explicitly link the "quality revolution" to standards and standardization, the linkage seems rather self-evident—for example, by considering the minimum quality standards, as well as other types of standards such as process standards, information standards and so on. Altogether, by establishing and spreading best practices and specifications through standards, increased quality can be achieved at lower cost.

In that sense, technical standards comprise a common language and vocabulary that enable smooth and straightforward communication among the different players in an existing market (Mione, 2009)—for example, manufacturers and

their suppliers. The less autonomous organizations are (which largely relates back to broad ranges and large volumes of product deliveries), the more action they will take to manage external interdependencies and IOR (Hillman, Withers, & Collins, 2009; Bae & Insead, 2004)—for example, through CSM. As Cooper and John (1988) and Barringer and Harrison (2000) pointed out, when organizations consume mainly their own output, demands and coordination are rather internalized, while, in the reverse case (that is, when they seek to obtain critical resources from other organizations), needs for interorganizational coordination emerge. The above summarizes the case for assertive organizations, which attempt, through their influence in standardization settings, to manage and articulate their relationships with suppliers. This is precisely why Volvo has justifiably opted to deploy an assertive SMA, while Scania does not need to do the same.

8.2.2.3 Growth itinerary

Last but not least, with respect to determining the company's circumstances, and hence the choice of SMA, growth itinerary plays an essential role, especially in the case of horizontal (acquisition-driven) expansion, as opposed to organic growth.

Pursuit of acquisitions (especially international ones), in combination with the intent to deploy a brand portfolio perspective—that is, embrace multibrand coordination, exponentially increases the necessity for vigorous CSM. Volvo Group comprises an example of a very active acquirer, having carried out a series of international acquisitions in recent decades (having acquired, the Canadian company Prévost in 1995, the French Renault trucks and American Mack trucks in 2000, the Japanese UD trucks in 2007 and the Indian Eicher trucks in 2008), and hence becoming an increasingly horizontally grown company.

The number of international acquisitions has significantly increased over recent decades (Hitt, Hoskisson, Johnson, & Moesel, 1996; Moeller & Schlingemann, 2005; Martynova & Renneboog, 2008). Acquisitions may be used as a major source of growth, new capabilities, increased resources under the control of management (Hill & Jones, 1992), as well as a pathway to enter desirable markets in today's global marketplace (Hitt et al., 1996; Balakrishnan, 1988). In particular, the latter has been a primary motive for Volvo Group's international acquisitions. Acquisition-driven expansion most likely leads to substantial increases in the number of assets and markets of the original firm; in essence, a whole new portfolio of businesses falls under the management of the acquirer (Hitt et al., 1996). Additional reasons for seeking and completing acquisitions

(especially horizontal ones—that is, acquisitions that include firms of the same industrial sector, operating on the same level of the supply chain) encompass the search for synergistic effects, such as scale and scope economies (Certo & Peter, 1988; Sudarsanam, 2003; Miklitz & Buxmann, 2007). Furthermore, as Pfeffer and Salancik (1978) stated, horizontal acquisitions increase concentration within the industry, which results in an elevation of power over suppliers and customers. As a consequence, such concentration confines "the choice set of stakeholders, thereby altering the configuration of resource dependencies." For a company like Volvo Group, which faces considerable resource dependencies (as discussed in earlier sections) as a result of its large scale and broad scope of manufacturing, escalation of power and control over suppliers (through concentration, in that case) is critical.

However, the increased complexity that comes with sudden (acquisition-driven) growth must not be underestimated—though it often is (Ahuja & Katila, 2001; Hitt et al., 1996). Once an acquisition has materialized, the process of integrating the acquired assets and consolidating business processes is vital but challenging (Fulmer & Gilkey, 1988; Shrivastava, 1986; Hitt et al., 1996; Miklitz & Buxmann, 2007). Indeed, Volvo Group has not avoided such challenges; the company has faced (and somewhat continues to face) difficulties of coordination among its various brands, as well as difficulties in reaping the anticipated synergistic effects. Corporate standards and standardization can play a central role in this substantial task; Hitt, Hoskisson, Ireland, and Harrison (1991), Hitt et al. (1996), and Ahuja and Katila (2001) stressed the issue of "absorption of managerial energy in the acquisition integration process at the expense of routine management." Miklitz and Buxmann (2007) also discussed how "employees have to be convinced and trained and business processes might have to be changed." By means of agile CSM, an organization becomes able to reduce information asymmetry (Hitt et al., 1996) and boost overall coordination—which is very much needed within a corporation that is pursuing one or more corporate acquisitions. In other words, especially in the case of a multibrand and multinational company, deployment of assertive standardization management is more adequate in order to prompt overall coordination and cost efficiency, and boost economies of scale and scope. On the other hand, in the case of an organically grown company (such as Scania), similar challenges are not as intense. Since the company has grown gradually, sudden coordination challenges have not appeared, which explains why the company has not sought to resolve such challenges through corporate standards and standardization (as per Volvo Group).

In conclusion, this study regarding CSM potentially entails implications for every firm with plans for acquisition-driven expansion. M&A strategies encompass well-grounded justification for a higher and more attentive prioritization of CSM—for example, through the deployment of an assertive approach.

8.3 Focal aspects of SMA

After having presented the factors that determine the selection of SMA, the following sections aim to present all focal aspects of SMA (and hence CSM), as indicated by the empirical study. Some were presented and discussed in the preliminary theoretical framework, while others were derived from the empirical material. As stated above, the two identified SMAs differ in their focus and subsequent choices. This degree of variation will be exposed in the following paragraphs, since all of the following aspects comprise cornerstones for an assertive approach, while not all of them are prerequisites of a vigilant SMA.

The focal aspects in relation to SMA were mentioned at the beginning of this chapter, but their associations will also now be discussed. The internally oriented ones encompass (1) resource commitment and (2) *organizational awareness*, while the externally oriented ones encompass (3) external participation and (4) *openness.* When organizational awareness and external participation are combined effectively, they stipulate *interrelation of internal and external efforts,* which comprises an internal interface element—that is, addresses intraorganizational dynamics. In addition, when resource commitment and openness are added to the picture and combined effectively, they spawn *precedence* and *cultivation of buying coalitions*—which comprise external interface elements—that is, address interorganizational dynamics. More specifically, precedence refers to horizontal external interfaces (relations with competitors), while cultivation of buying coalitions refers to vertical external interfaces (relations with suppliers). Each of the abovementioned concepts is more elaborately defined and discussed in the following paragraphs.

This chapter will also illustrate aspects that were not found in this study to be critical for CSM. Theoretical connotations in regard to these aspects will be discussed as well, in an attempt to unravel why they were not supported by the study even though they were included in the preliminary theoretical framework.

8.3.1 Resource commitment

Sufficient resource availability was portrayed in the preliminary framework as a significant challenge that organizations need to overcome in association with standardization management, considering that demands can reach quite high levels (Betancourt & Walsh, 1995), while standardization initiatives will most likely not be launched unless resources are available to support them (Zhao et al., 2011). Along similar lines, Henson and Humphrey (2010) also pointed out that developing and maintaining standards is costly, and even questioned why private actors (for example, firms) would choose to be involved. However, they claimed that many different entities (referring primarily to companies, but even including governments as well), utilize standards "as part of their competitive strategies" (Henson & Humphrey, 2010). They provided a number of examples from the agri-food industry, but did not specify the characteristics of those entities. I believe that the previous section (that is, on factors determining SMA choice) provides some insight on this matter, as resource availability and, most importantly, readiness to commit organizational resources play a vital role in the pursuit of CSM (Betancourt & Walsh, 1995) and especially in the pursuit of an assertive approach—which in turn comprises a strategic/competitive tool. Namely, Volvo, which deploys an assertive SMA, manifested in the empirical study a noticeable readiness to commit the required organizational resources (both financial and human), in order to push through its assertive approach in the formal standardization committees. More specifically, very experienced standardization personnel manage corporate standardization, both internally as well as externally; regular standardization-related communication and coordination takes place within the organization, while multiple company representatives also take part in the various formal standardization committees (so that the company enjoys increased chances of influencing, and even leading, the work and decision making).

Furthermore, Grossmann et al. (2015) discussed the fact that as long as participating firms appear willing to incur the costs of their participation in formal standardization activities—not to mention leading those activities—they must be reaping benefits from it that exceed those costs. Examples of such benefits could include cost savings or increase in market share (Swann, 2000; de Vries, 2007; Weissinger, 2013). In any case though, irrespective the of different companies' justifications, it has been repeatedly stated—or at least hinted at—in previous literature that the costs related to standardization activities should not be overlooked. More specifically, availability and readiness of means (such as

financial means and knowledgeable human capital) comprise a key feature that fundamentally distinguishes an assertive organization from a vigilant one, taking into account the amount of human and capital resources required in order to pursue assertive standardization. As Mione (2015) stated, "setting standards (i.e. formal standardization) requires time, money and sharing knowledge and knowhow;" hence, a crucial question is whether a firm is prepared to go along that road.

Scania comprises an example of a firm that is not prepared to do so; it does not show a counterpart willingness to direct organizational resources towards standardization work, especially in regard to the external aspects of it. More specifically, Scania limits its external participation to minimum requirements (that is, one company representative per standardization committee, most of the time), which of course does not hint at any ambition in particular to lead or influence those processes—rather, Scania representatives aim to remain up to date on any progress.

However, it is important to clarify here that such a "minimum requirement" is still a voluntary one, since every company could choose to completely refrain from formal standardization work and hence make no organizational resources at all available for that purpose. Hence, it is essential to keep in mind that although a categorical distinction is being made here regarding the readiness of organizational resources towards standardization work, or their minimum consumption, it is made within a framework of firms that choose to be involved and engaged in formal standardization work. This should not be seen as a distinction of firms who engage in, or overlook, formal standardization work and progress; in fact, Scania, despite deploying a merely vigilant SMA and subsequently aiming to limit resource consumption, by no means overlooks formal standardization, since the company's representatives are regular members in a number of standardization committees.

Coming back to the differentiation between assertive and vigilant SMAs, the empirical observations did reveal that organizations' standardization approaches and strategic intentions connect tightly with the amount of resources engaged in standardization work (and equivalently with the readiness to commit further resources if required), in order to accomplish their strategic aims. These differences in approach (and, in turn, in resource availability for standardization work), also connect tightly with the organizations' varying needs and dependencies. Resource dependence theory explicates how organizations "*need* … to forge relationships with other organizations" (and most preferably "stable inter-organizational relations based on cooperation," such as durable ongoing

standardization groups), in an attempt to regulate the external environment and manage their own dependencies (Rossignoli & Ricciardi, 2015). Therefore, it is arguable that organizations facing the highest uncertainties, as well as high dependence on others (such as high resource dependence due to a large scale and broad scope of manufacturing), can be expected to appear more invested in those ongoing interorganizational groups (that is, standardization committees). Resource availability (and willingness to commit resources towards CSM) is an indispensible feature for an assertive standardization approach; assertive standardization strategies cannot be maintained in correspondence with strict resource limitations, and that needs to be taken into serious consideration by organizations when outlining their standardization itineraries. On the other hand, a vigilant approach is feasible in a situation of resource limitations; that is, a vigilant organization may still participate in standardization committees and keep a keen eye on ongoing standardization trends, but with a philosophy of minimizing resource consumption.

Hence, besides financial means, human capital was also found to play a significant role in CSM. It was discussed in the preliminary framework that personnel's prior knowledge (Jensen & Webster, 2009), experience (Arthur, 1989), and expertise (Lehr, 1992) play a key role in a firm's capability regarding managing standardization. It was also stressed that effective participation in standard setting requires a high level of competence—for example, technical and business expertise—otherwise, participants will not be capable of handling the process effectively (Lehr, 1992). The empirical findings support these propositions, specifically in connection with the abovementioned interrelation of efforts and external participation (which will be discussed in more detail later on). Specifically, the competence of the standardization workforce regulates how standardization management is practically performed and how well the different roles are carried out. Examples of such outcomes within Volvo include the build up of robust communication flows between the standardization department and the rest of the organization, the tight interrelation of internal and external standardization efforts, the enduring external scrutiny of ongoing standardization work, and finally, the capacity to maintain control of the firm's overall standardization management. The abovementioned (arguably challenging) accomplishments to a large degree relate to Volvo's standardization personnel's experience and abilities in managing and retaining those vital functions that allow for overall coordinated standardization management. On the other hand, Scania's standardization personnel have not been able to retain (or revive) those similar standardization-related corporate functions, not because

they are less capable, but mainly because the whole team (put in place by higher-level management) is very new to standardization management.

However, unlike internal corporate standardization, the personnel managing external standardization—that is, representing the companies in formal standardization committees—comprise highly experienced technical experts and specialists (both for Volvo and Scania). That is, empirical observations endorsed (Lehr, 1992) argumentation that high levels of technical and business expertise are required in order to capably handle external standardization processes; this was also supported by empirical observations. Characteristically, in both case companies it was exclusively experienced and knowledgeable personnel (in regard to standardization as well as the organization per se) joining the external standardization committees, contending that effective participation is not otherwise viable. As a matter of fact, considerable technical competence and expertise are required in order to ensure that company representatives are not overwhelmed by the ongoing standardization process, but maintain the capacity to identify the relevant issues (for each company, respectively) and make fitting choices throughout the standardization processes.

8.3.2 Organizational awareness

The concept of organizational awareness, which was not discussed in the preliminary framework but was unearthed empirically, denotes management's and standardization personnel's extensive knowledge of the organization's circumstances, interests, strengths, and weaknesses. Although not discussed specifically in relation to CSM, the concept of awareness has been introduced in previous research and defined as "an understanding of the activities of others, which provides a context for your own activity" (Dourish & Bellotti, 1992). Within the context of an organization, members have become aware of their own and others' activities when they are able to discern them from, and relate them to, a context—as well as to discern and relate them to each other and to the whole (Marton & Booth, 1997). As Dourish & Bellotti (1992) stated, overall awareness (of individual, as well as collective, activities) is essential to enable prosperous collaboration—that is, "enable each individual to make sense of others' activity and tailor their own work accordingly." Arena (2004) also discussed organizational awareness, and although he did not clearly define the concept, he assigned some important characteristics to it, such as "a heightened understanding of organizational strategy," "clarity around common group struggles," and "appreciation for the various roles across the larger organization."

In other disciplines, Tierney (1981) and Álvarez-Napagao, Gómez Sebastià, Vázquez Salceda, and Koch (2010) explicitly drew attention to organizational awareness. Tierney (1981) also discussed organizational awareness in her study about hazardous materials and acute chemical emergencies. She related this to preparedness for chemical emergencies, and essentially approached the concept of awareness as some kind of high-level understanding and realization (of the hazards implied, and of the necessity for anticipative planning). Álvarez-Napagao et al. (2010) discussed organizational awareness in the field of artificial intelligence, and more specifically in real-time strategy games. They discussed the fact that awareness is crucial in academic artificial intelligence research, since it provides insights and explanations into individual agents' decision making in specific contexts, and specify the importance of organizational awareness in terms of "high-level objectives, structure and normative restrictions" (to be taken into consideration in decision making).

In other words, despite the fact that the concept of organizational awareness has been utilized in different disciplines, the abovementioned definitions and approaches apply to CSM as well. Since corporate standardization should be managed in a way that holistically suits the firm, it inescapably connects with a necessity for strong overall organizational awareness. Especially in order to deploy an assertive approach—that is, endorse preferred standards specifications and drive the standardization process in accordance with the company's interests—those interests need to be very clearly renowned among the company representatives in formal standardization committees. For that reason, Volvo highly prioritizes such organizational awareness—that is, has very good knowledge of the company's circumstances, strengths, and interests. Once strong organizational awareness has been accomplished, meaning that a clear comprehension and outline of the company's interests and objectives has been attained (primarily by the standardization personnel), assertive representatives can focus their efforts on pushing towards those objectives and standards specifications externally—that is, in external standardization committees. Otherwise, the company's interests cannot be served effectively and in a coordinated fashion. In fact, Van Wessel, Ribbers, and De Vries (2007) quoting Cargill (1989), stated that "company standardization should be directed by an understanding of where an organization is going." Although none of them called this "organizational awareness" (or anything else), their point of gaining "understanding" is arguably similar to obtaining overall organizational awareness. Furthermore, in relation to standardization settings, and although again not mentioned specifically, the necessity (and actuality) of organizational awareness was depicted in earlier research by Schilling (1999). Schilling was

among the first (and very few) researchers to point out that firms could "strategically influence" standardization outcomes—with the word "strategically" denoting that firms should be very well aware of why and in what direction they wish to influence standardization. More recently, Mione (2015) stated, "the discussions and conflicts within SDOs reveal that standards are not only a question of technical optimization but reveal deeper conceptions about the products, the service offered and the market." In other words, participants join standardization settings with broader views and conceptions regarding their objectives and aspirations than purely technological ones. These varying, or even "contradictory," objectives (Mione, 2015) may, at least to a large degree, be assigned to various organizational circumstances—which representatives must be aware of.

Such awareness is in turn accomplished through regular and well-functioning communication among different parts of the organization, meaning that efforts need to be made by various organizational teams (namely, high-level management and standardization personnel) in order to maintain constant organizational awareness. However, unlike an assertive approach that is hopeless without strong organizational awareness, a vigilant one can be sustained even without a strong overall organizational awareness, since the company representatives are not primarily joining standardization meetings in order to influence and direct them. To cite Scania as an example, the company's standardization engineers and technical experts carry out CSM with noticeably less organizational awareness compared to Volvo's personnel. For instance, in Scania, the different parties do not meet at regular or fixed times to exchange information and opinions and coordinate their actions, in the way that the respective teams in Volvo do. Instead, the standardization unit carries out primarily internal standardization-related activities, while external standardization is managed by the company's representatives (technical experts and specialists), without these two parties instructing each other. Hence, overall standardization-related awareness is not pursued in Scania, though the company carries out its SMA successfully. As expressed already, the only reason this is possible is because Scania deploys a vigilant approach (and not an assertive one, for which organizational awareness is necessary). Nonetheless, organizational awareness would certainly be beneficial for every organization, inclusive of vigilant ones (although it is not imperative in those cases) due to the tight internal coordination it both requires and generates.

8.3.3 External participation

Regular external participation in formal standardization settings was presented in the preliminary framework as vital in order to remain up to date on the ongoing standardization progress—and this was empirically established, regardless of the SMA used. However, such participation might occur in different forms (depending on approach); namely, with the aim of merely scrutinizing the external environment (as in Scania's vigilant approach), or with the intention of scrutinizing and influencing the outcomes (as in Volvo's assertive approach).

Schilling (1998) highlighted the hazard of technological lockout faced by every organization indiscriminately, and Funk (2003) and Leiponen and Helfat (2010) suggested that a way to tackle this hazard is through information advantages—for example, through participation in external standardization committees. Formal standardization encompasses a setting in which actors of multiple organizations are involved (Grossmann et al., 2015). As further stated by Delcamp and Leiponen (2013) and Ballester et al. (2006), participating firms engage in the activities of external standardization committees in order to access the new knowledge that is created during those processes. The benefits that firms become able to reap by acquiring external knowledge have been debated numerous times in previous literature; for example, by He, Ghobadian, and Gallear (2013), Lawson, Petersen, Cousins, and Handfield (2009), Rauniar, Doll, Rawski, and Hong (2008), Yeung, Lo, Yeung, and Cheng (2008), Modi and Mabert (2007), Kotabe, Martin, and Domoto, (2003) and Wu and Hsu (2001). He et al. (2013) specifically pointed out that the newly acquired information and knowledge enhances firms' performance and generates various kinds of capabilities—for example, "dynamic learning capabilities" and "client-specific capabilities" (Dyer & Nobeoka, 2000; Ethiraj, Kale, Krishnan, & Singh, 2005). Furthermore, He et al. (2013) and Wu and Hsu (2001) noted that the quantity and variety of knowledge acquired by firms has been found to enhance their innovativeness. Within the standard-setting context, knowledge (for example, R&D knowledge) is shared among participants (Delcamp & Leiponen, 2013), allowing companies to access a plethora of information (Mione, 2015).

Scott and Davis (2007) also stressed the issue of knowledge exchange among organizations, in association with coordination of activities for the pursuit of organizations' joint objectives. The authors took up Schermerhorn's (1975) discussion on how conditions of resource scarcity/dependence and environmental uncertainty stimulate organizations to engage in cooperative

arrangements with other companies. In that context, with respect to resource dependence theory, Davis and Cobb (2009) stated that ways to reduce uncertainty, and the subsequent dependencies, emanate from "devices" of governing relations with other industry players (and out of a variety of such devices, organizations tend to prefer the least-constraining ones). The authors then indicated specific means of inducing collaboration and coordination among various organizations, such as alliances and joint ventures, though they see these as risky and rather constraining tactics, and hence far from ideal. Conversely, coordination of efforts through standardization committees (although not acknowledged by any of the aforementioned authors) does not impose any apparent constraints on the participants, yet has beneficial effects.

Participation in external standardization committees emerged in the empirical study as a major information source for organizations, regardless of SMA. The need for an alert standardization management, and subsequently regular participation in external standardization committees as a way to collect important relevant information, comprises a key task in CSM for both Scania and Volvo, irrespective of their dissimilar SMAs. The organizations' experts who attend external standardization meetings are able to understand the external circumstances and assure that the organization will not be found technologically lagging behind or having missed out on vital information. At the same time, these experts are able to keep a careful eye on competitors and general industry trends. By participating in standardization committees—where standards' specifications are contemplated and contributors' negotiations begin—participants enjoy an opportunity to directly monitor other industry players—that is, competitors.

In regard to vigilant organizations, where influencing the outcomes is not a primary goal, information advantages and monitoring of competitors still constitute a necessary condition in order to ensure that the company will not find itself technologically lagging behind its competitors. On the contrary, by regularly being present in formal standardization committees, Scania's representatives maintain the capacity to "react"—that is, adjust if needed—to industry developments, ongoing standardization progress, as well as forthcoming standards.

As far as assertive SMA is concerned, since Volvo's representatives aim to stay a step ahead technologically and lead (or at least highly influence) standardization work towards favorable specifications, they cannot forgo industry trends and technological developments—on the contrary, they must be as aware as possible of the industry's and competitors' technological progress and status. In other

words, an assertive organization (such as Volvo) ought to regularly participate in external standardization committees. Of course, scrutinizing competitors and progress is highly beneficial, but the ultimate goal of Volvo's tactics is to influence that progress; standardization-related scrutiny is beneficial for the materialization of an assertive approach, but influence on the ongoing standardization work is also necessary.

Hence, both case companies, Volvo and Scania, participate regularly in external standardization committees, though with somewhat different predetermined objectives. That is, Volvo aims to participate in and influence outcomes, while Scania aims to participate in and remain updated on the progress and those outcomes.

Admittedly, participants' discussions and contributions within external standardization committees permit them to monitor each other—and at the same time be monitored themselves. As Grossmann et al. (2015) also pointed out, engagement in external standardization activities entails the risk of leaking proprietary knowhow to competitors. In other words, the more open an organization is in those discussions, the more it allows others to assess and monitor it. However, influencing external standardization (as in Volvo's assertive SMA) is unavoidable, and goes hand in hand with considerable contributions throughout the standardization work and progress. Even though participants can choose to be more or less open and thus have a more or less influential role (taking Volvo's stance as an example of the former and Scania's as an example of the latter), nevertheless both organizations partake in standardization discussions. Formal standardization comprises a joint effort by interested parties, which consensually set standards to be accessible for the public and available for any organization to use them freely, or "for a reasonable amount of money" (Grossmann et al., 2015). The upside of engaging in external standardization (in terms of information and external knowledge acquisition) is evaluated as worth being open to assessment or "monitoring" by other companies, and comprises an imperative factor for CSM.

8.3.4 Openness regarding internal standards

Openness is a factor that emerged from the empirical material, and connects very closely with both external participation and the choice of SMA. The concept refers to the policy of openness of organizations' internal standards, specifically encompassing tactics of openness in regard to internal specifications

and solutions (for example, revelation of internal standards and specifications) in order to induce collaborative behaviors within the setting of international standardization committees (Brandenburger & Nalebuff, 1997; Alexy et al., 2013). Openness differs from external participation since it specifically concerns the contribution to the standardization process (for example, by being open in regard to internal specifications and solutions and introducing them into the discussions and processes, as well as allowing internal specifications and standards be accessible by external parties, for example by not protecting them with passwords). On the other hand, external participation is not so much about contributing as it is about attending and taking information in. Hence, a tactic of openness within formal standardization requires that the firm participates in the standardization processes (which is how they connect), but external participation alone does not necessarily induce a tactic of openness (which is why these two concepts differ from each other). In other words, these two concepts jointly represent both "outside-in" and "inside-out" idiosyncrasies, where the former comprises external participation (that is, bringing inside the firm information from the outside, e.g. information from the standardization settings) and the latter encompasses openness (that is, offering solutions and specification from inside the organization to the outside, e.g. to standardization settings). It is important to separate these, since external participation ("outside-in") is a critical aspect of CSM, regardless of selected approach (assertive or vigilant), while openness ("inside-out") becomes important, or at least beneficial, once participants aim to lead and shape standardization outcomes (for assertive SMA only). Namely, Scania, which deploys a vigilant SMA, demonstrates external participation (in standardization committees), while Volvo, deploying an assertive SMA, demonstrates in those same settings of formal standardization both external participation and openness regarding its internal specifications.

By virtue of the two companies' dissimilar choices of SMA, Scania and Volvo are led to dissimilar openness tactics regarding their internal solutions. While Scania's vigilant SMA is satisfactorily served through a policy of protectionism—that is, of protecting the company's internal standards, Volvo's assertive approach is better supported by an openness policy, which means that the company's standards are not analogously protected. More specifically, since Volvo aims to push through and establish particular standards' specifications, the company is arguably benefited by selectively not protecting those specific internally developed standards, but instead allowing them to be visible online (to anyone, even competitors, who search using the standard number). The reason why such tactics might benefit from openness is that as long as Volvo aims to influence international standards towards specific directions, familiarity of other

industry participants with certain specifications advances the chances of those specifications being established in the industry; hence, the company does not strive to keep its standards' specifications secret or unique.

A policy of openness somewhat contradicts "conventional wisdom" claiming that "uniqueness is recommended" (Mione, 2009) and "imitation is the bugaboo of business strategy" (Brandenburger & Nalebuff, 1997). However, openness could be utilized as a useful tool for assertive organizations—that is, organizations that aim to influence external standards' specifications, since it provides them with the valuable opportunity to influence emerging formal standards "by contributing content from [their] own company standards" (Grossmann et al., 2015). As Alexy et al. (2013) discussed, selective revelation of information and knowledge can "be conceived as a strategic mechanism" among competitors. In that sense, an assertive organization finds benefit in adopting a tactic of openness in regard to internal specifications (for example, revelation of internal standards and specifications) in order to induce collaborative behaviors within the setting of international standardization committees. Similarly, Chesbrough (2006), Von Hippel (2005) and Laursen and Salter (2014) highlighted "the paradox of openness," stressing the need for firms to open up (to external actors) or "miss opportunities to exchange knowledge with different actors" (Laursen & Salter, 2014, p.876). On the contrary, protecting a technology will dramatically decrease the likelihood—or at least delay the process—of this technology being diffused in the market (Schilling, 1999). He et al. (2013) discussed how interorganizational collaboration expedites the development of valuable resources, while also "undertaking knowledge transfer activities helps a firm create value for itself" (He et al., 2013, p.609). For instance, knowledge transfer may create innovation-related advantages in the future, once an organization directs industry development and technological progress towards specific paths. Along these lines, previous empirical research within the automotive industry has shown that some automobile manufacturers choose to adhere to cooperative approaches, encouraging communication and sharing of benefits (Maloni & Benton, 2000; He et al., 2013).

Furthermore, Dyer and Nobeoka (2000) claimed that a network of firms can be far more effective in generating new knowledge compared to one single firm alone, due to the diversity embodied within the network. Consequently, Dyer and Nobeoka stated, great possibilities reside in the network's potential for cooperation. However, these observations are not limited to one industry; Powell et al. (1996) maintained that their study in the biotechnology industry showed the locus of innovation to be the network of firms, and not the

individual firm (Dyer & Nobeoka, 2000). In relation to inter-firm cooperation, Brandenburger and Nalebuff (1997) extensively discussed the subject of coopetition, where firms "simultaneously promote their own technology, and cooperate in sharing their technical knowledge" (Mione, 2009, p.93). As they claim, "where conventional wisdom goes wrong, is in ignoring the possibility of win–win strategies" (Brandenburger & Nalebuff, 1997). Within the coopetitive paradigm, firms pursue their own interests but at the same time consider their competitors' objectives, since mutual adoption is the most agile pathway to realize the firm's aspirations (Mione, 2009). Hence, an assertive organization (which essentially desires the diffusion of internally developed specifications among other market players), will not keep those standards secret or unique—but will make them accessible and potentially visible to external parties, even competitors. In essence, that is a fine strategic balance between openness and uniqueness, since the company's unique characteristics and interests are intended to be supported and established through openness.

On the other hand, "if the firm has no strategy in place to capture the value from its innovative efforts, it might choose to do it alone" (Laursen & Salter, 2014). That is, a vigilant organization (which does not deploy an equivalent strategy of diffusion of internal specifications among other market players—that is, does not have such a strategy in place), does not share respective incentives to allow its internal standards to be visible to external parties. A vigilant organization, such as Scania, does not seek to motivate collaborative efforts within the setting of an external standardization committee, but merely to remain up to date on such progress; therefore, Scania finds no benefit from such revelation (Alexy et al., 2013) or openness (Laursen & Salter, 2014). Unsurprisingly, then, Scania does not make its internal standards visible to external parties. Hence, the choice of openness (or not) is justified in accordance with an organization's overall SMA and needs to support its pursuits, as is clear in the cases of Scania and Volvo, which have made different choices that nevertheless suit their respective goals.

8.3.5 Organizational structure

In the preliminary framework, organizational structure was introduced as a potentially meaningful component for CSM, based on papers by Timmermans and Epstein (2010) and Zhao et al. (2011). These scholars have argued for the significance of "physical and cultural infrastructure" (Timmermans & Epstein,

2010) and "social structures" (such as organizational structures) (Zhao et al., 2011), for the endurance of standards and standardization initiatives.

More specifically, Timmermans and Epstein (2010) went as far as to discuss a standard-setting infrastructure (Tamm Hallström, 2004), referring to the internal structures and processes employed within an organization, towards the creation and establishment of a standard. Furthermore, Tamm Hallström (2004) connected structure to the proliferation of standards, implying that structure per se in essence facilitates the standardization process. The reason for this can be linked to the fact that, in the absence of an organizational structure that will hold things together, implementing standards within an organization (and hence moving "from design to procedural issues"), becomes "all the more challenging" throughout the different stages of implementation (Timmermans & Epstein, 2010).

However, the empirical case did not expose an equivalently significant role of organization structure for CSM (at least for the two case companies), in the sense that Volvo and Scania share an unexpectedly similar picture in regard to their standardization departments' organizational positions (in both cases, the standardization unit is hosted under the umbrella of R&D and encompasses close collaboration between standardization engineers and technical experts). Nevertheless, the two case companies employ highly dissimilar standardization approaches—leading to the conclusion that organizational structure is no determinant when it comes to CSM, at least in regard to firms that are engaged in formal standardization (for example, by participating in formal standardization committees).

Specifically delineating the two companies' similarities in terms of organizational structure (at the time of the study, but also, interestingly, over the past five decades), both Scania and Volvo founded their standardization departments more than half a century ago and decentralized their technical experts (from the standardization departments into various corporate areas) around 30 years ago. That is, approximately at the same time, both companies decided to change the (very similar) standardization-related organization structure they had at the time, and formalized it into a (very similar again) more decentralized one. As mentioned in earlier chapters, both companies decided on such decentralization as a necessary response to the increasing complexity of the automotive products and the growing number of technical experts in the companies—which rendered it impossible to keep all those experts under the umbrella of the standardization departments. Yet again, despite their astonishing similarities structure-wise, Volvo and Scania have dissimilar SMAs.

Perhaps the reason why organizational structure did not appear to play a decisive role in this study relates precisely to the specific cases, in the sense that both companies engage (actively) in CSM. It is likely that organizational structure would emerge as a differentiating component among companies that, respectively, do or do not engage in corporate standardization. Meaning that as long as a firm has chosen to stay away from corporate (internal and external) standardization, no internal structures need to be in place to support any standardization-related functions. On the contrary, as long as a firm has chosen to manage corporate standardization, specific features of organizational structure were not exposed to differentiate SMAs—as Scania and Volvo employ remarkably different SMAs, but share a notably similar organizational structure.

Finally, in this case study, organizational structure was completely overshadowed by standardization-related communication (for example, communication between the standardization departments and the company's experts and management), and subsequently interrelation of standardization efforts (as discussed in earlier paragraphs). That is, once well-functioning communication throughout the whole organization is present, it can very capably lead to interrelated standardization-related efforts of the various parties, regardless of the specific organizational structure (that is, the specific positions of each of those parties). This is precisely the reason why the two companies' similar organizational structure did not lead to equivalently similar outcomes in regard to the abovementioned interrelation of activities and efforts of the various actors within the organization. Hence, taking into account the unimportant role that organizational structure seems to play for CSM and approach, it is not encompassed in the final theoretical framework; rather, interrelation of efforts (which will be discussed in detail in following sections) was revealed to play an influential role in CSM.

8.3.6 Organizational culture

Organizational culture was another component included in the preliminary theoretical framework as potentially meaningful for CSM. Hofstede (1980) defined culture as "the collective programming of the mind, which distinguishes the members of one group or society from those of another" (where this might refer to a national, organizational, or any other type of group). Specifically in regard to standards and standardization, previous studies have stressed the significant nature of culture in organizations' attempts to adopt and implement standards. Namely, Sandholtz (2012) discussed the case of two equivalent

engineering divisions (within the same organization) seeking ISO 9000 certification; while both divisions achieved the desired certification, their internal characteristics created two very different stories and led to "divergent outcomes in the pursuit of standardization" (Sandholtz, 2012). It is interesting to note that Sandholtz's study did not even deal with two different organizational cultures (since both divisions belonged to the same organization), but with a smaller-scale micro-culture—which was still enough to provoke the aforementioned "divergent outcomes." Sandholtz went on to characterize one of the divisions as predominated by a "cultural of cynicism" (which was not evident in the other division) and stressed this difference in culture as the source of the contradictory aftermath. Such internal characteristics comprise elements of (organizational) culture; hence, Sandholtz provided evidence for the significant role of culture in standards implementation—that is, as part of standardization management. Two other empirical studies putting spotlight on culture and standards are those by Servais (2004) and Chow et al. (2001). Servais (2004) specifically discussed the disturbance that cultural differences impose on the implementation of universal labor standards—which are strictly "universal in scope," but the various and divergent cultural contexts strain those standards' harmonious implementation. Servais (2004) argued that the source of such influence (and often even disturbance), relates to the fact that "culture's defining characteristics continue to play a significant role in how humans behave and work" (see also Austen, 2003; Rocha, 2003; Hofstede, & Hofstede, 2001). Chow et al. (2001) demonstrated, through a large-scale experiment, differences in standards' implementation and effects due to cultural differences. Even after taking into considerations the limitations and potential biases of such an experiment, the study's findings point to very apparent culture-related effects on employees' responses to standards implementation.

Despite the strong empirical evidence in previous studies about the cultural impacts on standards, such implications were not uncovered in this empirical study. Both case companies have long-standing standardization cultures, as demonstrated by the foundation of departments for standardization concurrently with the foundation of the companies themselves. Moreover, both Scania and Volvo have been enduring and regular members of formal standardization committees. Nevertheless, the two companies are currently deploying dissimilar SMAs, based on each company's distinctive circumstances and needs (as discussed in detail in the section about factors determining SMA), rather than on cultural connotations. In other words, specific evidence on how organizational (or even national) culture affects CSM did not emerge in this empirical study. However, a limitation of the study may be the fact that both

companies' headquarters (as well as their standardization departments) are located in Sweden, which is likely to rule out major national cultural differences that might affect their CSM. However, taking into account the international presence of both companies, as well as the globalized arena of standardization as such, it is actually not surprising per se that culture (especially national culture) does not play a major role in their standardization management.

8.4 Internal and external interfaces

As mentioned previously, the effective utilization and combination of SMA focal aspects stipulates internal and external interfaces, namely *interrelation of internal and external efforts* and *precedence and cultivation of buying coalitions*, respectively. That is, both intra- and interorganizational dynamics are addressed by CSM, but the latter is primarily used for an assertive standardization approach. Specifically, assertive players—who aim to influence the standardization outcomes through their actions—employ precedence to influence their relations with competitors (horizontal external interface) and cultivate buying coalitions to shape their relations with suppliers (vertical external interface). Timing is also discussed, but this was not exposed to play an influential role for either corporate SMA, and hence was not encompassed in the final theoretical framework. These concepts will be further elucidated in the following sections.

8.4.1 Interrelation of internal and external standardization efforts

A concept that has not been identified in previous standardization research but emerged from the empirical material is the interrelation of internal and external (standardization-related) efforts—that is, inside and outside of the firm.

Predominantly for assertive standardization management, a close interrelation of internal and external standardization efforts is fundamental in order to coordinate the efforts of different actors (especially focusing on coordination of the standardization efforts inside and outside of the firm). In Volvo's assertive SMA, such close interrelation is apparent, boosting a virtuous circle across the internal and the external environment. The experts, the standardization department, and the rest of the organization—that is, managers and decision makers, maintain regular exchange of information. More specifically,

interrelation of internal and external circumstances and efforts (functioning as a perpetual cycle for the firm) is necessary for tackling the challenge of identifying value-potential issues for the company (Betancourt & Walsh, 1995)—and subsequently ascertaining that the organization's interests and strategies are served through its standardization management (both internally and externally). Especially since assertive organization aims to forcefully influence the standardization discussions, progress, and outcomes towards its own interests, these interests need to be clear and holistically served, in a coordinative fashion, by the various company representatives in the standardization committees.

Grossmann et al. (2015), discussing standardization strategies, borrowed Porter's (1996) definition of firm strategy as one of "defining a company's position, making trade-offs and forging fit among activities." Strategy comprises the firm's deliberate and unique choice of market position, governing the firm's numerous actions and activities in an integrated fashion (Porter, 1996). In a similar vein, Grossmann et al. (2015) stated that a firm's standardization activities "will need to be in accordance with the overall managerial strategy of a firm." However, what they failed to discuss is the fact that in order for a firm to be able to govern its standardization activities well in accordance with a specified overall strategy, activities need to be determined and stipulated on such an organizational level that permits the different parts of the organization to remain coordinated across their various efforts. These different parts need to have the same idea on what the overall strategy is, how standardization could serve it, what direction it needs to go in, and what specific actions need to be taken in accordance with new or emerging information. Unless internal information (from inside the organization) is effectively communicated and integrated with external information (from outside the organization), coordinated standardization efforts cannot be sustained. Volvo's personnel interrelate their efforts routinely through regular meetings in which the various standardization-related parties (including higher-level managers), exchange information and coordinate their upcoming work.

Nonetheless, the reason why "interrelation of efforts" is selected here as a more appropriate word than coordination is that the standardization-related efforts of different parties within an organization should in fact "affect one another" (Merriam-Webster, 2015) through the exchange of assessments, opinions, and information regarding the organization both internally and externally. Consequently, robust communication flows between the various actors of corporate standardization become critical (for example, through formalized, regular meetings in which standardization personnel, technical experts, and

higher-level management exchange information), since such exchanges establish a close interrelation of standardization efforts. Otherwise, information from internal (intraorganizational) and external (standardization committees) sources cannot be effectively integrated, which leads to fragmentation and decoupling of corporate standardization efforts.

On that issue, Huber (1990) specifically discussed horizontal integration within organizations as the utilization of communication structures and processes to serve and facilitate joint decision making among various entities or individuals in the organization. He pointed to the tremendous benefit and prosperity of decision making (in terms of development and evaluation of alternatives) once information exchanges "among a moderate to large number of experts or partisans" has taken place. The prominence of formal standardization-related communication flows and interrelation of efforts between the standardization unit and the rest of the organization (primarily technical experts and management) has not been embraced in earlier research, though was has been empirically found to be a powerful attribute for CSM. In fact, in this study, organizational structure per se does not appear to play a decisive role at all (as pointed out in an earlier paragraph) in regard to CSM and approach. Rather, it is the efficacy of communication flows that determine whether standardization management can be performed in a coordinated and controlled fashion. For that reason, despite the fact that Volvo and Scania are structured in a very similar way and have gone through comparable standardization-related structural changes (for example, placing technical experts outside the standardization departments), their corporate SMA is noticeably different. An essential difference between the two companies is that in Volvo, well-functioning standardization-related communication runs throughout the whole organization, while in Scania this is not the case at all. Consequently, the overall standardization efforts in Volvo are closely interrelated, while again, in Scania this is not the case at all. This lack of interrelation does not allow Scania to utilize standardization management strategically (that is, to achieve strategic outcomes) in the way Volvo does.

Nevertheless, Scania pushes through its vigilant SMA even though a cyclical interrelation of internal and external efforts does not take place—notwithstanding that if it did, it would be beneficial for the company (due to increased coordination). However, in the case of assertive SMA, unless regular integration of information has been nurtured (for example, through fixed meetings or formal channels of information exchange), the various actors of

CSM become unable to coordinate overall standardization management towards a specific direction.

Although not addressing standardization management specifically (but relationship quality management instead), Dimitriadis and Stevens (2008) discussed the necessity of "an integrated perspective," which "underlines the importance of coordination and coherence among all organizational, technological and human components" of an organization. Their discussion is arguably relevant for standardization management as well, in agreement with the empirical findings. As Dimitriadis and Stevens (2008) argued, lack of information, and subsequently lack of coordination, will produce an "internal/external gap;" unavoidably, "the existence of this gap will reveal obstacles" for the implementation of organizational objectives (Dimitriadis & Stevens, 2008). Peng and Litteljohn (2001) complement the idea of "bridging the gap," claiming that "communication is pervasive in every aspect of strategy implementation, and it is related in a complex way to organizing processes, organizational context and implementation objectives."

Despite the fact that organizational communication "does not guarantee the effectiveness of implementation," it is "a primary requirement of effective implementation" (Peng & Litteljohn, 2001). In regard to CSM, the empirical study revealed that for robust formal structures of communication to be set up and sustained, personnel experience is important in order to manage ongoing contact among various areas of the organization. Nevertheless, decision makers' support is an even more decisive factor. Specifically, explicit involvement of higher-level management in standardization-related activities (either in the sense of involvement in prioritizing future standardization work, or by demanding regular reporting through fixed meetings) is an effective way to ascertain that standardization-related communication is enforced. Otherwise—that is, unless higher-level management is involved and stresses standardization-related activities within the organization—it was shown in the empirical case that the technical experts will shirk the effort to implement or perform these activities. Explanations for this can differ; employees either try to avoid efforts and changes that have not been ordered by higher management, or perceive that as long as higher management has not requested them, they are not vital for the organization. The reason may also be a combination of both.

Predominantly in the case of an assertive approach, the necessity for interrelated internal and external standardization efforts is a prerequisite. A close interrelation and coordination comprise indispensible features, meaning that in order to be able to deploy assertive standardization management—that is,

assertively pursue and support the organization's interests and strategies in external standardization—internal and external information need to be constantly blended together in an unremitting cycle. As soon as this tight coordination is absent, an assertive approach cannot be sustained. However, such interrelation is beneficial for any type of standardization management regardless of approach; since it connotes, as well as creates, tight intraorganizational coordination (without necessarily increasing by much the costs for CSM). Simply, the same actors and mechanisms that are already in place for CSM would need to communicate and coordinate in a better way, which would then render those different parts aware of each other's actions and maneuvers, leading to better-informed decisions.

8.4.2 Precedence

Precedence, which was included in the preliminary framework based on previous studies by Arthur (1989) and Schilling (1998, 2002), refers to the tactic of standardization participants acting quickly and diffusing early their preferred specifications within the formal standardization setting, in order to enjoy an elevated opportunity to establish them before competing (and potentially technologically superior) alternatives are on the table (Mione, 2015; Schilling, 1999; Arthur, 1989).

Such ambitions of preferential establishment are of course connected with an assertive SMA. Volvo's standardization personnel (that is, company representatives, technical experts, standardization engineers, and even members of management) repeatedly expressed during the interviews that their primary goal is to influence external standardization processes—for which it becomes crucial to act quickly and offer solutions during standardization committee discussions. Preceding other participants with early technological solutions increases the company's chances of successfully establishing them. Interestingly, the concept of precedence in formal standardization was emphasized as far back as 1984 by Sutton (1984, p.88) (despite not being given a label back then), and revisited by Georgiou (2004, p.221), with both authors arguing that "an effective lobbyist" will endeavor to influence standard-setting processes at an early phase, while views and opinions are still "crystallizing." At this stage, both authors claim, chances of influence enjoy a peak. Volvo's representatives appear to have figured that out, as they characteristically made statements such as *"if we already have a solution, then of course we are pushing [this solution into] the Swedish or European standardization"* (stated by a standardization manager in

Volvo). On the other hand, efforts to precede other participants' solutions do not take place in a vigilant SMA, as long as no ambitions of influencing the standardization outcomes ensue for vigilant players. Along that line, Scania's representatives outspokenly stated that they would rather protect their internally developed specifications and solutions and keep them hidden from external parties. Hence, preceding with technological solutions within standardization committees is not really part of Scania's agenda.

Arthur (1989) and Schilling (1998, 2002) argued that corporations need to act quickly within the game of standardization processes, on the one hand to make sure that they do not find themselves technologically locked out (Schilling, 1998, 2002), and on the other to increase their chances that their particular technologies will be locked in (Arthur, 1989; Gruber, 2000; Schilling, 1998, 2002). Contemporary dominant technologies will enjoy advantages over future superior technologies due to lock-in effects (Gruber, 2000; Arthur, 1989). Shin, Kim, and Hwang (2015) underlined how standards impact whole industries "by establishing the rules of the game and creating a shared framework for innovation" (Grossmann et al., 2015), while Gruber (2000) highlighted how first-movers become able to carry over such advantages for decades ("across generations"), due to lock-in effects into dominant designs. Further, Shin et al. (2015) contended that standards "define common vocabularies" and "set the essential characteristics" of products and services. Grossmann et al. (2015) built upon the argumentation by Shin et al., extending it to company standards (that is, corporate standardization) and stating that a firm's innovative efforts could comprise a catalyst towards fruitful results, potentially for the whole industry. More specifically, developing internal standards and specifications, and subsequently pushing them into formal standardization in order to be included in emerging formal standards, has been characterized in previous research as a potential strategic advantage (Malisius & Weidner, 1998; Salop & Scheffman, 1983; Grossmann et al., 2015). Hence, precedence within the standardization setting relates to assertive players—since these are the ones that aim to push forward preferred standards' specifications, and attributes the relations with other industry players (namely competitors)—since assertive players aim to precede other participants (who are mainly competitors) within the specific standardization setting.

Assertive organizations, whose primary goal is to influence external standardization processes and establish particular specifications in accordance with the company's preferences, may "compete with each other to promote their own technology and choose the direction that is most beneficial to them"

(Mione, 2009). Before the establishment of a standard, a number of alternative technologies or solutions may be available (Mione, 2015). As mentioned above, precedent specifications and solutions enjoy increased chances to be established before rival (and potentially technologically superior) alternatives emerge. It has been stated a number of times in previous research that other factors "unrelated to technical superiority" may reign over the entrenchment of a technology—such as early offering (Schilling, 1999; Arthur, 1989; England, 1994; Katz & Shapiro, 1986). For instance, offering a technical solution quickly to an emerging problem or challenge during an external standardization process considerably increases the chances of "locking in" that solution—that is, the company's favored one. Subsequently, once a firm's favored solution has been chosen, that firm "is in a good position to shape the evolution of the industry, greatly influencing what future generations of products will look like," since "technology trajectories tend to be path dependent" and "standards are often capable of shaping the technological progress in an area" (Schilling, 1999). Altogether, precedence is vital when a company pursues an assertive standardization strategy—that is, a strategy of promoting particular technological specifications—and attempts to ensure that an early-established technology becomes dominant, so that even superior alternatives will not gain a footing (Arthur, 1989).

8.4.3 Timing

Despite the fact that precedence was found to hold for assertive organizations, timing per se was not empirically found to be vital (in this particular study), for either the vigilant or the assertive approach. Timing was encompassed in the preliminary framework, following the suggestions by Arthur (1989) and Georgiou (2004).

Arthur (1989), discussing competing technologies and lock-in effects, pointed out the importance of timing for future technological choices of users and developers. Although Arthur was not specifically or exclusively discussing standards and standardization, he pointed to the establishment of specific standards as an indicative example of where lock-in effects are potentially incurred. That being said, Arthur's propositions seem to frame an assertive organization's intentions very well; that is, once an organization aims to push through and establish specific technologies or technological specifications, the timing of "propagandism" can be expected to play an immense role in the strategy's success.

Furthermore, Georgiou (2004) accentuated an equivalent claim, stating that his research provided evidence "with respect to the timing at which [lobbying] activity takes place and its perceived effectiveness"—in other words, Georgiou very tightly connected the timing of an activity (in his specific example, lobbying) with the successfulness of that activity's cause. Arguably, Georgiou's case of standardization-related lobbying is comparable to an (assertive) organization's efforts for pushing through specific solutions within a formal standardization setting; one way or another, that organization is "lobbying" in favor of specific decisions among the standardization participants. Based on Georgiou's empirical evidence, the timing of those specific solutions' or specifications' introduction in the standardization discussions should play a critical role for their establishment.

However, such a role was not unearthed in this empirical study through the interviewees of either Volvo or Scania—although it would have mainly been Volvo (deploying an assertive SMA) that would have exposed such connotations, if any existed. Thus, somewhat surprisingly, timing was not found to be a significant factor for CSM; likely reasons for this probably lie with the particular nature of the industry and the automotive products. By way of explanation, the aforementioned scholars related the importance of timing to fast-moving industries and products (such as telecommunications [Arthur, 1989]). On the contrary, the life cycle of the automotive product is very long, and product planning per se lasts for years. In other words, the automotive product is a remarkably slow-moving one, where rapid changes seldom occur and finalization of adjustments often take place rather slowly—hence, timing is not dramatically connected to the product, or, subsequently, to standardization of that product.

Consequently, despite early offering of solutions and specifications increasing their chances of being established (that is, despite precedence being important for assertive standardization management), the specific timing does not appear critical. On the contrary, an assertive company will aim to create the desired circumstances—for example, through actively engaging and influencing formal standardization—instead of simply waiting for the right timing. In addition, a distinction between this study and the one by Arthur is that Arthur's mainly discussed the emergence of *de facto* standards, where timing plays an important role due to market dominance and subsequent technological lock ins, while this study focuses mainly on formal and organized standardization, encompassing internal corporate standardization and external formal standardization. As Farrell and Saloner (1988) and Grossmann et al. (2015) pointed out, the pace of

formal standardization processes, on both national and international levels, is rather slow.

Lastly, as depicted above, neither precedence nor timing were found to be relevant for vigilant SMA, since acting quickly towards the establishment of particular specifications is not even a concern for a vigilant organization.

8.4.4 Cultivation of buying coalitions (relations with suppliers)

Finally, a way to manage interdependencies among market participants (as stated in the preliminary framework) is more specifically the cultivation of buying coalitions. Such cultivation, which attends to relations with suppliers, refers to the isomorphism of buyers' demands (through the establishment of common standards), and hence the integration of factor markets. Through the establishment of common standards, to which suppliers quickly become accustomed, manufacturers are able to source the resources needed in a much less complicated manner, and with lower risks (for example, risk of not meeting their resource needs or sourcing low-quality resources due to suppliers' unfamiliarity with the specific demands and specifications). Hence, organizations that are highly dependent on others for the resources they need in order to survive and grow become able to reduce their environmental uncertainties, and subsequently other organizations' power over them, through the establishment and usage of common standards.

As predicted by resource dependence theory (Davis & Cobb, 2009; Pfeffer & Salancik, 1978), the organization's internal decision makers will act, to the best of their ability, to reduce their entity's uncertainties and dependencies, particularly focusing on "critical resource flows" (Rossignoli & Ricciardi, 2015). However, according to Rossignoli and Ricciardi (2015), as a consequence of their attempt to manage their resource dependencies, organizations must focus their efforts on negotiations with those organizations that control the resources (that is, suppliers). Interestingly, the standardization arena depicts a case in which organizations, in their attempt to reduce environmental uncertainty and resource dependence, focus their efforts on negotiations with their horizontal counterplayers (that is, competitors), rather than suppliers directly. Eventually, though, by managing the relationships with competitors and coordinating industry players' demands (that is, sourcing demands), relationships with suppliers are regulated as well.

Isomorphism of buyers' demands (towards promoted specifications) is the primary intention of an assertive SMA; by diffusing the firm's internal specifications as broadly adopted standards (which are utilized by a number of industry players), a plethora of suppliers become familiar with those specifications. Hence, the organization creates, for its benefit, a broader pool of accessible suppliers and simultaneously reduces other entities' power over the organization (referring, for instance, to suppliers, or even competitors enjoying close relationships with specific suppliers). Brandenburger and Nalebuff (1997) also discussed this matter, albeit from a coopetition perspective, concluding that "forming buying coalitions is a powerful strategy to bring in more suppliers," and consequently "bringing in more suppliers as a way to shift the balance of *power* in [the firm's] favor." In other words, incorporating resource dependence theory and a coopetition perspective to understand corporate standardization elucidates how active engagement in standardization processes might be a way for organizations' decision-makers to deal with power differentials, redistribute power among organizations, and reduce resource dependence and environmental uncertainty.

Lockström, Schadel, Harrison, Moser, and Malhotra (2010) reported plenty of empirical evidence denoting companies' difficulties in sourcing inputs, especially in the case of international operation, and even more so in regard to the automotive industry (Pyke, Robb, & Farley, 2000; Murray, Kotabe, & Zhou, 2005; Wilkinson, Eberhardt, McLaren, & Millington, 2005; Holweg, Luo, & Oliver, 2008; Zhang & Chen, 2006). Cultivation of buying coalitions and hence creation of a broad pool of suppliers is a safe strategy to avoid a shortage of supply sources, as well as dependence on specific suppliers. Resource dependence theory, developed by Pfeffer and Salancik (2003, 1978), focuses on how organizations can manage their dependence on other entities and preferably reduce it. Since organizations are not self-sufficient, they have to externally obtain necessary resources (Barringer & Harrison, 2000). More specifically, due to high requirements on quality and deliveries, the automotive industry is designated with "a high degree of value added by suppliers" (Lockström et al., 2010, p.241 - see also Tiemann, Scholz, & Thies, 2000; Quesada, Syamil, & Doll, 2006; Wagner, Bode, & Koziol, 2009). Suppliers comprise critical resources for a firm, both directly and indirectly (that is, through materials and services) influencing the firm's offerings. The eventual quality and cost of the goods and services depict the capabilities not only of the firm in question, but also of its supply network (Modi & Mabert, 2007). Of course, this means that firms are exposed to unintended quality risks connected with their suppliers, which only increase the lower the control and visibility in the supply chain

(Steven, Dong, & Corsi, 2014; Doig, Ritter, Speckhals, & Woolson, 2001; Landis, Mishra, & Porrello, 2005; Robinson et al., 2008). Henson and Humphrey (2010) cited standards as an efficient way for retailers to govern their suppliers' inputs along their supply chains, while simultaneously being able to expand the network of suppliers from which they can procure. Freidberg (2004) highlighted this as a way to "govern from a distance," and although he was referring to food safety in global supply chains, his observation holds in other contexts as well, where suppliers' contribution is crucial for firms' final offerings. Resource dependence theory recognizes the stimulus of external factors on organizational conduct, and (despite being limited by their context), management can act to reduce environmental uncertainty and dependence (Hillman et al., 2009).

In other words, organizations make efforts to reduce others' power over them, and resource dependence theory has been applied broadly to explain how they can do so (Hillman et al., 2009). However, standardization management, which offers such an opportunity, has not been discussed from that angle to date. An assertive SMA essentially comprises a strategy of crafting a broader supplier base, ensured through widely known and adopted standards. Consequently, through the formation of buying coalitions, an assertive approach comprises a tactic to lessen the dependence on specific resource providers. In particular, concerning Volvo, which manufactures roughly 250,000 trucks and buses per year, including vehicles from class 1 to class 8 (in other words, encompassing a broad manufacturing scope), being able to source quality materials from all over the world is crucial for the company's operation and credibility. For Volvo, then, a safe and efficient way to ascertain that it has a large base of suppliers arises through assertive CSM; more specifically, by influencing formal standardization outcomes.

By influencing standardization outcomes and driving the consensus standardization processes, Volvo aims to cultivate buying coalitions (that is, boost an isomorphism of buyers' demands through the establishment of common formal standards). Then, through those well-established formal standards, it becomes viable for Volvo Group to communicate effectively with a broad range of suppliers that are already familiar with those specific requirements and specifications (which the company has already pushed for through its prior activity in the standardization committees). Such tactics save Volvo a great deal of trouble—that is, by ensuring that suppliers will be able to deliver reliably. Along similar lines, Williamson's (1991) transaction costs, especially focusing on those between manufacturers and suppliers, are effectively

mitigated through formal standardization. Of course, reduction of transaction costs through standards has been largely addressed in previous literature (e.g., Foss, 1996; Den Butter et al., 2007; Brunsson et al., 2012; Botzem and Dobusch, 2012 etc.), though not explicitly from a corporate strategic management perspective, where specific corporations promote their preferred specifications in the direction of external formal standards, so that they spare themselves the effort and cost to embody these specifications in idiosyncratic contracts with the various suppliers (subsequently also having to train those suppliers so that they are able to deliver).

By the same token, addressing the challenges in regard to retailer–supplier relationships, Modi and Mabert (2007) stressed the barriers of interfirm communication. They cited poor or ineffective communication as "a prime cause of supplier product problems" (Modi & Mabert, 2007; Newman, & Rhee, 1990) and pointed to sources of misunderstanding often being simply "the use of unknown symbols, concepts and ideas" (Modi & Mabert, 2007). The weight of effective communication and information exchange for smooth IORs has been profoundly highlighted in earlier research (Monczka, Peterson, Handfield, & Ragatz, 1998; Mohr & Nevin, 1990; Modi & Mabert, 2007). Again, the establishment and utilization of joint standards, which are commonly used by a number of retailers in their interactions with suppliers, ensures that communication becomes smoother, and even more cost-efficient (since suppliers become familiar with those specific standards and hence are not required to be familiarized and "trained" from scratch).

In fact, the abovementioned benefits hold for all industry participants, irrespective of their SMA (that is, including organizations deploying a vigilant SMA, such as Scania). More specifically in the matter of vigilant organizations, despite not leading the formation of buying coalitions (and consequently not setting the standards), they can still benefit from their common establishment; simply by adopting the widely established standards, they become able to access a broader pool of resource providers (suppliers), who are furthermore already familiar with the particular specifications. Of course, such a situation (that is, vigilant organizations adopting emerging standards) works for assertive organizations as well, since the materialization of buying coalitions in practice comes from the broad establishment and adoption of "their" standards. Hence, this brings the discussion back to Brandenburger and Nalebuff 's (1997) "win–win strategies;" CSM certainly demonstrates one example.

Summing up the qualities and purposes of the two distinct SMAs, assertive players aim to launch and establish their preferred technical specifications

(demands) in formal standardization settings, while vigilant ones aim merely to scrutinize and remaining up to date on those settings. More specifically, through their standardization activity, assertive actors aim to promote factor market integration by ensuring that industry players (that is, they and their competitors) have isomorphic demands from their suppliers.

The purpose of integrating various industry players' demands is fourfold:

- *Manage resource dependence and power differentials* (due to some players' amplified resource dependence and hence environmental uncertainty).
- *Ascertain that a broad and extensive pool of suppliers becomes familiar* with those specifications/demands and hence becomes able to effectively satisfy them (since various industry players request them).
- *Boost factor market cost optimization* (since the consequent greater volumes drive the cost down).
- *Enhance trade-ons*—that is, greater quality and lower cost at the same time (due to increased familiarity along with greater volumes).

By all means, materializing an assertive approach comes with high internal (resource commitment and organizational awareness) and external (external participation and openness) organizational demands. On the other hand, a vigilant approach (which is mainly focused on scrutinizing the standardization progress than leading it), is far less demanding. Hence, in the case that corporations do not have an urgent need for integrating the factor market,[7] it makes sense to retain a (far less demanding) vigilant SMA.

Furthermore, vigilant players can still benefit from the factor market integration that assertive players have instigated, even though it is not crucial for them to construct it themselves (see footnote 7). By adopting the commonly established formal standards (which have possibly been driven by assertive players), vigilant actors do become able to reap the aforementioned benefits (namely, access to a broad pool of suppliers, factor market cost optimization, and trade-ons). On the other hand, an assertive approach is unlikely to be successful unless there are

[7] Depending on the criteria: size, scope, growth itinerary, and relations with suppliers.

vigilant players in the formal standardization process who are willing to retain a less active role and subsequently adopt the emerging standards. In other words, factor market integration will not materialize unless the (voluntary) formal standards are commonly adopted and hence generate isomorphism of buyers' demands.

Therefore, the two distinct approaches coexist within the formal standardization settings, or are even contingent on each other, and simultaneous deployment of both (by different players) is requisite in order to render each other viable. Namely, an assertive approach cannot be successful unless vigilant players are present in the formal standardization process as well; it is not viable to assume that all participants try to lead the formal standardization process, since they will hinder each other. On the other hand, vigilant players who are not willing to commit the necessary resources to lead those standardization processes are still able to take advantage of formal standardization progress due to the fact that assertive players are driving them. Each player may select the most appropriate SMA depending on the corporate needs and circumstances to be accommodated—as discussed earlier in this chapter. Thus, competing players reap benefits from collaborating with each other (as the perspective of coopetition confers) within the setting of formal standardization.

Nevertheless, additional SMAs (other than the two discussed in this study) could exist and be deployed by organizations, particularly those with different needs, strategic objectives, or industrial contexts than the two case companies analyzed here. Product- /industry-specific attributes could be expected to play an important role in shaping organizations' SMAs (and hence their overall CSM), which, in the current study, was not clearly demonstrated (although anticipated). This is due to the fact that the study's empirical material was collected within the same industry (for explicit reasons, as discussed in chapter 3) and at the same time previous contributions regarding a framework for CSM (for example, for the sake of comparison between industries) could not be found. However, even in the case that the two specific approaches would be the only ones commonly deployed by organizations, standardization arenas would still appear fully functional, as shown in the previous section (and to some extent discussed in earlier chapters as well).

Furthermore, in relation to product-specific characteristics (as well as product life cycle), it may be expected that during turning points of the industry (such as major changes in the product's characteristics and/or the end of a product life cycle), organizations may, or even must, reconsider and reassess their selected SMA. That is, at such turning points the industry's future is forecasted

differently, new industry situations are anticipated to emerge, and perhaps even new strategic objectives and intentions are shaped; with all those aspects coming into play, organizations may wish to utilize corporate standardization differently and hence adjust their SMA accordingly. In other words, these could be the times at which vigilant organizations may decide to become more assertive (perhaps in specific areas that have drawn management's and standardization personnel's attention), or, respectively, at which assertive organizations consider a more vigilant approach instead of explicitly aiming at steering standardization outcomes (at least for some time or within specific areas again).

Table 7 illustrates a summary of the different concepts discussed in relation to CSM in this chapter—that is, the various SMA focal aspects as introduced in section 8.2. For ease of reading, Table 7 also points out the differences between the two SMAs. As stated throughout this chapter, the various aspects (or concepts) are characterized as "necessary," "beneficial," or "unnecessary" for each of the SMAs. Table 7 can also serve as a concise guide for understanding and outlining the similarities and differences between the two SMAs.

Table 7
Summary of variations between the two SM approaches.

CSM qualities/aspects	Assertive *SMA*	Vigilant *SMA*
1. Resource commitment	Necessary	*Beneficial*
2. Organizational awareness	Necessary	*Beneficial*
3a. External participation (in order to scrutinize)	*Beneficial*	Necessary
3b. External participation (in order to scrutinize & influence)	Necessary	Unnecessary
4. Openness	*Beneficial*	Unnecessary
5. Interrelation	Necessary	*Beneficial*
6. Precedence	Necessary	Unnecessary
7. Cultivation of buying coalitions	Necessary	*Beneficial*

8.4.5 Revised theoretical framework

Figure 13 outlines the suggested revised theoretical framework for CSM. Unlike the preliminary theoretical framework (seen in Figure 3), the revised one encompasses the notion of SMA. SMA has not been unraveled in earlier research; however, it comprises a useful concept for describing concisely firms' standardization-related strategies and activities, which in turn has connotations for the overall management of standardization within a corporation. Since an integrative framework for CSM as shown in Figure 13 has not been developed to date, the empirical findings of this study contribute to our understanding of CSM.

Previous research has rarely explored the subject of CSM per se, in the way that the empirical material of this study has done. Understanding (at a strictly corporate level) of the motives of individual firms to engage in corporate and formal standardization is currently limited, along with comprehending how corporations manage standards and standardization in practice, on both a short- and long-term basis. Consequently, this study increases understanding of standardization management in three ways, by *(1) uncovering the notion of SMA*, *(2) shedding light on corporate-level motives for engagement in standardization,* and, *3) developing a theoretical framework for CSM* (Figure 12). The latter part of this study's contribution (the theoretical framework per se) has been advanced by the empirical findings. More specifically, while previous research (notwithstanding that addressing standards and standardization in general, and not CSM in particular) was utilized to provide guidance conducting the study, empirical evidence challenges the relevance of well-established theoretical conceptions (firstly in the automotive industry, but potentially also in other commensurate industries; for example, mature, capital-intensive, and slow-moving segments).

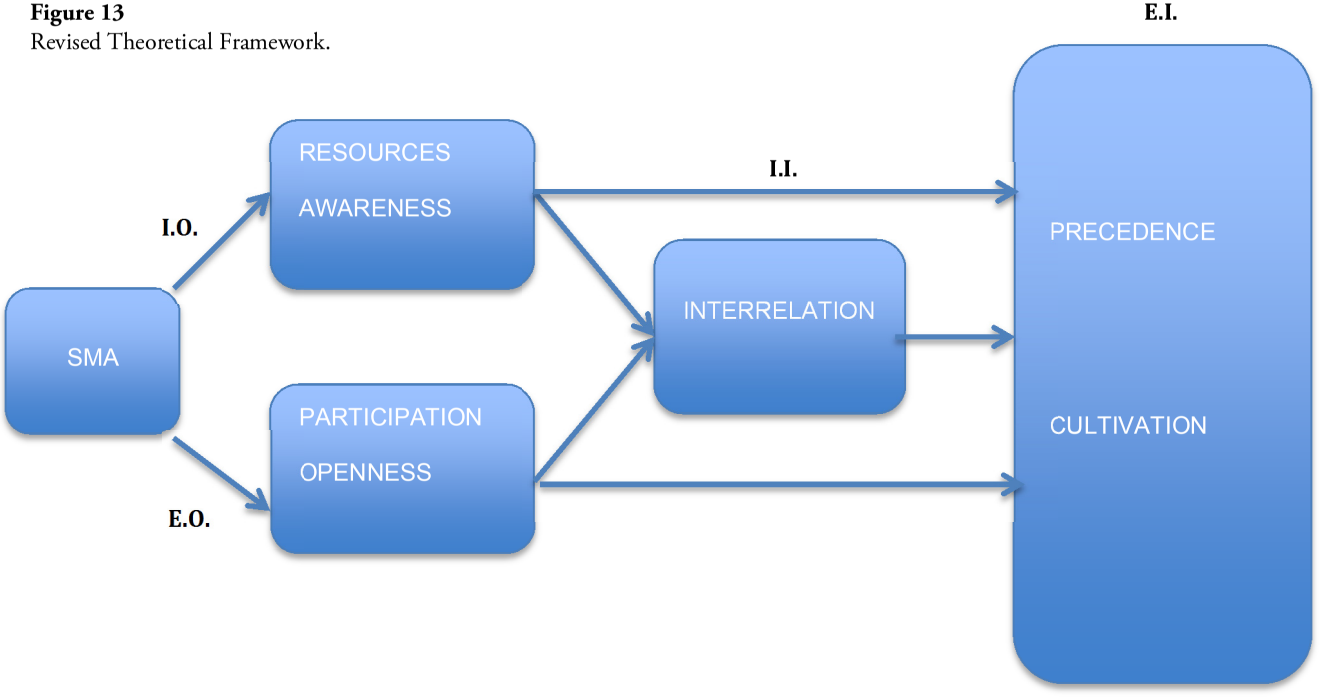
In particular, compared to the preliminary theoretical framework, the empirical findings of the study challenge the relevance of *(1) timing* (Arthur, 1989; Georgiou, 2004), *(2) organizational structure* (Zhao et al., 2011; Timmermans & Epstein, 2010) and *(3) organizational culture* (Sandholtz, 2012) for CSM. On the other hand, a number of concepts spotted in earlier standardization research have been supported by the empirical study as influential for CSM, such as *(1) resource commitment* (Zhao et al., 2011), *(2) external participation* (Leiponen & Helfat, 2010; Funk, 2003; Schilling, 1998) and *(3) precedence* (Mione, 2015; Gruber, 2000; Schilling, 2002, 1999, 1998; Arthur, 1989). Finally, the empirical findings have also contributed to unearthing a number of concepts

that have not been discussed (at all, or at least in-depth) in relation to standards and standardization to date, but do relate closely to CSM. These highly relevant concepts are: *(1) organizational awareness, (2) openness in regard to internal standards, (3) interrelation of efforts,* and *(4) cultivation of buying coalitions*, which are distinguished as "necessary," "beneficial," or even "unnecessary" depending on the selected SMA. Earlier sections in this chapter discussed in detail all abovementioned concepts and their connotations for standardization management.

Furthermore, the visualization of the final theoretical framework also portrays the disguised relations among them, denoting etiological patterns and consequently encompassing a somewhat temporal dimension within the framework. Namely, when internally and externally oriented aspects/concepts (that is, organizational awareness and external participation) are combined effectively, they set in motion intraorganizational interfaces, such as interrelation of efforts (both internal and external standardization-related). Onwards adding availability of resources and potentially openness in regard to internal standards as well, precedence and cultivation of buying coalitions are stipulated (external interface elements). In other words, the theoretical framework effectively describes a temporal and spatial process of CSM, outlining the practices and activities that take place inside a corporation (for example, organizational awareness), as well as outside of it (for example, external participation).

To conclude, the revised theoretical framework ought to be conceived as a depiction of the mechanisms of CSM, where SMA is the enabling vehicle for organizations' standardization-related pursuits (for assertively or vigilantly pursuing their interests).

Figure 13
Revised Theoretical Framework.



9 Conclusion

I decided to write this thesis with the overarching goal of theorizing and empirically unpacking a phenomenon that I soon came to call corporate standardization management. I had to somewhat invent this term, surprisingly, due to the fact that CSM has not been systematically explored in academic texts to date—despite the fact that standards and standardization have been a central research topic for at least the past two decades. However, standards and standardization have usually been approached from a macro perspective, meaning with a focus upon the macro-motives and macro-effects—that is, on a macro-economic level. Very early into my research process, I came to realize that even though the overarching organizers of formal standardization might be governmental agencies, its drivers are still primarily firms (participating in formal standardization committees). Nonetheless, the micro-motives and effects (that is, the individual firms' motives and effects), as well the firms' internal processes towards managing their participation in formal committees, were not equally focused upon. In other words, although standardization is not a new phenomenon, the corporate and potentially strategic aspect of it to some degree is.

As discussed in Chapters 1, 2, and 8, I would argue that the closest attempt to spotlight the "corporate" part—that is, focus on how individual corporations manage standardization, was attempted by Betancourt and Walsh back in 1995; they also introduced the term "standardization management." The closest attempt to spotlight the "strategic" part—that is, how standardization could potentially be utilized for the support of corporate strategy—was by Schilling back in 1999, who introduced the idea that individual firms might be able to affect the trajectory of formal standardization and subsequently affect an industry's trajectory and evolution. Without suggesting that other scholars' contributions to the field of standardization have not been valuable, I find it intriguing that, 20 years later, a solid theorization of CSM is still lacking, and in fact very little has been done towards that direction. Our understanding of how corporate standardization unfolds and what the potential strategic implications

are is still very fragmented. Unpacking this phenomenon and understanding its strategic connotations seemed like an interesting, largely unknown, and relevant matter, and completing this project proved even more stimulating than I had predicted.

In this chapter, I will summarize the insights gained from my study as well as the implications, for both academics and practitioners. In fact, part of the reason why I consider this study extremely relevant is that its contributions are respectively useful for both academic dialogue and theory building, as well as for strategy and management practice. More specifically, this study augments knowledge in four primary ways: (1) it introduces CSM as a concept that is relevant for the field of strategic management; (2) it unpacks the phenomenon and pinpoints the specific organizational aspects that affect it; (3) it highlights CSM from a resource dependence perspective as well as a coopetitive angle, manifesting the theoretical relevance and possibilities of both in unfolding current phenomena; and (4) it provides new insights and guidance to practitioners in regard to the strategic possibilities that CSM could offer.

9.1 Thesis intuitions in brief

As stated in Chapter 1, the purpose of this thesis is to increase understanding of the role that standardization plays in corporate strategizing, especially focusing on the related activities and strategic motives in regard to standardization management at the firm level. By way of explanation, this research project addresses the topic of corporate standardization; it concerns the role corporate standardization plays in corporate strategizing and addresses standardization decision making, particularly focusing on the related procedures, strategic motives, and potential effects of corporate standardization in the realization of strategy. To tackle these enquiries, I endeavored to gain relevant understanding of CSM by putting an explicit empirical focus on firms' day-to-day activities, as well as their long-term management of corporate standardization, in order to scrutinize pertinent (deliberate or not) corporate choices and the potential strategic connotations for standardization at the firm level. Through two in-depth case studies, which also enabled a comparative analysis, I was able to retrospectively investigate a chunk of corporate operations and specialized activities, decision-making processes, and consequences of those decisions. This investigation was guided by the research questions *how* can standards and

standardization be utilized in strategizing and *what* are the corporate factors affecting CSM?

The empirical chapters (5, 6, and 7) describe the two case firms' sequences of activities and procedures in relation to CSM, revealing that a specific SMA ought to be followed by each organization, consistently determined by the specific organization's needs and circumstances, and consistently pursued thereafter.

Chapter 5 demonstrates how firm-specific developments (such as purely organic growth, limited scope of manufacturing and an internally advanced modularity system based on internal standardization processes) are the primary indications, or even determinants, in regard to what type of stratagems the firm pursues. Namely, due to such specific properties, which reduce the organization's contingent dependencies, standardization may not comprise much more than a hygiene factor. On the other hand, Chapter 6 unfolds how different corporate idiosyncrasies (such as horizontal expansion, large scale and scope of product offerings, and subsequent supply dependencies), render standardization management a potentially strategic tool, which facilitates pursuit of the organization's corporate strategy. The empirical study sheds light on Schilling's (1999) stipulations that firms are able to strategically influence an industry's trajectory by promoting and influencing the outcomes of formal standardization, as well as on the assertion by Alexy et al. (2013) that selective revelation to other market participants (for example, competitors) "can be conceived as a strategic mechanism," prompting future industry developments towards stipulated directions. Such manipulation induces the creation of a broad supply network in order to avoid a shortage of supply sources or dependence on specific suppliers—spotlighting Pfeffer and Salancik's (1978) resource dependence theory, which focuses on how organizations can manage their dependence on other entities, and ideally lessen it.

Finally, a way to manage the interdependencies among market participants is more specifically the isomorphism of buyers' demands (through CSM and the establishment of common standards), and hence the integration of factor markets, which is in line with Brandenburger and Nalebuff's (1997) claims regarding coopetition.

Chapter 7 provides a comparative case analysis, signifying the diverse circumstances and motives of two somewhat similar but markedly different organizations. This comparison provides the ultimate, or essential, reasons for how and why common aspects of strategy, such as standards and

standardization, might be of great importance in some strategizing contexts, but less so in others. Simply put, corporate tools and motives vary, because corporate needs and prerequisites do. This thesis contributes to specifically recognizing and inscribing those variances.

9.2 Overarching contributions

In particular regarding the overarching contributions of this thesis, as delineated in the previous sections, I argue that my study contributes in four primary ways to literature (reviewed in Chapter 2), as well as practical aspects of standardization management (discussed in Chapter 1). Both are further unpacked in the following sections by first discussing the specific theoretical contributions (viz. relevant for academics, specifically within the fields of strategic management and standardization), and secondly examining the practical ones (viz. for practitioners, such as managers and standardization personnel).

9.2.1 Theoretical implications

Firstly, this thesis introduces (or more firmly drafts what was previously only loosely sketched) the concept of CSM, and specifically relates it to the field of strategic management. While standards and standardization are increasingly deployed within organizations (and have been for the past few decades), a solid conceptual basis for discussing and analyzing CSM was still lacking. By increasing understanding about CSM, this study also managed to show that corporate standardization deserves a place within the field of strategic management. Secondly, this study unpacks the empirical phenomenon of corporate standardization and pinpoints the specific organizational aspects that affect it. By looking into organizational procedures, hierarchies, and interactions (both formalized and nonformalized), substantial understanding is gained regarding the intraorganizational dynamics of corporate standardization, its functional determinants, and a number of interorganizational outcomes. Thirdly, this study contributes to resource dependence theory by applying it to a new empirical context (that is, corporate standardization and the organized standardization arenas), and showing how standardization strategies may be considered as means for managing the external environment and hence

organizations' resource dependencies (hence advancing resource dependence theory). As Davis and Cobb (2009) stated, "there is currently a revival of interest in [resource dependence] theory," and a fruitful direction for future work in regard to the theory would be to devote efforts to "updating the sources of power and dependence" or "cataloging the new set of available tactics for managing dependence." The findings of this study indicate that active engagement in standardization work could function as an effective means of managing organizations' resource dependence (according to organizations' specific needs and circumstances), and is therefore catalogued as such a tactic. Fourthly, this thesis highlights CSM from a coopetitive angle, which to some degree appears to resolves interorganizational tensions (by demonstrating the possibilities of "win–win strategies" [Brandenburger & Nalebuff, 1997]). In other words, it manifests the theoretical relevance of coopetitive stances in the contemporary, increasingly complex business environments, where outdated competitive viewpoints might be proven insufficient for success or even survival.

As mentioned already, this thesis addresses two fields of interest, namely strategic management and standardization research. Strategic management literature was addressed in Chapter 1, emphasizing streams of research on areas such as TCE, resource dependence theory, economization, and coopetition. A broad review of existing standardization research was provided in Chapter 2, demonstrating that intraorganizational accounts are very rarely the unit of analysis in prevailing standardization literature. This study aims to address this gap by approaching the practical phenomenon of standardization through formal theory and eventually demonstrating that different theories are needed in order to cover it holistically; both dependence theory and coopetition are utilized simultaneously to understand *(1) the choice of engaging in organized voluntary standardization*, *(2) how different organizations' standardization work differs*, and *(3) the varying degrees of external and internal standardization performance*—and linking all those aspects to strategic management.

A central contribution of this study is that it acquaints standardization with the field of strategy management, demonstrating their potential connection—namely, that standardization may be utilized in corporate strategizing. Although standardization is not a completely new phenomenon, CSM specifically has remained, to a large degree, largely unknown and unexplored. Betancourt and Walsh (1995), Schilling (1999), and Slager et al. (2012) all touched upon the concept of standardization management, but this thesis goes in-depth into the activities, interactions, and dynamics of this corporate phenomenon to finally create a crystallized framework for CSM. The introduction of the concept of

SMA, along with specification of the factors that determine an organization's SMA, and of the organizational aspects that are linked to it, comprises a significant theoretical contribution; the ground is at last set to understand and even further explore corporate standardization and its connotations.

A number of scholars, such as Ambrutyte (2014), Mione (2009; 2015), Zhao et al. (2011), Delcamp and Leiponen (2013), and Grossmann et al. (2015), have discussed these factors separately, stressing their importance for corporate standardization. The authors have discussed, respectively, the breadth of product offerings, the high requirements of organizational resources, the necessity of participation in formal committees, and the need for overall corporate coordination in regard to standardization activities (to name a few examples; see Chapter 8). However, this thesis integrates previously known standardization-related factors in a meaningful way, along with uncovering relevant new ones (such as organizational awareness, interrelation and precedence; again, see Chapter 8).

In other words, the suggested theoretical framework for CSM (visualized in Figure 13) brings together efforts of several earlier studies, while also complementing them with additional insights. In addition, since this study aims to (potentially) address CSM from a strategic management perspective, it uses a distinctive research approach on standardization and strategy, recognizing concealed dynamics (such as strategic motives and effects), escalating challenges, and deliberate decision-making procedures (which are well-thought-out at times, and more iterative at others).

9.2.2 Practical implications

In regard to this study's overarching contributions, it provides new insights and guidance to practitioners in regard to the strategic possibilities that CSM may offer. The study's intuitions not only provide a straightforward direction for interested practitioners (strategists and/or standardization personnel) for designing and deploying corporate standardization strategies, but also open up a practical toolkit as a point of reference and assessment for presently employed schemes. As noted in earlier chapters, these practical implications have not been straightforward or well researched to date. Chapter 8, especially section 8.3.5, in which the findings are summarized and visualized, comprises a hands-on account, providing guidance and insights on how to manage CSM, and in particular how to link specific strategic objectives with an explicit SMA. I argue

that practitioners will be able to derive useful knowledge on CSM from this thesis.

In pursuing a consistent and meaningful standardization approach, managers and standardization personnel could closely follow the steps of this study, either from a null starting point of putting a standardization approach in place, or reassessing current overall standardization-related activities. Starting from the organization's strategic objectives and specific needs, practitioners can be guided through which SMA suits their circumstances, and subsequently how to set it up so that it will function appropriately within the particular organizational setting. In other words, this thesis spotlights precisely those organizational aspects that need to be carefully considered and assessed in regard to CSM, from a strategic as well as an operational point of view.

9.3 External validity

Previous research was substantially utilized to create the preliminary theoretical framework, meaning that pre-existing theoretical insights guided the design and conduct of this study, both before initiation of the empirical fieldwork as well as during data analysis. The preliminary theoretical framework spotlighted certain organizational and standardization-related aspects, which were closely considered, especially during the first interview round. However, for the two following rounds of interviews, the preliminary framework's importance was somewhat downplayed, as preliminary data analysis led to the emergence of additional concepts and constructs that have not been identified in previous literature. Altogether, as described in more detail in Chapter 8:

- Some of the initial insights (that is, constructs encompassed in the preliminary theoretical framework) "survived" the case study processed and were included in the revised theoretical framework.
- Other insights did not "survive," as they were not confirmed or observed during the longitudinal comparative case studies conducted.
- A few additional theoretical constructs were added to the framework after respective insights manifested in this study.

In other words, prevailing research, in the fields of both standardization and strategic management, has demonstrated specific theoretical gaps, since the findings of this study do not necessarily correspond to existing theoretical

understanding (as also discussed in previous sections of this chapter). Hence, the study's findings, and subsequently the revised theoretical framework, contribute substantially to updating knowledge regarding CSM and its specific intraorganizational activities and challenges, as well as the potential role of standardization in corporate strategizing.

The revised theoretical framework that resulted from this study—that is, a framework for CSM, including alternative SMAs, determining factors (for selecting a suitable approach), and succeeding organizational choices and outcomes—was crafted within an automotive–heavy trucks industrial context. Nonetheless, a number of characteristics of the specific industry—such as the capital-intensive and slow-moving industrial setting, the notable engineering complexities, and the globalized market and arena of operations—bear similarities to a number of other industries (such as steel and iron, aluminum, oil, advanced composite materials, etc.), which means that the findings are arguably transferable to other industries.

Therefore, although this in-depth comparative case study does not allow (and did not ever aim) for statistical generalization, analytical generalization—meaning generalization from empirical observations (the study's findings) to theory (Gibbert et al., 2008)—is meaningful Consequently, in-depth understanding of the particular cases within the automotive industry could provide valuable insights into the mechanisms and dynamics of corporate standardization in other industries as well, in particular when faced with comparable conditions, as in this study (that is, as presented already in the previous paragraph capital-intensive, slow-moving, globalized industrial settings). Going back to Clark's (1991) observation (which was made more than 20 years ago but is still highly relevant), the automotive industry shares a plethora of basic patterns with other industries, due to the identical prevailing challenge of integrating engineering and manufacturing, and establishing links between a large number of technically complicated parts. That is, the theoretical framework for CSM that was developed in this thesis ought to be relevant and applicable to a large number of organizations, in a plethora of industrial settings.

9.4 Limitations and future research

This study aims to contribute to understanding of CSM, and specifically to recognize how CSM is potentially utilized in corporate strategizing and what

factors affect it. Nevertheless, the findings are, to some extent, limited to heavy equipment manufacturing firms that operate in mature, capital-intensive, and slow-moving industrial settings. Subsequently, future research could further enrich knowledge of CSM by examining it in organizations that operate in different industrial settings, such as fast-moving ones, and produce different sorts of products—that is, less durable, fast-changing ones. Namely, CSM in firms that maneuver in very dynamic, fast-moving, and disruptive markets, where product innovation is regular and frequent, might fluctuate noticeably from the type of CSM observed in this study. Presumably, in a setting where competition is fierce in regard to newly emerging innovations, and hence first-movers (in the product market) enjoy elevated opportunities to capture a larger market share, firms might not have interest in pushing their internally developed solutions and specifications into formal standards, but might rather aim to push them into the market directly in order to capture customers. Equivalently, in a setting where large upfront investments are not required (that is, in non-capital intensive industries), it might be viable for firms to take, to some degree at least, higher risks in offering innovative products without having formal standards crafted first. Instead, various qualities relative to CSM might be required for such firms, in comparison to those demanded for manufacturing firms operating in mature and slow-changing markets.

Furthermore, future research could explore the functionality, motives, and effects of CSM within distinctive industrial and organizational settings, to clarify whether it is the same or other organizational factors that play a crucial role—depending on the specific markets. Perhaps timing and organizational culture, which were not considered significant in the frame of this specific study's findings, might play in more significant role when other types of industries or offerings are examined.

In fact, this thesis proposes the very first framework for CSM (to the best of my knowledge), setting the ground for additional exploration of the phenomenon. Future studies could advance understanding of the interactions between the various organizational aspects outlined in the framework, as well as of the emerging inter-organizational dynamics (between competitors, but also between manufacturers and suppliers). For example, vertical relationships, which go backward and forward between firms, are highly influenced by standards. Value appropriation of standardization in these relationships is an issue that was not investigated in the fieldwork, but could potentially draw sharper lines and linkages in our understanding of the overall phenomenon of corporate

standardization and firms' conduct. Future research in the field could substantially complement the findings of this study.

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Appendix I

The list of questions for each interview round are provided in this Appendix.

1st interview round

1) Short introduction in regard to the company, the interviewee's job description and the study (on my behalf). *2)* How is standardization organized? Decentralized section, autonomous to make decisions? How has it historically been organized? *3)* What is the overarching role of the standardization department within the company? Why is it needed? *4)* When and why was a standardization team put in place? Strategic reasons/implications? *5)* How many people are involved with corporate standardization and who? Exclusively involved with it or combine it with other tasks? *6)* What does the standardization decision-making process look like? How is it initiated, who are the people involved? What are the motives/factors considered? *7)* How is the final decision made? *8)* How is the execution of the decision planned and initiated, what are the actions taking place? *9)* Examples of both adoption and non-adoption decisions, what was the different background and circumstances that led to the different decision? *10)* Are specific (desired) outcomes taken into account or is it an open process? *11)* Is competition considered during decision-making? *12)* What are the next steps following an adoption decision? *13)* What aspects/factors are taken into consideration? Thoroughly planned or spontaneously adjusted? *14)* Factors that were underestimated before the initiation of implementation but gained attention later? *15)* Which elements of the corporate standardization process have been perceived as success factors over the years and were those indeed proven crucial, or overestimated? *16)* What are your expectations from the standardization department, in the short-term and in the long-term? *17)* What kinds of follow-up procedures are used? Do you measure or link the outcomes otherwise? *18)* Were the expected/desired effects lived up? *19)* Based on the experience, did the adoption of the standard led or

related to the development of competitive advantages? *20)* Is differentiation among competitors lessened due to the adoption of the same standards? *21)* Could you give examples of great successes (or failures) of the standardization department?

2nd interview round

1) How do you perceive the standardization department's work within the company? *2)* How would you describe and evaluate the interaction between the standardization department and the rest of the organization? *3)* Is the company active in external standardization committees? *4)* If yes/no, why so? *5)* Does participation in external standardization committees help the firm access and collect important information? *6)* Is involvement in external standardisation important in monitoring competitors and controlling information and knowledge? *7)* How are decisions communicated, internally and externally? *8)* Do standards serve as knowledge transmission mechanisms within firms and among firms? *9)* Is there any hazard of knowledge "leakage", which undermines the firm's ability to capture profits? *10)* Is knowledge creation more important than secrecy itself? How does the firm capture the benefits from that knowledge creation? *11)* Is standardisation a competitive threat or a complementary opportunity? *12)* How can firms cooperate in standardisation without killing the competition? *13)* Has standardisation affected the game of competition? *14)* Does standardization work affect the firm boundaries? *15)* In regards to corporate standardization, what is the firm very good at, and what is it not so good at? *16)* What are the main aspects/factors that are taken into consideration? *17)* How would you compare yourselves to competitors, with regard to standards and standardization work?

3rd interview round

1) How would you assess the strategic positioning of the standardization unit? *2)* Internal and external standardisation efforts are independent of each other, or better be combined? *3)* Are company standards secret/open? *4)* Do you happen to have any information if your internal standards are followed by competitors? *5)* Are there benefits from allowing other companies to use your standards? *6)*

Are there benefits from using other companies' standards? *7)* In what cases would you follow another company's standards, especially competitors'? *8)* Is participation in external standardisation (and also visibility of internal standards), a special form of collaboration among companies? *9)* How are companies are able to retrieve relevant information? *10)* Is this information/knowledge then utilized in internal standardisation as well? *11)* Would you say that the standardization department's importance/contribution has been increased or decreased over the years and why? *12)* Why are some firms willing to share their in-house standards and other firms are willing to adopt them? *13)* What are the factors that distinguish between firms that decide to engage in (external) standardisation and the ones that do not?

Appendix II

More detailed accounts on the two case companies' histories are provided in this Appendix.

The history of Scania AB

Year 1891, Philip Wersén and Surahammarsbruk, a centuries-old ironworks, jointly establish Vagnfabriksaktiebolaget in Södertälje (Vabis). Nine years later, in 1900, Maskinfabriksaktiebolaget Scania is established in in Malmö, Skåne. The Latin word for Skåne, Sweden's southernmost province is the origin of the Scania name.
Only 11 years later, in 1911, Vabis and Scania merge, but by 1921 Scania-Vabis runs into financial difficulties. Stockholms Enskilda Bank, owned by the Wallenberg family, supplies fresh capital and by 1934 the company manages to work out its difficulties. This was the last year that it showed a loss.
In 1948 the common history of Scania and Volkswagen takes off, when Scania-Vabis introduces Volkswagen in Sweden, and then remains the official VW distributor until 2002, when Volkswagen takes over the sales company in Sweden.
In 1957 Scania-Vabis expands its production worldwide, starting with a plant in Brazil, followed by an assembly plant in the Netherlands in 1965, and two more factories, one in Argentina in 1976 and one in France in 1992.
In 1969 Scania-Vabis and Saab AB merge into a new company, Saab-Scania, which in 1991 becomes a wholly owned subsidiary of Investor AB and is de-listed.
By 1995 Saab-Scania is divided into two companies, Saab AB (defence material and aerospace) and Scania AB. Both companies are wholly owned subsidiaries of Investor AB.
Scania AB becomes publicly listed in 1996 on the NASDAQ OMX Stockholm stock exchange and the New York Stock Exchange. Initially, Investor

offers 50% of Scania 's Series A shares and 50% of its Series B shares to the market. Including an over-allotment option, Investor reduces its holding to 45% of A shares and 45% of B shares. Investor also issues warrants equivalent to 20% of the share capital to the shareholders in Investor entitling them to buy B shares in Scania.
In 1999, Investor sells B shares equivalent to 20% of the share capital through the above-mentioned warrant program. In January 1999, Volvo begins buying shares in Scania, reaching 21.5% of voting power in Scania by late April. In August, Investor reaches an agreement with Volvo under which Investor sells its remaining shares in Scania to Volvo. At the same time, Volvo makes an offer for the remaining shares outstanding. This agreement was conditional upon the European Union approving a merger between Scania and Volvo.
In 2000 the EU rejected Volvo's plans to buy Scania. As a consequence of this, Investor sells A shares equivalent to 34% of voting power and 18.7% of share capital in Scania to Volkswagen, rising Volkswagen into a leading owner. After this, Investor still controls 15% of voting power and 9% of share capital in Scania. Meanwhile, Volvo controls about 30% of voting power and 45% of share capital in Scania after its unsuccessful bid.
In 2002 Scania sells its 50% holding in the Swedish company Svenska Volkswagen AB to Volkswagen AG and one year later Scania shares are de-listed from the New York Stock Exchange.
In 2004 Volvo sells its B shares in Scania to Deutsche Bank, which in turn sells them to the market. Volvo's A shares were transferred to a new company called Ainax, which in turn was distributed to the shareholders in Volvo. Scania later presented an offer for all shares in Ainax, which was accepted by 96 per cent of Ainax shareholders.
In 2006 MAN AG presents a hostile bid for Scania. MAN achieves ownership of 13.23% of share capital and 17.01% of voting power after the bid was rejected by both Volkswagen and Investor.
In March of 2008, Volkswagen and Investor reach an agreement under which Volkswagen acquires 134,711,900 A shares from Investor and the Wallenberg foundations. Volkswagen thereby increases its stake in Scania to 68.60% of voting power and 37.73% of share capital. Scania becomes the 9th brand on the Volkswagen Group. Scania nevertheless remains an independent company listed on the Stockholm Stock Exchange, with nearly 130,000 other shareholders and more than 60% of the capital owned by this free float. This means that Scania is governed by the Swedish Company Law and stock market regulations and is obliged to follow a set of rules, which basically means that VW and Scania are allowed co-operate 'at arm's length'.

In 2009 Porsche presents a mandatory offer for Scania, since the company had increased its holding in Volkswagen to more than 50% and thereby gained indirect control of Scania. Porsche acquires nearly 8% of share capital and more than 2% of voting power in Scania. These shares were sold to Volkswagen, which thus increased its holding to 49.29% of share capital and 71.81% of voting power in Scania.
On the 9th of November 2011 Volkswagen AG completed its acquisition of the majority shareholding in MAN SE. Volkswagen's ownership thus amounted to the equivalent of 55.9% of the voting rights and 53.7% of the share capital in MAN. As a result of the acquisition, MAN's holding in Scania shall be included in Volkswagen's ownership of Scania. Volkswagen's ownership of Scania thus amounted to the equivalent of 89.2% of the voting rights (formerly 71.8%) and 62.6% of the share capital (formerly 49.3%).
On the 21st of February 2014, Volkswagen announces a public offer to the shareholders of Scania to tender all shares in Scania to Volkswagen at a price of SEK 200 in cash per share. On 13th of May, Volkswagen reaches over 90% of the shares and 5th of June was the last of trading Scania shares on the stock exchange. Scania became a wholly owned subsidiary of the Volkswagen Group.

The products of Scania

Scania offers trucks, buses and coaches, industrial engines and supportive services. Scania ‘s products are outlined in more detail as follows (Scania, 2014).
1.Trucks.
As Scania puts it “Transport is a trust business”. Reliability and uptime come from Scania ’s long tradition of delivering precisely according to the customer’s business needs, offering a wealth of choices and an array of modular configurations.
2. Buses & Coaches.
Scania offers a complete range of buses and coaches for public transport operators and coach companies. Scania buses and coaches are renowned for their outstanding operating economy, and set world-class standards for fuel economy and road handling. Every model can be customized to the preferences of the customer.
3. Industrial engines.
With diverse engine sizes and power ratings, there is a series of Scania industrial engines, meeting existing and foreseeable emission legislation. Scania industrial

engines can be integrated with customer equipment, and straightforwardly contribute to strengthen brand, profitability and end-user satisfaction.
4.Services.
Scania trucks, buses and engines are backed up with supportive services. Examples of the above supportive services are: vital parts deliveries, maintenance programs, drivers' trainings and financial solutions. The company's goal is in fact "one-stop shopping", consequently offering individual services as well as flexible packages. Scania services are brought to life by the professionals in the company's extensive network, who can provide with solutions, at the same time that an equal level of service is ensured all over the world.

The history of Volvo: A journey over the last nine decades

Era: 20s. Automotive status quo: The production of the T-Ford was discontinued in the USA, after 15 million cars had rolled off the assembly line. Two visionaries, Assar Gabrielsson and Gustaf Larson, make a big decision to start the construction of a Swedish car. The year is 1924. A few years later, on April 14 1927, Volvo is officially founded.

Although it was incorporated in 1915 as a subsidiary of the Swedish ball bearing manufacturer AB SKF, Volvo, which was destined to become one of the world's leading manufacturers of equipment for transportation, was born that day, in April 1927, when the first series-manufactured Volvo car left the factory in Hisingen, Göteborg.

In 1928, Volvo's first series-manufactured trucks proved to be an unexpected and immediate success. By the time the series was launched a large number of customers had already placed orders and the vehicles were completely sold out after just six months.

By 1929, when Germany is producing 148 different makes of vehicles, France 109 and USA approximately 70, Volvo's Penta Group for marine applications introduces its legendary U-21 outboard engine - an engine that remained in production, basically unchanged, until 1962. In 1929, two years after its official founding, Volvo presents profit for the first time. One year later, in 1930, the company was finally financially viable, after its very successful truck sales. The

Series 3 trucks were extremely popular and Volvo Penta was enjoying tremendous success with its outboard engines.

Due to petrol rationing, Volvo invented in the '40s a producer-gas unit, which quickly became popular, while in the '50s a new material known as "reflex" (reflector) was introduced in the Swedish market, designed to increase traffic safety in the darkness. Volvo acquired AB Bolinder-Munktell, a construction equipment manufacturer that was later incorporated in the VME Group (today Volvo Construction Equipment).

In 1960 Volvo strengthened its position in the (profitable) combine harvester sector even further in 1960, when it acquired its competitor, Arvika-Thermaenius. One decade later, in the autumn of 1970, the two-millionth Volvo car rolled off the assembly line. Volvo was constantly upgrading its products, releasing more and more powerful trucks and tractors.

By 1980, while for the very first time in history the number of cars manufactured in Japan exceeded the number manufactured in the USA, (7.0 million as opposed to 6.4 million), Volvo starts operating a new plant in Brazil, producing bus chassis and trucks, and AB Volvo acquires Beijerinvest AB, with interests in oil trading, food industry etc.

The decade of 90s started with the big announcement that Volvo had entered into an alliance with the French automotive manufacturer, Renault. At first, the news was received with excitement, but as time passed the reaction seemed to change. Though, by 2000 a number of new products were launched. Among these, to name just a few, were Volvo Trucks' new FL generation, Volvo Buses' new B12M, Volvo CE's A35D and A40D and Volvo Penta's launch of the new engine series, 420 and 620. A new business area for Volvo's finance operations was formed, Volvo Financial Services, including customer-financing operations, insurance business, treasury and real estate operations. Volvo Aero divests its truck components manufacturing to Finnveden, while acquires an interest in Mitsubishi Fuso Truck and Bus Company and establishes an agreement on a new bus company in China between Volvo Buses and Shanghai Automotive Industry Corporation (SAIC).

Up to date, Volvo maintains its passion for superior products. In April of 2010, UD Trucks (Volvo Group's Japanese subsidiary) presented a new range of Quon heavy-duty trucks. The latest Quon lineup has been developed to meet high levels of demand for both fuel economy and driving performance. It features newly developed engines and automated manual transmissions based on Group architecture. In fact, as a partner of WWF and being the world's first vehicle

manufacturer to join the World Wide Fund for Nature's (WWF) Climate Savers Program, Volvo Group's truck companies undertake to reduce the CO2-emissions from vehicles manufactured between 2009 and 2014 by 13 million tons. Independent technical experts will oversee the results.

UD Trucks has also added a new model equipped with a new medium-duty engine to its Condor truck lineup. At the same time, as part of Volvo Construction Equipment's (Volvo CE) objective of supporting customers in the growing BRIC (Brazil, Russia, India and China) markets, it has announced a strategic investment in its existing facility in Bangalore, India.

On the other hand, Volvo announced the end of the collaboration between UD Trucks and Nissan Motor on manufacturing light-duty trucks, after the expiration and non-renewal of the contract in January 2011, as well as the sale of the US subsidiary Volvo Aero Services in July 2011.

Moreover, in the summer of 2011, Leif Johansson, the President and CEO of Volvo for the past 14 years, resigned - in conjunction with his 60th birthday, and welcomed Olof Persson as his successor.

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Corporate Standardization Management

A Case Study of the Automotive Industry

In modern business, standards are too important to be ignored. But what is the rationale for active engagement in long and costly standardization processes when most of those standards will be openly available for a much lower price once they are finalized? What are the strategic motives for engaging in such processes? And even when the motives are clear, how is corporate standardization managed, both inside and outside of the organization? Prior standardization and strategic management literatures have not explored these inquiries, leading to a limited understanding of corporate standardization management and its drivers, complexities, and potential.



An in-depth comparative case study of two heavy-truck manufacturers, Scania AB and Volvo Group, provides insights into organizations' varied choices, rationales and desired outcomes in regard to corporate standardization management. Depending on the organizations' corporate strategies and particular needs, different standardization approaches may serve them most effectively. The findings from this qualitative study provide empirical evidence for at least two standardization approaches emerging in the context of voluntary consensus-driven standardization settings, namely the assertive approach and the vigilant one. The choice of standardization approach should comprise a deliberate and informed managerial decision, while the findings indicate that active engagement in standardization work could function as an effective way for managing organizations' resource dependence and environmental uncertainties and hence shall be catalogued as such, advancing Resource Dependence theory.

Finally, this study highlights corporate standardization management from a co-opetitive angle, which to some degree appears to resolve inter-organizational tensions within standardization settings, by demonstrating the possibilities of "win-win strategies". In other words, this thesis manifests the theoretical relevance of co-opetitive stances in the contemporary, increasingly complex business environments, where old-school competitive viewpoints might prove insufficient for success or even survival.

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LUND UNIVERSITY
School of Economics and Management

Department of Business Administration
Institute of Economic Research
ISBN 978-91-7753-169-2