Key motivations and barriers of SMEs regarding Dutch formal standardization in the biobased industry

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Abstract

Underrepresentation of small and medium-sized enterprises (SMEs) in formal standards development processes (standardization) is a persistent point of concern. The development process of formal standards is open to all parties concerned and research shows that a large group of SMEs wants to participate. However, only small part of that group is currently active. Variety among SMEs is unexplored, although they encompass a wide variety of businesses. The purpose of this study therefore was to provide a greater understanding in SME representation in formal standardization by providing insight in the variety of motivations and barriers of distinctive SME groups.

The issue is explored under the assumption that SMEs are willing to participate in standardization when the motivation to do so is greater than the barriers they experience. The research setting is defined by the biomass value chain in the Netherlands. The method of Grounded Theory is applied. First, several groups of SMEs are distinguished that relate to a particular motivation or barrier. Subsequently, five clusters of key motivations are found. Ten clusters of key barriers are found. Finally, propositions are formulated that attribute the key motivations and barriers to several distinctive SME groups. Although SMEs are not expected to have no other motivations or barriers than the ones presented in the propositions. It is recommended that the theoretical propositions are supported by subsequent theory-testing research in other industries. The results are expected to be context specific. Finally, the propositions may potentially be extended to a general theory on SMEs in relation to their willingness to participate in formal standardization.

Keywords: Formal standardization, SME underrepresentation, Disruptive, Diversification, Company development phase

Introduction

Underrepresentation of small and medium-sized enterprises (SMEs) in formal standards development processes (standardization) is a persistent point of concern. Already twenty years ago, several scientists started examining the topic. E.g. (de Vries, 1997; Fuente & de Vries, 1995; Karlsson, 1997; Meeus & et al., 1996).

In addition, the European Commission committed itself to financially and politically to support participation of SMEs by Regulation (EU) 1025/2012. Through that Regulation, national standards development organizations (SDOs) are obliged to encourage the involvement of SMEs in the standardization process (The European Parliament and the Council, 2012).

SMEs (< 250 employees) represent the majority of all businesses in Europe and therefore comprise a large group of potential standards users. Consequently, standardization is dependent on SMEs for the market acceptance of standards. SMEs are dependent on standardization to make standards accessible, fit for use and cost-efficient. Large companies create solutions and requirements of standards through the

development process that are not necessarily in favor of SMEs (Toffaletti, 2016). Large firms and SMEs are opposites in many ways.

Efforts have been made to include more SMEs into standardization activities by the European Commission and SDOs. The development process of formal standards is open to all parties concerned and research shows that a large group of SMEs wants to participate (De Vries, Blind, Mangelsdorf, Verheul, & van der Zwan, 2009). However, only a small part of that group is currently active.

The standardization world has radically changed over the past two decades and that its impact on business and society has increased significantly (Kurihara, 2006). Standards are part of an approach to manage the increased complexity due to globalization, convergence and the emergence of the networked economy is argued. Standards provide technical solutions to match 'thing' with 'thing' (e.g. bolts and nuts), man with 'thing' (e.g. safety or ergonomic requirements) or man with man (e.g. procedures and management systems) (De Vries, 2012). They provide primary guidance to assure that materials, products and processes are fit for their purpose. Neglecting standards or using inferior or inadequate standards would be at the detriment of the quality and usability of products and services. More alarming, products and services may become unreliable and dangerous.

The increased impact on society is accompanied by a considerable increase in the number of scientific publications over the past decades (Choi, Lee, & Sung, 2011; Gepp, Steinmann, Vollmar, & Voigt, 2012; Russell, 2005).

The issue of underrepresentation is explored in this study under the following assumption: SMEs are willing to participate in standardization when the motivation to do so is greater than the barriers they experience. This simplification is made explicit in the cost-benefit framework of Riillo (2013). Insight in the motivations and barriers of specific SMEs may support SDOs in their stakeholder involvement processes.

Surprisingly little is known about firm-specific motives regarding participation in standardization, according to Blind & Mangelsdorf (2016). Also the barriers they perceive are underexposed. As stated by De Vries et al. (2009): *"There are still very few systematic descriptions and evaluations of causes and solutions to the issue of SME access"* (p.21). Furthermore, variety is underexposed.

From an SDO perspective, the general benefits of participating for firms in standardization are explored in existing literature by (Antonelli, 1994; Swann, 2000; Wakke, Blind, & Ramel, 2016). E.g. benefits by learning from fellow participants or 'win' by steering the process in a way which favours company interests.

Also from an SDO perspective, De Vries et al. (2009) identify the barriers an SME might encounter along the full cycle of standardization development, from awareness to evaluation after participation. E.g. barriers regarding the tracing standardization projects and a lack of financial resources.

From an SME perspective however, formal standardization may have many value propositions for SMEs. There is a large variety of standardization topics and corresponding standardization processes. SMEs may have many different motivations to participate in formal standardization. In addition, SMEs may perceive many, potentially diverging, barriers in relation to formal standardization that may discourage them to participate. An SDO perspective is therefore not adequate to identify the specific motivations and barriers of distinctive SME groups. Insight is therefore required in the motivations and barriers from the perspective of SMEs.

From a firm perspective, two authors recently explored the motives of firms to participate in standardization (Blind & Mangelsdorf, 2016; Riillo, 2013). Riillo (2013) makes a distinction between the motivations and barriers of large and international firms, which are active in product standardization, and

small and local firms active in management standardization. Blind & Mangelsdorf (2016) explore firm characteristics as size, R&D intensity and competitiveness of its environment, on the basis of a quantitative research among German manufacturing companies in the electrical engineering and machinery industry.

However, SMEs are consistently considered as a uniform group, while SMEs "*encompass a wide variety of businesses, which have very different reasons on why, how and how long they seek to be in businesses*" (Perera, 2008, p. 3). SMEs, together with craft enterprises, represent 99.8% of all businesses in Europe (Small Business Standards (SBS), 2016). Insight is therefore needed in the variety of motivations and barriers to participate among specific groups of SMEs.

To conclude, there is little empirical evidence about the motivations and barriers of SMEs in relation to standardization in existing literature. Moreover, existing literature is inadequate as variety is underexposed.

The purpose of this study therefore was to provide a greater understanding of the SME representation in formal standardization by providing insight in the variety of motivations and barriers of distinctive SME groups. The findings may serve as input for the limited base of empirical evidence in existing literature. Furthermore, the findings may support SDOs in their stakeholder involvement processes to accordingly improve SME participation. Moreover, the study may contribute to prevent a dialogue of the deaf, in which SDOs and SMEs "*unintentionally, talk past one another as a consequence of asymmetrical argumentation structures*" (Koppenjan & Klijn, 2004, p. 34),

Grounded theory (GT) on the basis of a case study is applied in this study. A theory building strategy is found suitable because it is critical to address the potential issue at hand and empirical evidence is lacking. Moreover, given the societal and scientific persistence of the problem, the exploratory character of GT is suitable to provide freshness in perspective.

The research setting is defined by the biomass value chain in the Netherlands. The industry is both local and international, emergent, highly diverse, highly competitive and has a large technological innovation potential. Standardization may play a large part in the development of the industry. It may address sustainability concerns, remove trade barriers, increase market transparency and increase public acceptance.

The research is organized around three main questions. First, what are relevant SME groups to distinguish on the basis of their distinctive features? By reason, SMEs may vary on many dimensions, as described earlier. However, only a limited distinctive features are found to be explanatory for a particular motivation or barrier. Second, which key clusters of motivations and barriers of SMEs can be identified? A variety of SME groups also implies a variety of motivations and barriers. Finally, is explored whether these key motivations and barriers can be attributed to several distinctive SME groups that are identified. Propositions are formulated in conclusion.

Research method

As suggested by Eisenhardt (1989) in the context of her method, sufficient evidence is presented in this report to allow readers to make their own assessment on how well data and theory align on the basis of the applied method.

Seven different committees of the Dutch SDO (NEN) in which standards are developed, or technical committees (TCs), are explored. The TCs form a coherent whole through the biomass value chain that relates them. Several SMEs that relate to a committee represent different cases. The scope comprises a sufficient amount of SMEs to achieve a suitable balance between profoundness and generalizability.

Moreover, multiple cases allow for the application of replication logic in which cases are considered as distinct experiments: *"Like a series of related laboratory experiments, multiple cases are discrete experiments that serve as replications, contrasts, and extensions to the emerging theory"* (Yin, 1994 as cited in Eisenhardt, 1989, p. 25). Accordingly, better explanations could be provided than a single case study (Dubois & Gadde, 2002) and the validity and reliability of the results could be increased (Dubois & Gadde, 2014).

Cases are selected according to theoretical sampling. I.e. theoretically useful cases are selected to replicate or extend the emergent theory (Eisenhardt, 1989). In contrary to random sampling which is applied in theory-testing. Therefore, multiple preliminary interviews at the Dutch SDO and analyses of the TC plans and the internal CRM software preceded the interviews.

The SMEs are identified and approached through snowball sampling. Consultants of the Dutch SDO that are responsible for a TC were approached before each SME approach. The list of potential interviewees on the basis of theoretical sampling was discussed and refined with each consultant.

In addition, snowball sampling increased the chance on collaboration of SMEs. SMEs are typically a challenging subject for empirical research. Gunningham (2002) for example approached 875 SMEs for a survey in the UK and received only 15 responses. The study finally includes 10 SMEs. Noteworthy, all SMEs approached were willing to participate in this study.

Theoretical sampling is conducted according to the polar types approach. The sample set varies over multiple dimensions. Dimensions in terms of SMEs characteristics or the situations in which the cases can be found. Extreme cases on each dimension are selected, which makes the observation of contrasting patterns in the data easier as described by Eisenhardt & Graebner (2007).

In addition, the sample set is composed to limit bias. According to Eisenhardt & Graebner (2007), a key approach to achieve this is *"using numerous and highly knowledgeable informants who view the focal phenomena from diverse perspectives"* (p. 28). The multiple dimensions of the sample set also contribute in that respect. Cases from other relevant organizations than NEN and SMEs and outside observers are furthermore included, which Eisenhardt & Graebner additionally advise. Eventually 6 SDO consultants, a strategic account manager and an experienced NEN consultant which is active outside the biomass value chain are included. Furthermore, the study includes contributors from a large company, an umbrella organization and the Ministry of Infrastructure and the Environment. These cases moreover shed light on the external validity of the progressive findings of the research.

The number of cases is based on the theoretical saturation principle. Cases have been added until the point where incremental and iterative learning and design was minimal. However, as described by Eisenhardt (1989), pragmatic considerations also play part in the determination of the number of cases (e.g. time and money). To anticipate time constraints, an approximate number of cases is determined in advance.

The main subjects of research are employees of SMEs. Semi-structured interviews are selected as primary research method. Structured interviews were not possible because a well-developed understanding of the phenomenon was lacking. The unstructured variant of interviewing did not provide the required focus to generate comparable results. A list of the key questions that were needed to be covered during the interview was composed for each interview. They were sent upfront to the interviewees to allow them to prepare. All interviews with consultants are conducted face-to-face. The interviews with external parties (including SMEs) were conducted either face-to-face or by telephone. Each interview took approximately one hour.

The interviews are supported by desk research and observation (triangulation of evidence). Multiple data collection methods strengthen the grounding of the research (Eisenhardt, 1989). Additionally, triangulation of *"multiple sources may contribute to revealing aspects unknown to the researcher, i.e., to discover new dimensions of the research problem"* (Dubois & Gadde, 2002, p. 556).

Desk research comprises the analysis of data (e.g. CRM data from NEN), reports (e.g. committee plans) and theoretical literature. A meeting of a TC committee is attended for observation. A more profound image of the standardization process and the dynamics of the parties involved is generated on the basis of this attendance.

As stated by Eisenhardt (1989): *"A striking feature of research to build theory from case studies is the frequent overlap of data analysis with data collection"* (p.538). Therefore also field notes are made during the research. An important mean to achieve this overlap, according to Eisenhardt (1989). This exercise is typically also referred to as theoretical memo-writing by grounded theory scholars. *"Memos can be about events, cases, categories, or relationships between categories"* (Sbaraini, Carter, Evans, & Blinkhorn, 2011, p. 3). They may include emergent ideas, cross-case comparisons, hunches about relationships, anecdotes, and informal observations, as mentioned by Eisenhardt (1989). The memos were valuable to capture initial ideas, to reflect, to make comparisons, to stimulate and record the developing thinking, as also stated by (Sbaraini et al., 2011). In addition the study explains that it enriches the data analysis and guides further data collection. Memos were kept on a continuous basis throughout the research.

Finally remark that apart from a careful formulation of the research method upfront, an exploratory mindset was at the heart of the research. Openness to new opportunities and new insights resulted in adaptations of the research steps along the way. An approach which is referred to as *planned opportunism* by Pettigrew (1992) and which fits well with the exploratory approach chosen.

The interview consisted of several open ended questions which were drafted upfront. To start, questions were asked to gain a general impression of the interviewee (in relation to standardization). Subsequently, several main topics of questions were discussed. The main topics related to the motivations and barriers SMEs perceive and the underlying thoughts and decision-making. Apart from the main questions the list of specific questions developed throughout the research, in line with the exploratory approach. E.g. a new emerged theme was further shaped throughout subsequent interviews.

Distinctive features

An overview of the variation of the SMEs in the sample set regarding their distinctive features is presented in Table 1. Dimensions in terms of SME characteristics or the situations in which the SMEs can be found. The dimensions are examined on a continuous basis throughout the research. Some distinctive features were directly observable before the interviews (e.g. through websites or information of NEN consultants). Others could only be elaborated by means of the interviews. Remark that the table only includes the dimensions that can be attributed to a motivation or barrier. The table accordingly presents an answer to the first research question. Further note that the companies are coded for anonymity.

Remark that the table represents a by and large categorization. In line with to the polar types approach, the cases are considered as extremes on each dimension. No in-depth analysis is included in this study to these features. The focus of the empirical study in this paper was in particular on the motivations and barriers, which are underexposed as described earlier.

Company development phase							
SME ID	Laboratory phase	Scaling phase	Established name	Disruptive	Involved from the start?	Concentrated company portfolio	National Location of head office
S1			x		N/A		x
S2	x			x		x	x
S3			x		N/A		x
S4		x		(x)*	x		x
S5			x	x	x		
S6	x			x		x	x
S7			x	x	x		x
S8			x	x	x		x
S9		x		x		x	
S10			x	x	N/A	x	x
Disruptivess is (high/low)							

Table 1: Distinctive features of SMEs in the sample set, attributable to motivations and barriers regarding formal standardization

Data analysis

All interview conversations are recorded and transcribed verbatim. The transcriptions are verified with all interviewees. The motivations and barriers are identified according to the traditional GT method. First, a *within-case* analysis is conducted. All motivations and barriers are coded in the Atlas.ti software. In total, the transcriptions are labeled with approximately 600 codes.

In a *cross-case analysis* phase, patterns are explored. Motivations and barriers are compared and clustered. The distinctive features on the dimensions were also coded as *families* in Atlas.ti. A useful feature of Atlas.ti is that (Excel) lists can be generated to show which and how often codes occur in the families. This made it easier to compare the characteristics of the families.

In this phase motivations and barriers were attributed to groups of SMEs with distinctive features. Subsequently, propositions were shaped in this regard. In an iterative process, each proposition was grounded with evidence from the cases. When a motivation or barrier could be attributed to a particular group, the relation was further explored.

To investigate the underlying logic (and exclude confounding variables) of the relationships found, evidence was sought for the *why* behind the relationships (see Eisenhardt, 1989). In particular the memos and interviews with non-SMEs were useful in this regard. Besides, potential relationships that were already identified during the research could be taken along in subsequent interviews for further exploration.

Finally, the motivations, barriers and relationships found in the interviews were compared with literature. As described by Eisenhardt (1989), it is critical when building theory to explore what is similar to the findings, what contradicts and why: *"Tying the emergent theory to existing literature enhances the internal validity, generalizability, and theoretical level of theory building from case study research."* (p.545).

Motivations

Five main clusters of motivations are found. See Table 2 for an overview.

Almost all SMEs participate to get their technology adopted in the market. Several SMEs want to make sure that clear agreements are formulated about the specifics of their product. For example S3 participates to make sure that clear agreements are formulated about the specifics of the innovative product. S5 wants to characterize its products and verify its characteristics because markets for their innovative product are still undeveloped. S6 is also involved to create space for his technology.

Motivations	Grounding
1. To get the technology adopted in the market	**S2, S4, S5, S6, S7, S8, S9, S10**
• To make sure that clear agreements are formulated about the specifics of the product	S2, S4, S5, S6, S7, S8, S9
• To make export/trading possible	S2, S8, S10
• Delegation of knowledge to municipalities, law enforcers and licensing authorities	S7
2. To be informed about new developments	**S1, S3, S4, S7**
3. Awareness through standardization to make sure that the technology fits/meets the requirements and desires of the market	**S2, S6, (S7)**
4. To prevent that undesirable changes are adopted in the standard	**S3, S8**
5. For promotion	**S1, S4, (S3)**

Table 2: Motivations of SMEs with empirical grounding

Others are more focused on verifying their product characteristics rather than creating space for their technology. S4 states that standardization helps their customers to implement their product more efficiently. Because implementation will be easier, project risks are decreased they argue. S9: argues that they want to get their solution/method/technology validated and accepted. The end-user will profit from this as it will be considered as proven technology. Which has a positive influence on their conduct of business and eventually their turnover. In addition S8, argues that it's convenient that consumers get what they expect. S7 has a different argument. They want to formulate an unambiguous and clear set of rules – to be able to build their technology in accordance with regulations on the basis of a single design (instead of multiple).

Finally, S2, S8 and S10 want a standard to make trade or export possible. An outstanding argument is mentioned by S7. Municipalities, law enforcers and licensing authorities also participate in the TC. In result, because S7 is an expert on the topic, they may convey knowledge to these other parties. Awareness and support can be generated for their technology accordingly. For example, many parties perceive a vehicle on natural gas as potentially highly explosive and dangerous. Although a petrol fueled car may be more dangerous is practice.

S2 and S6 are still in the laboratory phase. Because their technology is still under development, they are able to steer their technology to fit the requires of the market, on the basis of the information they gather in the TC. Remark that this is different than steering the rules to meet a fully developed technology. Although this is not that clear-cut in practice. S7 also argues that occasionally their technology is improved on the basis of new information in the TC.

S2 for example participates for information provision out of the whole (vertical) value chain. Which is notably an added value of standardization as opposed to trade-associations . Through trade-associations, typically the same types of companies meet. Information can merely be gathered on a horizontal level in result. Through information on the value chain the company gathers information about transport and market requirements for example.

S3 and S8 have more defensive arguments to participate. S8 for example argues that it wants to prevent that specifications are adopted in a standard are conflicting, complicated or unworkable for their company. S3 wants to prevent that undesirable changes are adopted in the revision on an existing standard.

Finally S1 and S4 participate for promotional arguments. Several SMEs furthermore participate because they want to be informed about new developments. However, not specifically as input for their technology under development.

Comparison of motivations with literature

Awareness through standardization to make sure that the technology matches with the requirements and desires of the market is also described in literature. In particular regarding knowledge exchange to stimulate proprietary innovation or extend R&D processes. In addition, the SMEs under study are indeed motivated to participate to be informed about new developments (through knowledge exchange). Finally, SMEs are also found in this study that participate for promotion, which can be related to participation for image building, as described in literature. As described by S4: If the standard becomes a success, we can say we contributed to the development. Notably, a motivation to become chairman for S3 was that it brings more (promotional) exposure for their company on an international level.

No SMEs in this study argued that the possibility to promote industry interests or the advancement of the sector is a motivation to participate. An hypothesis is mentioned by a consultant: Large companies are typically responsible for the development of the market (because of their large market share). SMEs follow the large companies subsequently, the consultant argues.

Indeed several SMEs that are interviewed participate to influence the content of standards. To get their technology adopted in the market, or to prevent that undesirable changes are adopted in the standard. Notably, as found in literature, especially the possibility to influence standards on an international level are a motivation for many SMEs.

No SMEs explicitly mentioned that they are motivated to participate to raise the costs of rivals or to prevent rivals to gain a competitive advantage. Although S3 argues that the participation of a competitor may be a driver to participate as well. S8 participates to prevent undesirable changes in a standard. However, this is from the perspective of a high quality standard that doesn't lead to a standard that is unworkable for them. Not with the aim to make a standard unworkable for others. This may be because larger companies are more aggressive and less reactive than SMEs in that respect. Although most SMEs in this study do not perceive the standardization context as a hostile environment. Potentially the TCs under study are just not that competitive. According to S5, everyone has common goal – to draft a standard. S3 explains that some conflicting interests are present, but in the end everyone wants the same - a standard. The biobased industry is highly competitive, however primarily in relation to other industries. The need for a chain approach and compatibility among the different parties in the value chain may result in more harmony. A more detailed explanation regarding competition is given by some interviewees. C3 argues that the mindset of NC participants is related to the location of the topic along the value chain. That there is more competition at the end of the value chain, for example in the biobased products industry. As explained by S5, although the biobased industry is relatively new, the wood industry [at the start of the chain] is a traditional industry. Which is perhaps less competitive.

Several SMEs in this study are indeed interested to influence regulation by means of standardization. S7 for example participates because they eventually want a clear set of rules for their (disruptive) technology. For S5 the success of participation is to a large extent dependent on the acceptance of the resulting standard in the market. Which is dependent on the extent to which the standard is going to be adopted in legislation. Standards should be made more compulsory through adoption in legislation in order to give the biobased economy a push, they argue. Finally, S2 is an example of an SME that participates to create new markets. They have developed a disruptive technology. Currently they participate to gather information from the potential value chain as a whole to eventually create a market (at the end of the value chain).

Barriers

Ten categories of barriers are found on the basis of the interviews. See Table 3 for an overview.

Barriers	Grounding
1. **No large barriers***	**S4, S5, (S7), (S8)**
2. **Memberships fee**	**S2, S6, S9, S10**
3. **Time**	**S1, S6, S9, (S4)), (S7), (S8)**
• Time in general	S1, S9, (S7), (S8)
• Traveling time and meeting time (national)	S4, S6, (S7)
4. **Other costs**	**S6, S7, S8**
• Costs in general	S8
• Travelling costs (national)	S7
• Costs of not working on other tasks (national)	S6
5. **Time, costs and energy regarding international participation**	**S1, S2, S3, S4, S7, S8**
• Traveling time and meeting time (international)	S1, S4, S7, S8
• Travelling/accommodation costs (international)	S2, S3, S4, S7, S8
• Costs/time of not working on other tasks (international)	S3, S4, S7
6. **Standardization is too slow, rigid and conservative**	**S1, S6, S9**
7. **Conservative forces in a TC in relation to new technologies.**	**S3, S9**
8. **Bureaucracy, intransparency, complexity of standardization system.**	**S5, S8**
9. **Sufficient level of expertise in the TC.**	**S4, S5**
10. **Knowledge spillovers to competitors**	**S1, S9**
*Not an actual barrier	

Table 3: Barriers of SMEs with empirical grounding

Strikingly, some SMEs perceive no barriers to participation. S7 and S8 stated that they perceive no large barriers when asked. Throughout the conversation however some barriers emerged regarding specific elements of the standardization process.

Further, the memberships fee is a barrier for several SMEs. For S2 the memberships fee is a large barrier because of the company development phase. They invested private capital. For S6 the membership fee was a motivation to stop participation. As a one-man business you don't have reserves, S6 argues. S10 stated that the relatively high memberships fee i.r.t. ASTM and a trade-association was reason not to participate. Notably S9 argues that a memberships fee is relatively a larger barrier for SMEs than for larger companies.

According to S1 standardization is too slow, rigid and conservative to keep up with new developments and lags behind relevant issues. S6 stopped participation because in particular the meetings did not meet expectations. They were perceived as not effective and too slow. In addition, S9 argues that the standardization process is slow and therefore the costs also add up.

S3 and S9 perceive conservative forces in a TC in relation to new technologies as a barrier. As explained by S3: In a TC, it is easier to vote in favor than against during balloting. Although parties may have little expertise, they are tended to vote in favor. Which makes it more difficult to get your expertise adopted

in a standard, when you're the only one that has expertise on a certain subject. S9 perceives barriers through the dominance of a competitor and conservative forces in relation to new technologies.

S5 states that standardization is not transparent. Investments and work programmes are unclear upfront, as well as the benefits afterwards. S8 argues that bureaucracy and complexity of the standardization system plays part.

S5 does not participate when there is a sufficient level of expertise in the TC. Noteworthy a desirable situation from an SDO perspective. In addition, S4 states that if they are no longer able to contribute to the standard development, this will influence their willingness to participate.

Finally, S1 and S9 state that (inevitable) knowledge spillovers to competitors are a barrier to participate in standardization processes. The barriers in relation to costs and time are broken down in concrete barriers in the table and are therefore not further explained.

Barriers in comparison with literature

The barrier of awareness of SMEs regarding standardization could not empirically be explored in this study because of the snowballing method applied. The SMEs in the study were all familiar to formal standardization.

According to literature, SMEs inform themselves about strategic issues through a limited network. Notably, all SMEs however participate to have influence on an international level. Which contradicts with the statement in literature. Possibly this can be ascribed to the characteristics of the biobased industry. As described, production is typically local but markets are international. Several SMEs in addition stated that participation merely on a national level is not interesting because relevant matters take place on an international level.

Literature states that SMEs only participate when a client demands it, regulations oblige it or competition forces them. That SMEs perceive standardization as an obligation. This relates to literature on general decision-making processes of SMEs. Literature states that the strategic decision-making cycle is reactive and adaptive. An analysis is made on how the SMEs of the sample set got involved or became aware of the formal standardization process of NEN. It is concluded that not all got involved in a reactive way, several SMEs pro-actively got involved. Which implies a certain awareness.

Barriers regarding *tracing* in literature are also found in empirical research. Several SMEs perceive bureaucracy, intransparency and complexity in relation to standardization. The barriers that relate to lack of time and money are also mentioned by the SMEs in this study. Barriers regarding the memberships fee, other costs, time in general and time, costs and energy regarding international participation. A deeper insight in the considerations regarding the time investments, for example in perspective of the daily operations of SMEs. Finally, SMEs mentioned in this study that the standardization processes is perceived as too slow, rigid and conservative. This logically relates the barrier in literature that the process is too long and inflexible.

A lack of knowledge and skills is noteworthy not found to be a barrier for the SMEs under study. By comparison, it is concluded that first a distinction should be made between process knowledge and substantive knowledge. A lack of process knowledge is not found to be a barrier for the SMEs under study. Although it is acknowledged that larger companies have more process knowledge by S5, S6 and S8. Because they have more experience according to S5 and S6. S8 argues that they indeed have more possibilities to put a standardization specialist on the job. But a lack of process knowledge is not perceived as a barrier. S8 even states that it is a good thing that there are other people in the process that have

knowledge on the process, because they don't have that expertise and are not able to assign a standardization specialist. Also S5 states that a lack of process knowledge is not a barrier because large companies provide that knowledge. Finally, S8 mentions that it is also the task of a NEN consultant to provide this knowledge.

A lack of substantive knowledge is not found for SMEs in relation to the larger companies. In this respect, the barrier of dominance of larger parties is also not found. There are no differences between SMEs and large companies in terms of influence within the standardization process according to S1, S3, S5 and S8. S5 states that this is due to the fact that departments of large companies are small SMEs in itself – with equal limitations in resources and manpower. S6 however argues that larger companies have more influence. According to S6 they are better able to bring arguments because of a greater knowledge reserve. In addition, S6 argues that because they are larger market players, they demand a larger say in the process. Also consultants argue that SMEs do not lose out on the big ones in this area. This may relate once more to the need for a chain approach in this industry. The need for compatibility among the different parties may explain more harmony.

In addition, everyone has an equal say in the process, according to S3 and S5. S4 however argues that this is formally the case, but in practice the balance of power is different. More active participation is equal to more influence in the process, according to S4. Which is not necessarily attributed to large companies though. Finally, S9 mentions the dominance of competitors as a barrier, rather than the dominance of large companies. S9 also expects differences in the sense that different groups are active in a NC, they are all stakeholders, but the stakeholders have diverging interests.

A lack of substantive knowledge is found to be a barrier in general though. However, for a different reason than found in literature. In literature a lack of substantive knowledge is perceived a barrier in the sense that SMEs are not able to put high qualified experts on the job or simply lack the expertise. In this study, several SMEs perceive a sufficient level of expertise in a TC as a barrier. SMEs lack expertise in the sense that they are not able to contribute on a substantial level in the TC. Note the subtle difference: Too little expertise as an SME (in literature) versus too much expertise in a TC. Logically, the perception of the barrier in the latter sense leads to less frustration among SMEs. It is therefore important to make this distinction. Finally note that too much expertise in a TC is logically also a motivation for several parties (e.g. to stimulate proprietary innovations, to be informed about new developments).

The language barrier is not mentioned by the SMEs in this study as a barrier to participate in formal standardization of NEN. All interviewees are Dutch-speaking. Although not all Dutch, one German participant is interviewed. This also goes for the interviewees from SMEs with a head-office abroad. The language employed on international level is typically English, which by reason also should not be a problem for Dutch and German participants. Note that S4 has mentioned difficulties in communication at international meetings with Chinese participants. *"Sometimes they mean yes, but they say no"* (S4). However, this is not perceived as a barrier for participation for S4. Further, S5 and S6 talk about a peculiar language in standards, which is inconvenient but not a barrier. This costs a lot of time according to (S6). S5 states that it is not a barrier because larger companies know how to deal with this.

In addition, limited operational support is not perceived by the SMEs under study. On the contrary. Most SMEs are very satisfied by the approach, information provision and support of NEN consultants. Noteworthy, also the SMEs that decided not to participate (any longer). However, S2 mentioned that the introduction to standardization from NEN was not sufficient but certainly required.

Knowledge spillovers are also mentioned by two SMEs in the empirical research. As described in literature, standards are a public good. The standardization process is indeed open and transparent and standards are publicly available, which makes the risk of knowledge spillovers plausible.

Conservative forces in a TC in relation to new technologies is mentioned by several SMEs in this study, but is not mentioned in literature however. One could argue that the discussed barrier of dominance of larger organization is so the speak a conservative force. However, the conservative forces mentioned in this study relate to the implications of the institutional context in combination with *ignorance* of other stakeholders. E.g. Due to a balloting system participants are more tended to vote in favor than against (S3). Conservative due to ignorance is different from conservative due to strategic behavior (of larger parties) that is implied in literature. The latter argument however does relate to the dominance of competitors which was found in an interview, as mentioned earlier.

Finally, several parties that are interviewed perceive no (large) barriers. This may possibly be due to the fact that their motivations are very strong (which makes them more or less blind to potential barriers, if there are any). By reason this is typically the case when standardization is perceived as an opportunity, rather than necessity or obligation.

Conclusions and propositions

The purpose of this study therefore was to provide a greater understanding of the SME representation in formal standardization by providing insight in the variety of motivations and barriers of distinctive SME groups.

Different groups of SMEs are identified. Subsequently several key motivations and barriers are found of the SMEs in this study. These are moreover strengthened through comparison with literature. On the basis of these findings, propositions are formulated that attribute key motivations and barriers to several distinctive SME groups. As described earlier, many dimensions are explored, as well as motivations and barriers. However only some are found to relate to each other.

The propositions are formulated by looking whether a specific group has specific motivations and barriers. It was intended to achieve mutually exclusiveness regarding each proposition. Although an SME may belong to multiple groups and may have multiple motivations of barriers. A proposition is only formulated when a plausible underlying logic is present regarding the relation (which moreover excludes confounding variables). Plausible explanations are sought for the why behind the relationships (Eisenhardt, 1989). Accordingly, each proposition is accompanied with a probable argumentation.

The evidence is presented in the boxes below. Subsequently three propositions that attribute specific motivations to a distinctive SME groups are presented. Furthermore, three propositions that attribute specific barriers to SME groups are presented.

Proposition 1

High disruptiveness (S2+(S4)+S5+S6+S7+S8+S9+S10) relates to To get technology adopted in the market (S2+S4+S5+S6+S7+S8+S9+S10)

Argumentation: Disruptive SMEs are off the beaten path. Their product or service in result does not fit within the institutional frame of an existing market. By participating in standardization, they are able to create room in standards for their product and services. When they are able to refer to standards regarding

their product or service, the confidence or trust in that product or service of potential customers is increased.

To conclude, the following proposition is formulated.

Proposition 1: SMEs that are highly disruptive primarily participate in formal standardization to get their technology adopted in the market.

Proposition 2

Low disruptiveness (S1+S3+(S4)) relates to Participate for promotion (S1+(S3)+S4).

First remark that S4 states that they have developed a low disruptive technology, the application of the technology is highly disruptive however. Hence the brackets. Second, S3 has become chairman of a TC for promotional exposure of their company. Which is no ordinary type of participation, hence the brackets.

Argumentation: An SME that is poorly disruptive may distinguish itself from the majority by participating in formal standardization processes. Standardization is used as a marketing tool. If the standard becomes a success, the SME is able to say that they have contributed to the development. Standardization increases the confidence in the service of product among their users or consumers.

To conclude, the following proposition is formulated.

Proposition 2: SMEs that are poorly disruptive primarily participate in formal standardization for promotion.

Proposition 3

Laboratory phase (S2+S6) relates to Participate to make sure that the technology matches with the requirements (S2+S6).

Note that S2 and S6 are still developing their technology. Although S2 is almost at end of laboratory phase and beginning of scaling phase.

Argumentation: Apart from steering the standardization process to create room for a disruptive product or service, a firm may also adapt its product or service to the requirements of the standard (under development). Through standardization, information on the latest developments can be gathered. Furthermore, standardization is also a way to get into contact with other parties in the value chain. Accordingly information can also be gathered about the requirements of other parties in the value chain (suppliers, transporters, etc.). SMEs that are still developing or testing their products or services, they are still able to steer the development to the requirements set in the standard. Standardization in result serves as input to their development process.

To conclude, the following proposition is formulated.

Proposition 3: SMEs that are in a start-up or laboratory phase primarily participate in formal standardization to make sure that their technology matches with the requirements of the market.

Proposition 4

Involved from the start, natural involvement (S4+S5+S7+S8) relates to No large barriers (S4+S5 (+S7)(+S8))

Argumentation: These SMEs all got involved from the start a standardization project i.e. the establishment of a TC. The possibility to influence the process is largest at the start of a TC. The potential influence diminishes when the process progresses. At the end of a project it is logically more difficult to propose changes to a standard. Moreover, S4, S5, S7 and S8 are all driven by the possibilities of market expansion. Although S8 also in part participates to prevent unworkable requirements in a standard. Hence, it is likely that these parties perceive standardization as an opportunity rather than a necessary or obligation.

To conclude, the following proposition is formulated.

Proposition 4: SMEs that are involved at an early formal standardization stage perceive no large barriers.

Proposition 5

Narrow product focus, little diversification as a company (S2+S6+S9+S10) relates to Memberships fee is a barrier (S2+S6+S9+S10)

Argumentation: SMEs with a narrow product focus don't have alternatives through which their investment risks are diversified. Participation is therefore perceived as a larger risk than for diversified SMEs. Therefore, out of pockets costs (memberships fees) are a larger barrier (and higher risk) for companies with little diversification.

To conclude, the following proposition is formulated.

Proposition 5: SMEs with an undiversified portfolio perceive the memberships fee as a large barrier.

Proposition 6

Main office abroad (S5+S9) relates to Time, costs and energy regarding international participation is **not an issue** (S5+9).

Argumentation: For (employees of) SMEs with a head office abroad, its more self-evident to work on an international level. These SMEs are therefore better able to anticipate time, costs and energy regarding international participation.

To conclude, the following proposition is formulated.

Proposition 6: SMEs with a main office abroad don't perceive time costs and energy regarding international participation as a large barrier.

Limitations and recommendations

The propositions are not mutually exclusive compared to each other. An SME in this study may belong to multiple groups and may have multiple motivations or barriers. For example, both proposition 1 and proposition 3 relate to S2. Moreover, a complete list of motivations and barriers is virtually impossible from a subjective perspective. Actors have many interests in relation to standardization, including irrational ones (De Vries, 1999). In addition, many other factors may influence the decision to participate than motivations and barriers. Next to (intrinsic) motivations, additional drivers may for example influence the decision-making. Its therefore important to remark that SMEs are not expected to have no other motivations or barriers than the ones presented in the propositions. It is likely however that they are very or most important, given that they emerged through the research presented. Note that the propositions are formulated in a reserved way in that respect (e.g. *primarily).*

The theoretical propositions are expected to be relevant and empirically valid because of the close adherence to the empirical data. However, it is recommended that they are evaluated in subsequent theory-testing research. They are based on theory-building research with a limited amount of research subjects in the particular setting of the biobased industry. Depth has been achieved, but at the detriment of generalizability. Moreover, the results are expected to be context specific because of a large influence of variety and situational influences. Future research is therefore recommended to the key motivations and barriers of the distinctive SME groups in other industries to support the findings of this study. Apart from application, testing and refining, the propositions may be extended in subsequent research. Propositions are made for several specific SMEs in relation to specific motivations and barriers. Potentially other groups of SMEs may be identified in relation to other motivations and barriers. Finally, the propositions may be extended to a general theory on SMEs in relation to their willingness to participate in formal standardization.

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