The impact of Strategic Performance Management on SME performance

DISSERTATION
University of St. Gallen,
School of Management,
Economics, Law, Social Sciences
and International Affairs
to obtain the title of
Doctor of Philosophy in Management

submitted by

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from

Germany

Approved on the application of

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Dissertation no. 4326

The University of St. Gallen, School of Management, Economics, Law, Social Sciences and International Affairs hereby consents to the printing of the present dissertation, without hereby expressing any opinion on the views herein expressed.

St. Gallen, October 22, 2014

The President:

Prof. Dr. Thomas Bieger

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Acknowledgements

"Our aspirations are our possibilities."

Samuel Johnson

When the thoughts of pursuing a PhD program first came to my mind, my aspiration was to generate insights both for the academic and practitioner's world and to investigate a topic that is related to Asia, reflecting the shift of economic power towards the East.

Even though our aspirations set the scope for possible achievements, there is no such a thing as a self-made man. Our thoughts and achievements build on advice, support, and access to networks from our mentors, colleagues, friends, and family. This project would not have been possible without the direct and indirect contribution of several people. Therefore, I would like to express my gratitude to the community of mentors, colleagues, friends, and family, who have helped to make this project possible.

Firstly, I would like to thank Prof. Dr. Thierry Volery and Prof. Dr. Klaus Möller for admitting me as their doctoral student and for steering my thoughts towards a unique and impactful direction. They were both receptive to new ideas yet did not hesitate to challenge them. Combined with their approachability and friendliness, I was able to define and build this research topic on a solid academic foundation.

Next, and importantly, I would like to thank the hundred over Swiss and Singaporean SME executives for their trust, for sharing information on their management practices, and for the subsequent invitations to discuss strategic topics. This research would not have been possible without them. Gaining access to SME executives was challenging, especially in Singapore. That said, my special thanks go to Andreas Fischer, John Goh, Yi Chung Law, Choon Yuen Sam, and Alexander Melchers, who have made all the difference in opening doors to executives in Singapore.

Dr. Gralf Sieghold deserves special mention not only for being a caring mentor throughout the time of my studies, but also for being a role model for business and ethical behavior across cultures. His attitudes towards integrity, work-family-balance, and leadership have inspired me from the very first day. Furthermore, his motivational support has helped me to get back on my feet when I fell in the dark valleys.

I would also like to thank my friends, who have counseled me during this project: David Lutterbeck, Dr. Saša Šarić, Dr. Joachim Goller, and Sascha Preiswerk. The quality of this dissertation has benefited greatly from numerous discussions and their valuable remarks.

Their mental support and personal attitudes in business and academic life have helped me to stay motivated and focused throughout my journey.

Next, I would like to thank Prof. Dr. Stefan Morkötter, Dr. Matthias Schaub, and the entire St. Gallen Institute of Management in Asia (SGI) team for their hospitality, ongoing support, and for creating memories that last.

I am also thankful for the loving support that I have received from Sarah Tan throughout the years. Sarah deserves particular praise in helping me understand the Singaporean culture, in teaching me how to play the gatekeepers' game, and in helping me row when there was no wind. Without her I would not have had the motivation and breath to finish this project.

The last years have been an amazing journey! I have met many inspiring and distinctive people. Certainly, I have learned a lot – less from reading and writing, but much more from listening and reflecting.

Thank you, to all of you!

<div align="right">Manuel Bäuml</div>

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ABC   Activity-based costing
ALS   Alignment of measures with firm strategy
AVE   Average variance extracted
BAL   Breadth of measurement system
BSC   Balanced Scorecard
CB   Covariance-based
CH   Switzerland
COU   Country
EDB   Economic Development Board of Singapore
ERP   Enterprise Resource Planning
EVA   Performance evaluation
FIMIX   Finite-mixture partial least squares
FOR   Formalization of measurement system
IE   International Enterprise Singapore
INC   Incentive setting
IPMS   Integrated Performance Measurement for Small Firms
KMO   Kaiser-Meyer-Olkin
OPM   Organizational Performance Measurement
ORG   Organizational complexity
PCA   Principal components analysis
PE   Precision engineering
PER   Firm performance
PIC   Productivity and Innovation Credit Scheme
PLS   Partial least squares
PMS   Performance measurement system
SBF   Singapore Business Federation
SEM   Structural equation modeling
SIN   Singapore
SIZ   Firm size
SME   Small and medium-sized enterprise
SMF   Singapore Manufacturing Federation
STA   Strategic alignment of employees
TAR   Target setting
VIF   Variance inflation factor

Abstract

Although extant literature specific to small and medium-sized enterprises (SMEs) suggests that Strategic Performance Management positively affects organizational outcomes, empirical evidence supporting this suggestion is pre-dominantly anecdotal or limited to a few qualitative case studies. Drawing on the resource-based view of the firm, this study develops predictions that link the use of measures in key managerial processes and three essential design properties of measurement systems (i.e., alignment of measures with firm strategy, breadth of measurement system, and degree of formalization) to the strategic alignment of employees and to an SME's financial performance.

To quantitatively test the developed hypotheses, 90 owner-managers and managing directors of Swiss and Singaporean manufacturing SMEs filled in a survey during interviews. Results suggest that the use of measures is positively associated with the strategic alignment of employees, which in turn affects firm performance. A critical firm size of 45-55 employees is found, beyond which the described first effect becomes increasingly significant. In addition, this study provides supporting evidence for the breadth of a measurement system. This design property positively moderates the underlying association between the use of measures and the strategic alignment of employees. Findings are discussed in light of existing theory with respect to large firms and taking into account SMEs' specific characteristics.

Next, seven propositions for the effect of national culture on Strategic Performance Management are developed. They draw on the theory of national culture and are substantiated by analyzing differences between Swiss and Singaporean SMEs. These propositions serve as avenues for further research to break new ground and help to overcome the overly dominant Western focus in performance management research.

Finally, findings are translated into concrete recommendations for practitioners. In a narrow sense, managerial implications are provided based on quantitative evidence from this study. Synthesizing qualitative findings, the strategic positioning of Swiss and Singaporean SMEs and associated challenges are presented and a three step-approach for the identification and integration of relevant measures into managerial processes is developed.

Kurzdarstellung

In der Literatur, die sich auf Strategisches Performance Management in kleinen und mittleren Unternehmen (KMU) bezieht, wird die positive Auswirkung dieses Managementansatzes auf den Unternehmenserfolg hervorgehoben. Allerdings basiert diese Einschätzung überwiegend auf Erzählungen oder wenigen Fallstudien. Die vorliegende Studie baut auf der ressourcenbasierten Sichtweise eines Unternehmens auf. Es werden Hypothesen entwickelt, die die Verwendung von Kennzahlen in zentralen Managementprozessen in KMUs, sowie den drei in der Literatur als wesentlich eingeschätzten Gestaltungsmerkmalen eines Kennzahlensystems [1] auf vor- und nachlaufende Erfolgskennzahlen eines Unternehmens in Beziehung setzen.

Um die Hypothesen zu testen, füllten 90 Inhaber und Geschäftsführer von Schweizer und Singapurer Maschinenbau-KMUs während Interviews einen Fragebogen aus. Die Ergebnisse zeigen, dass die Verwendung von Kennzahlen sich positiv auf Kenntnis der Mitarbeiter über die, und Zustimmung zur Unternehmensstrategie auswirkt, was wiederum zu einem größeren Unternehmenserfolg führt. Der zuerst beschriebene Effekt wird ab einer Anzahl von mind. 45-55 Mitarbeitern zunehmend statistisch signifikant. Zusätzlich zeigt diese Studie einen positiven Interaktionseffekt des Umfangs eines Kennzahlensystems auf.

Im Weiteren werden sieben Theoreme erarbeitet, die den Effekt der Kultur einer Gesellschaft auf Strategisches Performance Management beschreiben. Sie basieren auf der Kulturtheorie und werden durch empirisch gefundene Unterschiede zwischen Schweizer und Singapurer KMUs erhärtet. Diese Theoreme sollen Wissenschaftlern in ihren zukünftigen Vorhaben leiten, um die starke Fokussierung in diesem Forschungsgebiet auf westliche Gesellschaften zu durchbrechen.

Zuletzt werden aus den gewonnen quantitativen Daten betriebswirtschaftliche Handlungsempfehlungen abgeleitet. Im Anschluss wird auf Basis der qualitativen Informationen die strategische Positionierung von Schweizer und Singapurer KMUs dargestellt sowie die damit verbundenen, aktuellen Herausforderungen erläutert. Abschließend wird ein dreistufiger Prozess vorgeschlagen, der der Ermittlung und Integration relevanter Kennzahlen in KMU-Managementprozesse dient.

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[1] Übereinstimmung mit der Unternehmensstrategie, Umfang eines Kennzahlensystems, und Formalisierungsgrad

1 Introduction

"I believe that there is a critical size of around 40 employees. We have about 110 employees and [are] getting to a point where informal ways are getting difficult. [...]Small firms that try to work in the same way as large firms die beautifully. Surviving in a mess is better than dying beautifully."

− Owner-manager of Singaporean manufacturing SME with 110 employees

Managerial accounting researchers exalt Strategic Performance Management as essential to identifying and exploiting an organization's strategic capabilities (Grafton, Lillis, & Widener, 2010). For example, strategic performance measurement systems operationalize firm strategy with a set of measures (Artz, Homburg, & Rajab, 2013) and influence the behavior of the organization's individuals (de Leeuw & van den Berg, 2011). A measure is a metric or indicator that allows for quantifying the performance of a focal construct. There is mounting evidence that both the use of measures and the design of a performance measurement system (PMS) are central to achieving and sustaining superior financial and market performance (e.g., Chenhall & Langfield-Smith, 1998; Evans, 2004; Luft & Shields, 2003).

Researchers in the domain of small and medium-sized enterprises (SME)[2] emphasize that SME characteristics differ to the ones of large firms (Storey, 1994). As PMSs were developed within, and for, large organizations findings may not be transferable to their smaller counterparts (Cook & Wolverton, 1995; Garengo, Biazzo, & Bititci, 2005). Researchers who adopt this view regularly highlight the challenges in implementing PMSs in SMEs (e.g., Garengo & Bititci, 2007; Price & Erwee, 2006). Most of this research appears to assume that Strategic Performance Management positively contributes to firm performance. In contrast, as indicated by the quote above, SME practitioners commonly view the use of measures as impedimental to firm performance.

Most of the research focuses on large firms as depicted in Figure 1. Sub-fields of interest are Strategic Performance Management as a means to operationalize a firm's strategy (e.g., Chennhall, 2005), effects of and on organizational design and culture

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[2] Enterprises that fulfill the following criteria: for medium-sized (small) firms less than 250 (50) employees and at least one of the following two criteria, annual turnover less than EUR 50 mn (EUR 10 mn) or annual balance sheet of less than EUR 43 mn (EUR 10 mn). Micro firms are companies with less than 10 employees (EU Commission, 2005, p.14).

Figure 1 – An overview of performance management literature

Core elements		Large firm	SME		Mediating effect	Large firm	SME			Performance[1]
Vision & strategy	Burney, Henle, & Widener (2009); Chenhall (2005); de Geuser et al. (2009); Dye (2004); Gimbert et al. (2010); Malina & Selto (2001)	✓	(✗)		**People behavior** Burney et al. (2009); Chenhall (2005); Choi, Hecht, & Tayler (2012); Chong (1996); de Leeuw & van den Berg (2011); Decoene & Bruggeman (2006); Hall (2008, 2011); Hartmann & Slapnicar (2012); Ittner, Larcker, & Meyer (2003); Liu & Leitch (2013); Marginson (2002); Mundy (2010)	✓	(✗) **3**			**Performance[1]** Chenhall & Langfield-Smith (1998)*; Cruz et al. (2011); Davila & Foster (2005); Davis & Albright (2002); Evans (2004)*; Hyvönen (2007); Ittner & Larcker (2001); Ittner, Larcker, & Randall (2003b); Lee & Yang (2010)*; Malina & Selto (2001)*; Perera, Harrison, & Poole (1997); Scott & Tiessen (1999)
Organizational design & culture	Hemmer (1998); Henri (2006b); Lee & Yang (2011)	✓	(✗)							
Use of measures	Artz, Homburg, & Rajab (2012); Bisbe & Malugueno (2012)	✓	✗ **1**							
Design of PMS	Dossi & Patelli (2010); Hall (2008); Hansen (2010); Ittner et al. (2003); Kaplan & Norton (1992, 1996); Kraus & Lind (2010); Lillis (2002); Webb (2010)	✓	(✗) **2**	**4**						
National culture	none	✗	✗		**Organizational capabilities** Chenhall (2005); Grafton et al. (2010)*; Hall (2008); Kolehmainen (2010); Wouters & Wilderom (2008)	✓	(✗)			
Role of PMS	Bisbe & Otley (2004); Henri (2006a); Malmi (2001); Tuomela (2005); Wiersma (2009)	✓	✗							
Networks	e.g., Baiman, Fischer, & Rajan (2001)	✓	✗							
Dynamic PMS	e.g., Chenhall (2003); Schläfke, Silvi, & Möller (2013)	✓	✗							
Context										

Research contribution
Empirical evidence:
✓ quantitative
✗ does not exist
(✗) qualitative/anecdotal

* perceived firm performance

1) Financial and market performance, business unit performance, team performance, managerial performance, inter-firm performance

Note: Classification of consequences based on Franco-Santos, Lucianetti, & Bourne (2012); classification of antecedents based on Ferreira & Otley (2009)

(e.g., Henri, 2006b), the design of PMS (e.g., Dossi & Patelli, 2010), the role of PMS in interactions with employees (e.g., Bisbe & Otley, 2004), Strategic Performance Management in networks (e.g., Baiman, Fischer, & Rajan, 2001), and PMSs in dynamic environments (e.g., Schläfke, Silvi, & Möller, 2013). Further research focuses on the effect on firm performance (e.g., Chenhall & Langfield-Smith, 1998) which more and more scholars suggest to be indirect through people behavior (e.g., Burney, Henle, & Widener, 2009) and organizational capabilities (e.g., Chenhall, 2005).

Researchers focusing on SMEs suggest that Strategic Performance Management has a positive effect on organizational outcomes, too (e.g., Hudson, Lean, & Smart, 2001; Garengo, Biazzo, & Bititci, 2005). However, there is little empirical evidence on whether

the use of measures actually contributes to an SME's performance and what role PMS properties play in this context.

This is notably because it takes significant resources to implement and maintain PMSs (Hudson, Smart, & Bourne, 2001b, p.1105) which are scarce in SMEs (Doole, Grimes, & Demack, 2006). The purpose of this study is to investigate the effects of the use of measures and the role of PMS properties in the context of SMEs. Therefore, this study aims to answer the following overriding research question:

What is the effect of Strategic Performance Management on SME performance?

In addition, this study addresses a further gap in literature in the field of national culture. Little empirical research has been conducted on how national culture affects Strategic Performance Management (e.g., Keleş & Aycan, 2011; Rubienska & Bovaird, 1999). A better understanding on the impact of national culture is particularly important in overcoming the overly dominant and ethnocentric Western focus in this field of research.

1.1 Contribution

This study is grounded in the resource-based view of the firm (Wernerfelt, 1984). I argue that the use of measures in managerial processes enhances an organization's capabilities to identify and then seize opportunities (Augier & Teece, 2009). In line with the extant view in literature, this research predicts an indirect effect on firm performance via the strategic alignment of employees. Strategic alignment is important because it reflects an organization's capability to stimulate desired behavior of its human resources and to execute strategy at a process level (Chenhall, 2005). In addition, the design of the PMS influences the extent to which employee actions are in line with the firm's strategy. As such, the PMS together with the use of measures can be a valuable resource unique to the firm that results in a competitive advantage. Besides the focus on Strategic Performance Management in SMEs, the study also aims to address effects of national culture on Strategic Performance Management, because most of the research so far was conducted in Western societies. Therefore, three related research questions will be addressed sequentially in this study and comprehensively provide an answer to the overriding research question:

(1) Does the use of measures in managerial processes of SMEs increase the alignment of employees with the firm's strategy and affect firm performance?

(2) What is the influence of PMS properties on the strategic alignment of employees in SMEs?

(3) Is there any difference between the practice of Strategic Performance Management in Singaporean and Swiss SMEs? If so, what role does national culture play?

This study contributes to the literature on SMEs in several ways (Figure 2).

Figure 2 – Overview of academic contributions

Firstly, relatively little prior empirical research investigated the associations between the use of measures and PMS properties (e.g., Artz, *et al.*, 2013). This field, to the best of my knowledge, was exclusively limited to large firms, and thus, this study focuses on SMEs. SMEs typically feature distinct characteristics so that associations drawn on existing research may be less prevalent or even non-existent in the context of SMEs. In particular, this study seeks to reveal whether the use of measures is beneficial to SMEs and whether a critical firm size exists. In doing so, my research intent is a response to Artz *et al.*'s (2013, p.457) call for further research with regards to the conditions that make the use of measures more or less effective. SME-specific field research so far lacks evidence of these associations and is often anecdotal or based on single case studies (e.g., Groen, Belt, & Wilderom, 2012; Turner, Bititci, & Nudurupati, 2005). As a result, researchers have come to the conclusion that PMSs are desirable for SMEs without ever quantitatively testing the proclaimed effects.

Secondly, I link PMS properties with the use of measures. Despite Otley's (1999, p.377) call for research that investigates PMSs together with key managerial processes such as target and reward setting, little empirical research has been conducted that empirically investigates the role of PMS properties (e.g., Artz *et al.*, 2013). As such, this study extends literature by suggesting which specific properties of PMSs affect the effectiveness of the use of measures.

Thirdly, this study extends extant literature by exploring the process by which PMSs influence organizational outcomes (Chenhall, 2003), taking into consideration the mediating role of employee behavior and organizational capabilities (Grafton *et al.*, 2010). It demonstrates that Strategic Performance Management affects firm performance via strategic alignment of employees, and therefore via the extent to which a firm can leverage its human resources and capabilities.

Next, the study contributes to research in international business by exploring the extent to which SMEs use measures with regards to the design of PMSs in an Asian and a European society. Studies in the field of international business suggest that one's country and national culture have as strong an effect on performance as industrial characteristics (Makino, Isobe, & Chan, 2004). However, little is known about how cultural characteristics affect Strategic Performance Management. My intention is not to offer an in-depth investigation of associations which would require a large-scale, multi-country research design (Harrigan, 1983). Instead, this study's secondary goal is to offer initial descriptive insights and to develop propositions to guide further research on the use of measures and the design of PMSs across national cultures.

Lastly, the study's results have important managerial implications for SME owner-managers and managing directors. SMEs often struggle to adopt new and innovative managerial practices (Cagliano, Blackmon, & Voss, 2001) and managers tend to have a misconception of performance management (Hussain, Gunasekaran, & Laitinen, 1998). However, my results suggest that Strategic Performance Management capabilities can lead to competitive advantage. SMEs that use measures and that have developed broader PMSs achieve, in average, higher strategic alignment of employees and ultimately superior firm performance.

1.2 Outline of this research

Based on these contributions and the underlying research questions, the structure of this research study is outlined in the following.

Chapter 2 provides an overview on the distinctive characteristics of SMEs compared to large companies and details how these differences affect Strategic Performance Management. In the first section a definition for Strategic Performance Management based on previous research is provided. Then, the manifold findings on SME characteristics are summarized and a classifying framework is suggested. I use this framework to showcase how the different types of SME characteristics affect the use of measures and the design of measurement systems.

Chapter 3 introduces the focal constructs to be measured and elaborates on the development of the conceptual model. It draws on literature from leading journals and demonstrates how the use of measure leads to an increased strategic alignment of employees and ultimately superior firm performance. I argue that the use of measures in SMEs has a positive effect on the extent to which employees are strategically aligned and ultimately on firm performance, too. However, a critical firm size exists above which this effect begins to take shape. Below this critical firm size, the effect of the use of measures is less significant due to the specific characteristics of an SME. In addition to this baseline model, three major constructs are introduced which are likely to have interaction effects on the underlying association: (1) alignment of measures with firm strategy, (2) breadth of measurement system, and (3) formalization of measurement system. Findings regarding these three effects are particularly important in SMEs as they provide answers to the diverging opinions on measurement systems between academics and practitioners. Chapter 3 closes with the conceptual model.

In response to the identified need for empirical research on Strategic Performance Management in SMEs, chapter 4 presents the research methodology. First, I introduce the field study which covers 62 Swiss and 28 Singaporean manufacturing SMEs. This section describes the rationales for the choice of both countries and elaborates on the data gathering process to recruit SME owner-managers and managing directors. The subsequent section reveals descriptive sample characteristics to ensure the suitability of the sample for the research intent. The next section lays the theoretical foundation for the construct measurement by introducing the nomenclature and the partial least square as the methodology of this study. It provides the rationales for the choice of this algorithm, and outlines the general process to operationalize constructs. Lastly, recommended

values for quality criteria for constructs and the structural model to ensure reliability and validity of findings are summarized.

In chapter 5 the empirical findings of this field study are presented. Section one elaborates on the operationalization of constructs and serves to establish confidence in reliability and validity of construct measurement. Section two provides three major findings from the analysis of the structural model regarding (1) the use of measures in SMEs, (2) existence of a critical firm size for the effect of use of measures, (3) the role of design characteristics of the measurement system. Next, several robustness checks serve to assess the sensitivity of results and to ensure that endogeneity is not an issue in this research. Building on the findings presented previously, the following section then discusses results and answers research questions one and two.

In chapter 6, an analysis of differences between the Singaporean and Swiss societies as found in literature sets the stage for the subsequent comparison with empirical findings. Next, descriptive characteristics regarding the use of measures and design of measurement systems in the participating SMEs in both countries help to systematically compare actual practices with theoretical predictions. This gives way to the development of seven propositions for the effect of national culture on Strategic Performance Management which serves to answer the third research question and to provide directions for further research.

Chapter 7 then translates the findings into recommendations for practitioners. Managerial implications in the narrow sense are provided based on quantitative evidence of this study. The following two sections aim to provide further recommendations to SME managers which draw on qualitative findings and current practices in SMEs. First, in-depth views on strategic positioning of Swiss and Singaporean manufacturing SMEs and current challenges are provided. Then, the common question of practitioners is addressed: how can an SME adopt measures given its specific requirements? Three concrete steps are outlined which help SMEs to identify relevant measures and integrate them into their managerial processes despite resource constraints.

Finally, chapter 8 unites the findings of this study and answers the overriding research question. It closes with a discussion of limitations and an outlook for further research.

2 Distinctive SME characteristics and Strategic Performance Management

Performance Management is a widely researched topic. It can be mostly found in large companies that use measurement systems to align their different country organizations towards overall company goals (Cruz, Scapens, & Major, 2011). The variety of research in this field often builds on differing or even no definition of the concept.[3] This chapter therefore provides a clear definition based on previous research of Strategic Performance Management and justifies research in the context of SMEs due to their distinctive firm characteristics.

2.1 Strategic Performance Management in SMEs

Strategic Performance Management refers to the use and design of PMS to manage organizational performance. As such, it comprises of "*formal and informal mechanisms, processes, systems and networks used by organizations for conveying the key objectives and goals elicited by management, for assisting the strategic process and ongoing management through analysis, planning, measurement, control, rewarding, and broadly managing performance, and for supporting and facilitating organizational learning and change*" (Ferreira & Otley, 2009, p.264). Appendix 1 summarizes the definitions of core constructs in this study. Beyond ex-post measuring performance, this approach is concerned with the ex-ante management of performance (e.g., Otley, 1999) with PMS providing multi-perspective indicators that increase an organization's focus on value adding activities (Kaplan & Norton, 1992, 1996b).

However, a firm that manages its performance using measures may not necessarily qualify as one that applies Strategic Performance Management. This is because the PMS requires a clear cause-effect linkage with firm strategy (e.g., Chenhall, 2005). As such, Strategic Performance Management facilitates the definition and achievement of strategic objectives (e.g., Hall, 2011; Lillis, 2002), links strategy with operations (e.g., Chenhall, 2005), and supports alignment of behaviors and attitudes with an organization's strategic direction (e.g., de Leeuw & van den Berg, 2011).

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[3] Researchers lack an agreement on a clear definition of Strategic Performance Management due to its complex nature and several perspectives to study these systems (Speckbacher *et al.*, 2003, p.362). In particular, the field has evolved from operations to strategic orientations, from measurement to management, and from static to a dynamic view (Srimai, Radford, & Wright, 2011). Several definitions for each evolutionary step can be found, without a concluding consensus in literature.

SMEs are different from large companies and these differences affect Strategic Performance Management. Such differences are rooted in the two defining characteristics of an SME: firm size and ownership structure, with the owner taking the central role (Bridge, O'Neill, & Cromie, 1998). SMEs greatly differ in the extent to which the owner's attitude and capabilities directly affect the organization (e.g., Garengo *et al.*, 2005), as well to which human resources and capital are available (Doole, Grimes, & Demack, 2006; Doern, 2009). These characteristics are inherent to an SME and distinctive to large companies. They can constitute additional characteristics that are common but not essential. For example, SMEs tend to have informal, dynamic strategies. However, this does not necessarily apply to all SMEs as some SME managers see value in formal strategic planning (Terziovski, 2010).

Based on literature in the context of SMEs, I show how SME characteristics affect the use of measures and an SME's capability to design, implement and maintain a strategic PMS. Effects are summarized in Table 1 and the following sections elaborate on the respective details.

Table 1 – SME characteristics and their effect on Strategic Performance Management

Defining Distinctive SME criteria / characteristics	Further SME characteristics	Effect on[1] — Measure use	Effect on[1] — Design of PMS
A. Ownership structure / central role of owner — ties (e.g., Garengo et al. 2005)	1. Informal, dynamic strategies (Terziovski, 2010)	o	–
	2. Centralized and quick decision-making (Hudson et al., 2001b)	o	o/–
	3. Misconception of performance measurement (Garengo et al., 2005)	–	–
	4. Fear of bureaucratization (McAdam, 2000; Hussain et al., 1998)	–	–
II. Limited capital resources (Doern, 2009)[2]	5. Low IT capabilities & reliance on simple IT technology (Bititci et al., 2002)	–	–
	6. Reliance on a small number of customers and operating in niche markets (Appiah-Adu & Singh, 1998)	o	+
B. Firm size ≤ 250 FTE (Doole, Grimes, & Demack, 2006) — III. Scarcity of human resources	7. Short-term and lack of external orientation (Ates et al., 2013)	o/–	–
	8. Flat structures and Flexible processes (Ghobadian & Gallear, 1997)	–	–
	9. Informal processes and communication (Garengo et al., 2005)	o	–
	10. Reactive, fire-fighting mentality (Hudson et al. 2001b)	–	–
	11. Closeness to customers and more personal relationships with customers (Jack et al., 2010; Moreno & Casillas, 2008)	o	o/–
	12. Flexibility to react quickly to customer needs (Carson & Gilmore, 2000)	o	o
	13. Scarcity of human resources to implement, gather and analyze measures (Ghobadian & Gallear, 1997)	–	–
	14. Focus on measures related to finance and operations (Sousa et al., 2006)	+	+
	15. Difficulties in defining new performance measures (Sousa et al., 2006)	–	–

1) Qualitative assessment; +/–/o indicate a positive/negative/no effect
2) In addition, inability to secure further sources of funding (Wang & Yao, 2002)

2.2 Use of measures in SMEs

Due to the organizational culture found in SMEs, employees tend to communicate and problem-solve without relying (extensively) on measures. With the focal role of the owner, decision-making in SMEs often is centralized and pragmatic (Hudson *et al.*, 2001b). In addition, most SME managers have a personalized method of management (Hudson *et al.*, 2001b). Both lead to a lower perceived need for measures that support communication. The use of measures refers to the extent to which an organization uses measures in the three key managerial processes: target setting, review of firm performance, and setting employee incentives. A measure is a metric or indicator that allows for quantifying the performance of a focal construct, e.g., efficiency of processes, product sales, or asset utilization. The following three examples represent a higher use of measures: a strong focus on financial figures on product level in target setting; systematic and in-depth monthly review of quality–related measures such as scrap rate or customer rejects; linking the employee reward system to measures that capture efficiency and quality of work.

SMEs operate in niche markets and rely on a small number of customers (Appiah-Adu & Singh, 1998). Their relationships with customers tend to be closer and more personal (Jack, Moult, Anderson, & Dodd, 2010; Moreno & Casillas, 2008). As a consequence, the complexity and need for quantified information associated with monitoring and managing customers, markets and employees tends to be smaller as compared to larger firms. In addition to the lower perceived need for measures, SMEs fear bureaucratization (McAdam, 2000; Hussain *et al.*, 1998).

Measuring, analyzing and reporting data requires human resources which are scarce in SMEs (Doole *et al.*, 2006). The scarcity of employees combined with a reactive and troubleshooting mentality (Hudson *et al.*, 2001b) often result in a prioritization of operational activities (Ates, Garengo, Cocca, & Bititci, 2013). SMEs tend to consider their flexibility and ability to react quickly to customer needs as competitive advantage in comparison to large firms (Carson & Gilmore, 2000). This leads to a lower willingness and focus on time-consuming data gathering and analysis with little immediate benefits. Their short-term orientation (Ates *et al.*, 2013) is likely to result in focusing less on leading performance indicators with long-term effects on firm performance. Given their capital resource constraints (Doern, 2009), SMEs tend to have limited IT capabilities and rely on rather simple IT technologies (Bititci, Nudurupati, Turner, & Creighton, 2002). Consequently, measuring and analyzing information is particularly challenging for SMEs. In sum, due to their characteristics SME practitioners

see less need for and subsequently, face several challenges in using measures in their managerial processes.

2.3 Designing, implementing and maintaining PMSs in SMEs

SMEs also face challenges in defining appropriate PMSs. Firstly, SME managers tend to have a misconception of PMS, particularly with respect to its benefits (Garengo *et al.*, 2005, p.30). Secondly, SMEs tend to have informal and dynamic strategies (Terziovski, 2010). Both result in the use of lagging accounting measures and in lack of awareness of profit-drivers (Dye, 2004). As such, SMEs struggle in identifying relevant and non-conflicting measures that reflect a cause-and-effect chain with value drivers and firm strategy. For example, SMEs typically state flexibility, responsiveness and innovativeness as sources of their competitive advantage (Terziovski, 2010, p.893). Defining measures that represent flexibility (e.g., time required to respond to an unplanned 20% increase in demand without service or cost penalty) could result in a conflict with other, less explicit strategic goals and measures such as asset utilization (e.g., machine utilization).

Thirdly, dynamic strategies and flexible structures promote tactical and context-specific knowledge (Jennings & Beaver, 1997). As a consequence, the relevance of measures can change over time which requires dynamic adaptations of the PMS (Schläfke, Silvi, & Möller, 2013). In addition, SMEs tend to have flat organizational structures and flexible, informal processes (Garengo *et al.*, 2005; Ghobadian & Gallear, 1997). This has a direct effect on communication within the organization which tends to be informal (Garengo *et al.*, 2005). In comparison, a PMS is a means to formalize communication (Wouters & Wilderom, 2008) which may conflict with SME culture.

Lastly, low levels of process standardization is perceived to support flexibility but aggravates consistent measurement (Garengo *et al.*, 2005). As a result, the benefits of the use of measures are lower. For example, an SME that follows the strategic goal to improve employee productivity[4] needs to track efficiency improvements. If processes are not clearly defined and therefore may change frequently, a meaningful measurement and comparison of processing times is not possible. Identifying appropriate metrics and measuring them correctly is particularly important in SMEs given their constraints in human resources to implement, gather and analyze measures (Ghobadian & Gallear, 1997). Not surprisingly, SMEs tend to focus on a few metrics, mainly financial and

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[4] Productivity can be broadly be defined as "*the level of output in relation to a given level of input*" (Heikkilä & Saranpää, 2006, p.28).

operational ones (Sousa, Aspinwall, & Rodrigues, 2006). In addition, SMEs tend to make less use of information provided by measures. Barnes *et al.*, 1998 suggest that SMEs often communicate relevant information with tables rather than graphs which do not simplify understanding and information interpretation.

In summary, due to their characteristics SMEs tend to use measures less often to manage firm performance and have an informal approach towards strategy with measures often reflecting only single aspects of firm strategy. This contributes to explain the moderate adoption rates of Strategic Performance Management (Wiesner, McDonald, & Banham, 2007) and the existence of numerous literature on implementation of PMSs in SMEs (e.g., Hudson, Lean, & Smart, 2001; Fernandes, Raja, & Whalley, 2006; Groen *et al.*, 2012). Unacknowledged however, is the question of whether SMEs actually benefit from the use of measures in the same way as large firms do. This is the focus of the next chapter in which hypotheses are developed based on previous research on Strategic Performance Management in large companies.

3 Strategic Performance Management in SMEs: A resource-based perspective

The aim of this chapter is to develop a conceptual model and hypotheses. The theoretical foundation focuses on relevant research published in 15 journals, five journals each in the topics of accounting, strategy and management, and operations management. The selected journals are the Journal of Accounting and Economics; Journal of Accounting Research; Accounting Review; Accounting, Organizations, and Society; Management Accounting Research; Academy of Management Journal; Academy of Management Review; Administrative Science Quarterly; Strategic Management Journal; Journal of Management; Operations Research; Journal of Operations Management; Management Science; European Journal of Operational Research; and Production and Operations Management. The selection is based on three criteria:

1. Journals being considered as of a high quality within each of the mentioned disciplines as indicated by the journal's impact[5].

2. Studies that provide conceptual or empirical evidence on the use of measures or the design of PMSs.

3. Published work from 1992 to March 2014.[6] The timeframe was selected as it coincides with the publication of the Balanced Scorecard framework (Kaplan & Norton, 1992) in 1992. This framework is important because it is widely considered as a turning point in performance management research as it has shifted the focus towards multiple measurement dimensions (Neely, Gregory, & Platts, 2005, p.96).

Thus, the theoretical foundation of this study builds on major contributions to the performance management literature which is spread across disciplines.

Building on the resource-based view of an organization, recent research suggests that performance management enables an organization to align employee behavior and to build capabilities (see Figure 1). I divide Strategic Performance Management into two focal components: the use of measures and the design of PMS. The resource-based view

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[5] The journal's impact expresses the average number of weighted citations received in 2012 by the documents published in the journal in the three previous years. Ranking provided by SCImago Journal & Country Rank (see www.scimagojr.com).

[6] The time span refers to the in-depth review of all articles in the respective journals. This comprehensive literature review is complemented by selected articles with significant contribution to the field that were published before 1992.

is used to argue that both constructs help to transform a firm's resources into competitive advantage. In particular, I argue that Strategic Performance Management can constitute a resource that is rare, difficult to imitate or substitute (Barney, 1991). A firm's strategy allows for sensing and exploiting opportunities thereby creating competitive advantage (Franco-Santos *et al.*, 2012; Grafton *et al.*, 2010). The use of measures and the design of PMSs help to align employee behavior towards strategy execution which therefore constitutes an organizational capability[7].

3.1 Use of measures, strategic alignment of employees, and firm performance

This study draws on the resource-based view of the firm (Wernerfelt, 1984) and the theories of dynamic capabilities (Eisenhardt & Martin, 2000) and decision-making (Keeney & Raiffa, 1993). A strategic PMS enhances an organization's capabilities to influence employee behavior by improving control, communication and organizational learning (Melnyk, Stewart, & Swink, 2004). Ferreira and Otley (2009) provide a comprehensive framework for the analyses of Strategic Performance Management (Appendix 2). Drawing on this framework, the use of measures refers to the degree to which an organization uses measures in three managerial processes: target setting, evaluation of performance, and incentive setting for employees.[8] I argue that the effect of these managerial processes on firm performance is mediated by the extent to which employees are strategically aligned. In the following, details are provided for (1)-(3) each of these processes, for (4) the effect on strategic alignment of employees, and on (5) firm performance.

Target setting

Behavioral accounting research highlights that target setting is not only an important part of an organization's budgeting but also, both the process (e.g., imposition, consultation, participation) and the outcome (e.g., perceived target difficulty) contribute to value-creation (Otley, 1999, p.370). Therefore, setting performance targets and the preceding process of strategic planning are important aspects of performance management. Klatt, Schläfke, and Möller (2011) found that a more measure-based approach by integrating

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[7] An organizational capability is a "*firm`s capacity to deploy resources for a desired end result*" (Helfat & Lieberman, 2002, p.725).
[8] Ferreira and Otley (2009, p.267) suggest that measures should be derived from an organization's objectives, strategies, and plans. In line with this, I consider these dimensions in the choice and characteristics of measures, i.e., in the design of PMSs.

business analytics into strategic planning results in superior performance. In the context of Strategic Performance Management, strategic planning and target setting allow for the translation of vision and strategy into strategic objectives that are associated with medium to long-term performance (Chenhall, 2005, p.399).

Target setting constitutes an organizational and strategic routine by which managers combine human (e.g., expertise in research and development) and organizational (e.g., superior sales network) resources to implement value-creating strategies (Barney, 1991; Grant 1996; Pisano, 1994; Wernerfelt, 1984, 1995). The use of measures serves as a means to signal desired future outcomes, to communicate strategic goals and to facilitate decision-making (Bisbe & Otley, 2004; Grafton *et al.*, 2010, p.690). It therefore contributes to a firm's dynamic capabilities[9] that allow managers to reconfigure existing and to build new capabilities for identifying and seizing opportunities into their organizations (Augier & Teece, 2009; Eisenhardt & Martin, 2000). For example, strategic innovation often involves "*changing the game*" which requires the development of capabilities (Winter, 2003, p.994). In line with this, the use of measures to monitor and manage innovation becomes increasingly important (Möller, Schönefeld, Messer, & Frenzel, 2011). For example, an innovation-focused firm may define the target that 10% of revenue should stem from products that have been introduced in the last three years. As a consequence, both the awareness for and the pressure to achieve the organization's strategic goal to continuously innovate are high.

Target setting therefore affects the level of strategic alignment of employees. As human resources are vital to a firm's success, it is imperative that employees are aware of and understand strategic goals. The difficulty of achieving targets defines the level of attention that managers and employees need pay to them (Otley, 1999, p.376).

Evaluation of company performance

Performance evaluation stimulates problem solving, especially when evaluations focus on company level (Ackelsberg & Yukl, 1979). Performance evaluation refers to bringing information together at the top management level and its interpretation for company-wide action (Gimbert, Bisbe, & Mendoza, 2010, p.481). As such, performance evaluation is an organization's routine concerned with performance of individuals, teams, departments, and the organization as a whole (Ferreira & Otley, 2009, p.272). The

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[9] Augier and Teece (2009, p.412) define dynamic capabilities "*the ability to sense and then seize new opportunities, and to reconfigure and protect knowledge assets, competencies, and complementary assets with the aim of achieving a sustained competitive advantage*".

ability to evaluate achievement of strategic goals is important because it can improve the extent to which a firm is able to exploit its existing capabilities. A firm that has established routines for performance evaluation benefits from increased transparency, strategic feedback and organizational learning (Kaplan & Norton, 1996b, p.85). This is likely to increase the strategic alignment of employees as frequent information on current achievements of strategic goals commemorates a company's strategy. It reminds managers and shopfloor workers alike to realign human and organizational resources towards strategic goals.

Without the evaluation of strategic objectives, a firm might run the risk of opportunistic behavior contributing towards the company's financial goals but not towards the achievement of its strategic goals. For example, a company emphasizes sales of its recently developed product B in its strategy. A customer might inquire on product A which is obsolete and request for customization. This results in a high level of effort on the company's part. As a result, this inquiry could contribute to the achievement of the supplier's revenue goals. However, the supplier risks tying up internal resources for the customization of product A. On the contrary, the execution of its firm strategy calls for focusing resources on business development, production and customer support activities for promoting product B.

In addition, the use of measures in performance evaluation increases a firm's capability to observe its performance and performance drivers (Ferreira & Otley, 2009, p.272). Frequent reviews and the use of measures facilitate identification of deviations and discussions about root causes for deviations of actual performance from mid- and longer-term goals. Therefore, measure-based discussions between managers and employees are likely to increase the overall understanding of strategic goals.

Incentive setting

The relationship between incentive setting and employee performance is complex. While classic organizational theory views decision-makers as problem-solvers that use feedback to improve future performance (Simon, 1997) mounting research has portrayed a more multifaceted picture. Researchers emphasize the importance of cognitive limitations and motives of the person being assessed (e.g., March & Simon, 1993). The term incentive setting refers to recognition by senior management both through financial (e.g., bonuses, salary increase) and non-financial rewards (e.g., promotion, lack of criticism). Granting rewards can significantly influence a subordinate's behavior. The extant literature has agreed that companies use incentive systems to stimulate desired

behavior of their employees by aligning an individual's goals with those of the organization (Hopwood, 1973). Differing findings exist with regards to benefits of financial vs. non-financial incentives and their effect on employee performance (e.g., Jenkins, Mitra, Gupta, & Shaw, 1998). This reflects that the association between rewards and employee performance is contingent on several factors such as task complexity (e.g., Bonner, Hastie, Sprinkle, & Young, 2000), employee's cognitive capabilities and rewarded dimensions (e.g., Bonner & Sprinkle, 2002), and interactive or diagnostic use of PMSs[10] (e.g., Simons, 1990).

The use of measures in reward schemes channels employees' efforts to measures that are linked to their evaluation and incentive schemes (Feltham & Xie, 1994).[11] The design of incentive schemes (e.g., appraisal dimensions) signals desired behavior, increases role clarity and empowerment (Hall, 2008). For example, a company that follows the strategic goal to promote teamwork implements an incentive scheme that is linked to dimensions such internal customer principle and communication of results. To improve teamwork and collaboration between departments, in addition to the individual's supervisor, two team members and two relevant team leaders of adjacent departments are requested to provide an annual assessment of the individual's performance.

Depending on how feedback systems are used in an interactive or diagnostic way, an incentive system can influence the development of new capabilities through organizational learning or the deployment and reconfiguration of existing capabilities (Grafton *et al.*, 2010). Incentive systems have an indirect behavioral effect on firm

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[10] According to Simons' (1995) levers of control there are different roles that a PMS can play. A diagnostic use refers to using the PMS as means to get feedback on the progress and results of intended strategies (single-loop learning). An interactive use refers to the use of PMS to learn about the need to replace or reshape strategy (double-loop learning) (Tuomela, 2005, p.299). These styles of use have different implications on the organization. An interactive use affects employees' belief system, stimulates dialogue in an organization and positively affects the quality of strategic management and employees' commitment to strategic targets (Tuomela, 2005). Ultimately, an interactive use can improve major organizational capabilities such as innovativeness, organizational learning, entrepreneurship, and market orientation (e.g., Bisbe & Otley, 2004; Henri, 2006a). Contrary, a diagnostic use of PMS emphasizes control by boundaries and can support resistance against strategic actions through increased visibility (Tuomela, 2005) which tends to consequently put negative pressure on the mentioned organizational capabilities (Henri, 2006a).

[11] Appraisal and reward systems can be also designed on team level based on collective achievement. This induces advantages (e.g., creation of an ownership culture) and disadvantages (e.g., free rider problems) (Ferreira & Otley, 2009, p.273). Some researchers suggest group-rewards to be particularly beneficial when an organization is a "*complex network of interdependent relationships*" (Hope & Fraser, 2003, p.107).

performance improvement via an employee's understanding, motivation and focus on improvement (de Leeuw & van den Berg, 2011; Lau & Sholihin, 2005). Therefore, incentive systems are likely to have a direct effect on strategic alignment of employees in SMEs as well.

Strategic alignment of employees

Employees are a valuable resource for SMEs (Carlson, Upton, & Seaman, 2006). The degree to which a firm can leverage this resource consequently affects its competitive advantage and ultimately organizational performance. Performance improvements are largely determined by employee behavior (de Leeuw & van den Berg, 2011) which is, in turn, affected by the alignment of employees with firm strategy. In this paper, the strategic alignment of employees is defined as the extent to which "*organizations align their [employee] actions in pursuit of their strategic objectives*" (Franco-Santos *et al.*, 2012, p.95). Strategic alignment is important because it reflects an organization's capability to stimulate desired behavior of its human resources and to execute strategy at a process level (Chenhall, 2005). As organizations face increasing internal and external complexity (Drucker, 1990), alignment becomes even more important (Chenhall, 2005).

In summary, the use of measures in the key managerial processes target setting, performance evaluation, and incentive setting enhances a firm's dynamic capabilities. With a greater focus on using measures, the ability of the organization to identify and then exploit opportunities increases. In particular, the use of measures in SMEs in target setting, performance evaluation, and incentive setting facilitates to purposefully align employees towards strategic objectives. Formally:

Hypothesis 1: The greater the extent to which a company uses measures in its managerial processes the higher the strategic alignment of employees.

Firm performance

The use of measures is likely to have a mediated effect through strategic alignment of employees on firm performance. Firm performance refers in this study to the perceived organization's financial performance as indicated by profitability growth and revenue growth.[12] A firm is a bundle of value activities which determines its cost structure and ability to create value (Porter, 1985, p.38). According to Porter (1991, p.104) strategy is

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[12]Bititci, Firat, and Garengo (2013) identify profitability as the most suited measure to compare organizational performance across sectors. Revenue was ranked fifth of the most suited performance indicators.

a configuration of value adding activities aiming at creating competitive advantage. Competitive advantage reflects a firm's strategic positioning in the market. The higher a firm's competitiveness, the more likely it is to realize competitive advantages by gaining rents. Consequently, a firm's performance is a result of how it utilizes its value-creating activities to gain a favorable position within its industry relative to its competitors.

The importance of aligning employees with strategy to develop competitive advantage has been emphasized in previous research (e.g., Chenhall, 2005; Kaplan & Norton, 1996b, 2001). In essence these studies argue that the ability to influence people's behavior towards strategy execution results in better strategy implementation "*by focusing people's decisions and actions on strategic goals*" (Franco-Santos *et al.*, 2012, p.99). As such, strategic alignment of employees constitutes an organizational capability that enables an organization to build and deliver competitive advantages (Chenhall, 2005; Franco-Santos *et al.*, 2012). In combination with the line of arguments of the previous hypothesis, the use of measures increases strategic alignment of employees which in turn is likely to lead to higher firm performance. Formally:

Hypothesis 2: The effect of the use of measures on firm performance is positively mediated by strategic alignment of employees.

This view is consistent with mounting research arguing that the effect of Strategic Performance Management on organizational performance is indirect through people behavior and organizational capabilities (e.g., Chenhall & Langfield-Smith, 1998; Evans, 2004; Ittner, Larcker, & Randall, 2003b; Malina & Selto, 2001).

3.2 Rethinking the use of measures in SMEs

The link between the use of measures to develop and utilize capabilities may vary for firms depending on their size.[13] A firm's capabilities spring from its organizational processes and routines (Day, 1994). Organizational theory suggests that accounting information and control processes tend to become more sophisticated and specialized with an increase in firm size (e.g., Ezzamel, 1990; Libby & Waterhouse, 1996). This view is shared in performance management literature for large firms (e.g., Speckbacher, Bischof, & Pfeiffer, 2003) and in the context of SMEs (e.g., Covin & Covin, 1990; Covin, Green, & Slevin, 2006; Wiesner, McDonald, & Banham, 2007).

Researchers in the context of SMEs found that small and family-owned businesses tend to have lower managerial capabilities (Bloom, Genakos, Sudan, & van Reenen, 2012). De Waal, Kourtit, and Nijkamp (2009) suggest that SMEs benefit by Strategic Performance Management through several qualitative and quantitative effects. For example, leading quality award participants tend to be SMEs with more sophisticated PMSs (Garengo, 2009).

However, the relationship use of measure with strategic alignment of employees may not be found in firms of all sizes. I hypothesize that within the scope of SMEs a critical firm size exists. For firms which are smaller than this critical size the effect of the use of measures on strategic alignment of employees is likely to be less significant for three reasons: (1) lower need for the use of measures, (2) fewer capabilities to exploit benefits, and (3) higher relative opportunity costs for measuring and analyzing.

Firstly, small firms are likely to achieve high strategic alignment through their informal mechanisms. The importance of social aspects such as quality of interactions is higher (Chu, 2011). The interaction between owner and business tends to be closer which results in sharing of more information (Poza, 2007), and consequently in higher strategic alignment of employees. In addition, smaller firms tend to have fewer products and therefore less complex strategies. As a result, the ease for employees to understand firm strategy is likely to be higher. In other words, the need for reinforcing communication by the use of measures is lower in small firms.

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[13]Firm size (measured in number of employees) serves as primary selection criteria in this field study. I could not draw on revenue or balance-sheet figures to allocate interviewed SMEs to size clusters because small businesses show an inherent reluctance to disclose financial information (Wijewardena, De Zoysa, Fonseka, & Perera, 2004, p.211).

Secondly, smaller firms may be less able to extract value from the use of measures, as managerial capabilities tend to be higher in larger firms. For example, larger firms had more opportunities to learn during the expansion of their businesses when they had to solve associated problems (Orser, Hogarth-Scott, & Riding, 2000). In contrast, small firms may have (faced) less organizational and business complexity and therefore have introduced rather simple approaches. Their ability to identify and to integrate measures in their managerial processes in a meaningful way is likely to be lower.

Thirdly, the relative costs for the use of measures are likely to be associated with firm size. Scarcity of human resources becomes more onerous when firm size is small. Measuring and analyzing data results in higher opportunity costs which might ultimately harm success factors such as innovativeness. For example, one hour of measuring past performance could be invested in one hour of production or business development.

In sum, smaller firms are likely to have a lower need for the use of measures, possess fewer capabilities to exploit benefits and have higher opportunity costs for measuring and analyzing. As such, I predict the following:

Hypothesis 3:   For small firms, the effect of the use of measures on strategic alignment of employees is minimal; as firm size increases beyond a critical level, the effect of the use of measures turns increasingly significant.

Figure 3 summarizes the described baseline model. It addresses hypotheses one to three. The use of measures is conceptualized as a second-order construct that consists of the three managerial processes target setting, company performance evaluation, and incentive setting (see section 5.2). Besides, the model is designed to account for several effects that previous studies found to affect the dependent variable. In section 4.2 details on the choice of these control variables are provided.

Figure 3 – Baseline model
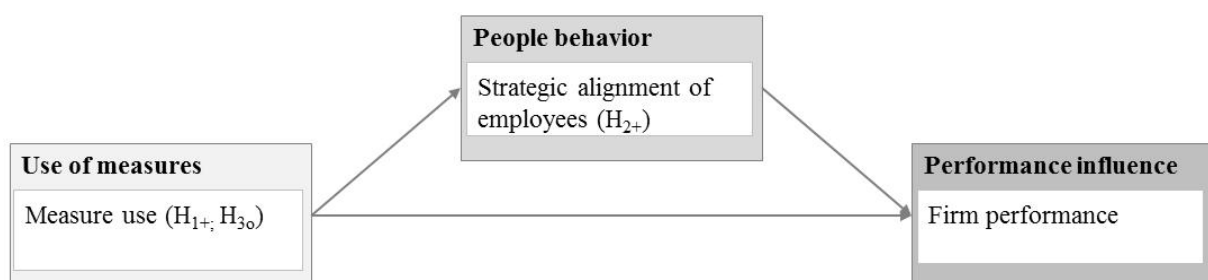
3.3 Interaction effects of the design of PMSs

Given SMEs' challenges in integrating and using measures in their managerial processes, it is particularly important to understand whether a PMS requires particular properties to generate the purported effects. The design of a PMS refers to properties that describe the scope of a PMS with regards to "*financial- and non-financial measures [that] are used to operationalize strategic objectives*" (building on Franco-Santos *et al.*, 2012, p.80, and Kaplan & Norton, 1992, 1996a). This study considers three properties that are commonly understood as essential for the design of effective PMS in large companies: alignment of measures with strategy, breadth of measurement system, and degree of formalization (Franco-Santos *et al.*, 2012). These properties are of a moderating nature because the use of measures and PMS properties are independent from each other and PMS properties have no effect on strategic alignment of employees in the absence of measure use.

3.3.1 Interaction effect of alignment of measures with strategy

The selection and use of strategy-aligned measures is essential to provide a link between strategy and execution (Evans, 2004). Strategy-aligned measures refer to the degree to which measures describe strategy consistently "*by using cause-and-effect relationships*" (building on Speckbacher *et al.*, 2003, pp.365-366, and Kaplan & Norton, 2001). In the context of large firms it is widely agreed that measures chosen need to reflect business strategy (e.g., Ittner, Larcker, & Randall, 2003). Alignment of measures with strategy is essential for *strategic* PMSs as it helps to translate strategy in operational terms (de Geuser, Mooraj, & Oyon, 2009). To successfully manage the links between strategy and firm performance, the management team needs to identify the specific factors that drive value creation, link firm strategy to these underlying value drivers, and identify measures that reflect these value drivers (Ittner & Larcker, 2001, p.353). For example, a maintenance company aims to diversify its revenue streams to be less dependent on single industries. The management team identifies as its key value drivers to serve new industries with existing services and to trade third party products. For each of these two drivers it defines a set of strategic and operational measures such as revenue per product line for new and existing customers.

For SMEs, the use of measures that are aligned with firm strategy could be particularly important to focus attention of their scarce resources on measures that matter. SMEs benefit by selecting and using these measures in two ways: strategy development and strategic focus. As noted previously, SMEs tend to have informal strategies with a higher focus on operational, short-term activities. Firstly, the use of strategy-aligned measures

may institutionalize and/or improve the strategy development process of an SME and therefore increase its organizational capabilities. The use of measures that are aligned with firm strategy increases the variety and number of strategic decisions in strategic reviews (Gimbert *et al.*, 2010). As a result, a more comprehensive strategic decision array (Bisbe & Malagueño, 2012) translates into a more comprehensive strategic agenda (Gimbert *et al.*, 2010). It is likely that the same holds true for SMEs as their strategies tend to be informal and mostly on firm-level only. For example, instead of developing one generic firm strategy, the use of measures that refer to value drivers facilitates the development of dedicated strategies for each business unit or product line. In addition, a strategic PMS assists in transforming strategy into a continuous process (de Geuser *et al.*, 2009). Measures provide insights on how business activities link to strategies and increase understanding on how activities of units in the organization influence each other (Chenhall, 2005). As such, strategy-aligned measures provide rich feedback about actual performance and the link to strategy. This frequent information may help SMEs to overcome their tendency to focus on short-term activities.

Secondly, SMEs may benefit from a change of behavior through managers and employees having a better understanding of value drivers. Identification and use of strategy-aligned measures assist managers and employees to understand value drivers of their business and therefore to increase their awareness of links between value drivers, strategy, and firm performance (Chenhall, 2005; Dye, 2004). Furthermore, strategic PMSs help managers to develop and to confirm their mental models of business operations (Hall, 2011). SMEs may benefit from this increase of transparency, as managerial capabilities and capacities tend to be lower (Garengo *et al.*, 2005, p.29). With regards to employees, these systems are said to improve role clarity and psychological empowerment of employees (Hall, 2008). The higher the perception of employees that the PMS reflects a causal model linked to firm strategy, the higher their perception of organizational justice (Burney, Henle, & Widener, 2009).

In sum, it is likely that strategy-aligned measures have a positive interaction effect on the underlying association between the use of measures and strategic alignment of employees. This is because strategy-aligned measures increase the strategic focus and improve the strategy development process. Formally,

Hypothesis 4: The association between measure use and strategic alignment of employees increases with greater alignment of measures with strategy.

3.3.2 Interaction effect of breadth of measurement system

The measures chosen are recommended to be a broader set of measures that represent more than the financial perspective. Breadth of measurement system refers to the degree to which a measurement system covers financial and non-financial aspects of the organization's strategy and to which measures are interlinked by a cause-and-effect relationship (Kaplan & Norton, 1992, 1996a). Kaplan and Norton (1992, 1996a) suggest a Balanced Scorecard (BSC) with four measurement perspectives that apply to all organizations regardless of their strategy[14]:

- *Financial perspective* that measures monetary cost and sales dimensions as well as firm performance, e.g., profitability, return on investment.
- *Customer perspective* that focuses on fulfilling customer needs, customer satisfaction and market share, e.g., satisfaction levels, achievement of service level agreements.
- *Internal perspective* that captures the performance of key internal processes, e.g., quality, process efficiency.
- *Innovation and learning perspective* that focuses on the organization's employees and resources, e.g., employee satisfaction, skills development.

This framework guides organizations in identifying measures that cover major perspectives that are important to an organization's success. In addition, it is the starting point for target setting, resource allocation, communication, and incentive systems. Thus, the Balanced Scorecard is a system for strategic measurement and control which helps to align departmental as well as individual goals and behavior within the organization (Kaplan & Norton, 1996b; Nørreklit, 2000). As a result, the attractiveness to managers and employees to achieve strategic goals is greater, especially when their reward system is tied to the achievement of financial- and non-financial goals (Lee & Yang, 2011).

Research in the extant literature focusing on the Balanced Scorecard further suggests that the measures within and between each of the four perspectives are linked through a cause-and-effect chain (e.g., Lee & Yang, 2011), consist of operational and strategic measures (e.g., Norton & Kaplan, 1992), and are of both leading and lagging nature (e.g., Kaplan & Norton, 1996b). As a consequence, several studies report that "*measurement-managed*" firms achieve, on average, higher strategic alignment within

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[14]Other researchers supplement these four perspectives by further, optional dimensions such as supply chain partners, and the environment (e.g., Edvinsson & Malone, 1997; Schiemann & Lingle, 1999).

the organization (Nørreklit, 2000), and ultimately higher financial performance (e.g., Lingle & Schiemann, 1996; Scott & Tiessen, 1999).

In contrast, SME practitioners claim that extensive measuring is not required in SMEs and that systems developed for large firms do not consider the specific requirements of smaller companies. Based on the extant literature, I argue that a *broader* set of measures positively moderates the association between use of measures and strategic alignment of employees for two reasons. Firstly, a more extensive use of particularly non-financial measures leads to higher performance (Ittner *et al.*, 2003b). SMEs tend to primarily use financial measures and focus, if at all, on few operational measures such as cycle time (Sousa *et al.*, 2006). Extending their measurement focus by selected non-financial metrics that address customers and other key business processes is likely to increase the focus on these areas. In addition, the inclusion of non-financial measures is positively associated with an interactive use of a PMS (Dossi & Patelli, 2010). This interactive use compared to a diagnostic or control use increases learning and strategic alignment by facilitating performance dialogue (Dossi & Patelli, 2010). This, in turn, is likely to support organizational learning (Melnyk, Stewart, & Swink, 2004) and helps SMEs to better leverage their scarce human resources.

Secondly and generally speaking, their organizational structure supports SMEs to make better use of PMSs compared to many large firms. SMEs tend to have few hierarchical layers, informal processes, and a horizontal mode of communication (Garengo *et al.*, 2005, p.36). Lee and Yang (2011) found that in contrast to mechanistic organizations these organic structures promote the use of measurement systems. According to them, organic organizations have greater information processing-requirements and use broader sets of measures for creating a common understanding and aligning behavior. As such, I predict the following:

Hypothesis 5: The association between measure use and strategic alignment of employees increases the broader the performance measurement system.

3.3.3   Interaction effect of formalization

A PMS is a form of formalization (Wouters & Wilderom, 2008). Formalization refers to the extent to which activities of employees are governed by process procedures and organizational standards (building on Terziovski, 2010, p.893; Golann, 2006, p.371). It is particularly important in the context of SMEs as formalization of measurement could affect sources of competitive advantage such as flexibility, responsiveness or innovation.

A long discussion has been on-going in literature whether or not greater formalization positively affects business performance in SMEs (e.g., Golann, 1996; Terziovski, 2010).

Supporters of informality suggest that formalization of systems and processes is not required and potentially impedes SME competitiveness. Unlike large firms, SMEs rely on a limited range of products and customers (Appiah-Adu & Singh, 1998). Their flexibility to respond to customer needs is crucial for their competitiveness (Ghobadian & Gallear, 1997). Formalization of processes and structures could impede this flexibility and reduce their agility (Golann, 2006). In addition, one could argue that SMEs do not require "*specific, predetermined behavior by means of formal direction and control from upper management [...] [as employees have a] shared understanding of what will enable individuals to choose effective actions for themselves*" (Jelinek & Litterer, 1995, pp.137-138).

Supporters of formalization in SMEs emphasize that the formalization of structures and systems contributes towards building organizational capabilities and is a key driver for performance (Terziovski, 2010). The need for greater formalization grows with increasing firm size (Mazzarol, Rebound, & Volery, 2010). Golann (2006) proposes that formal processes that include relevant, timely measures and reporting increase an SME's responsiveness. In addition, formalization improves two-way communication and coordination within an organization (Golann, 2006). Researchers have found formalization to be the basis for process improvements and ultimately reduce internal costs in manufacturing firms (e.g., Terziovski, 2010).

Weighing both views, I argue that formalization in terms of integrating measures into standardized organizational processes and procedures supports strategic alignment of employees. Given SMEs' informal approaches towards strategy and processes (Berry, 1998; Ghobadian & Gallear, 1997), I expect formalization to positively contribute to strategic alignment of employees by providing information more systematically (Chong, 1996) and by stimulating desired behavior through increased role clarity and commitment (Prakash & Gupta, 2008). The pre-dominant organizational culture in SMEs is likely to be conducive to benefit from more formal performance management. In particular, organizations which promote flexibility use measures and PMSs for focusing attention on strategic priorities, supporting strategic decision-making and stimulating dialogue (Henri, 2006b). Thus:

Hypothesis 6: The association between measure use and strategic alignment of employees increases with greater formalization.

3.4 Excursus: Performance Measurement System design in SME literature

This section provides an overview for the design of PMS which researchers suggest to be suitable for SMEs. In addition, the actual use of measures in SMEs is reported based on literature. It differs from the sections before as it refers less to the associations between constructs but more to concrete frameworks that single researchers have suggested in the context of SMEs in less frequently cited journals. Consequently, the nature of this section is more descriptive and it aims to provide the interested reader with ideas on how to design PMSs suitable for SMEs.

3.4.1 Performance Measurement Systems developed for SMEs

Research on large firms suggests that PMSs are beneficial when they are fully operational, link measurement dimensions to a company's critical success factors, and when measured, reviewed and discussed on a regular basis to manage business performance (de Waal, Kourtit, & Nijkamp, 2009; Bititci, Mendibil, Nudurupati, Garengo, & Turner, 2006). However, models have been developed for, and in the context of large firms. SME-specific research has focused so far on the adaptation of models for large firms and few researchers have suggested new frameworks. Garengo *et al.* (2005, p.34) emphasize that SMEs require systems that focus on breadth rather than depth. This is because it allows for a comprehensive assessment of firm performance whilst at the same time maintaining a simple model with less resource need (McAdam, 2000). In contrast to large companies and resulting from the less complex organizational structure, the need to create transparency on single departments is lower (Lynch & Cross, 1991). The depth of a PMS refers to "*the level of detail to which performance measures and indicators are applied*", whereas the breadth is "*the scope of the activities included in the PMS*" (Garengo *et al.*, 2005, p.34). This is important because an in-depth model helps to focus on major objectives tying up fewer resources, whereas a model with a wide breadth allows for a comprehensive assessment of the company's performance (Tenhunen *et al.*, 2001 as cited in Garengo *et al.*, 2005, p.34). According to Garengo *et al.* (2005, p.40) a higher focus on breadth allows for developing more simplistic models which require less resources and limited managerial capacity. The authors have

systematically assessed eight existing PMS regarding their fit to SME-specific needs along key characteristics such as breadth and depth.[15]

With regards to the generalizability of these specific frameworks, the reader should bear in mind that the nature of the underlying studies is often anecdotal (e.g., Chow, Haddad, & Williamson, 1997) or based on single or few case studies (e.g., Chennell *et al.*, 2000; Chong, 2008; Manville, 2007). Garengo *et al.* (2005) identify two models in their systematic assessment as most suitable in an SME context: (1) Organizational Performance Measurement (Chennell *et al.*, 2000), and (2) Integrated Performance Measurement for Small Firms (Laitinen, 2002). Both models were exclusively designed to address the characteristics of SMEs. In addition, several authors suggest the (3) Balanced Scorecard application to SMEs as suitable for application in an SME context (e.g., Chow, Haddad, & Williamson, 1997; Manville, 2007).[16]

Organizational Performance Measurement (OPM)

The OPM (Chennell *et al.*, 2000) is a model that is said to be suitable for SMEs because of its characteristics balance between dimensions, process-orientation, covering of both dimensions of breadth and depth, and its focus on company stakeholders thereby emphasizing a horizontal structure (Garengo *et al.*, 2005, p.37). The inventors do not recommend concrete measures but rather define "*five value-adding areas, in which an organization must be successful to survive and prosper*" (Chennell *et al.*, 2000, p.5). As depicted in Figure 4 it systematically links organizational activities that should be reflected appropriately by the measures chosen.

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[15]Garengo *et al.* (2005) provide a detailed assessment of eight PMS models along 13 criteria that reflect PMS requirements for SME. In scope of this comparison are six of the most popular generic models without consideration of firm size (Performance Pyramid System, Balanced Scorecard, Integrated Performance Measurement System, Performance Prism, Performance Measurement Matrix, as well as Result and Determinants Framework) and two that were specifically developed for SMEs (Organizational Performance Measurement, Integrated Performance Measurement for Small firms).

[16]Taticchi, Tonelli, and Cagnazzo (2010, p.12) provide a longlist of SME-specific frameworks developed between 1995 until 2008. However, of these 18 models listed, only three are archetypes of PMS: BSC application to SMEs (Chow *et al.*, 1997), Organizational Performance Measurement (Chennell *et al.*, 2000), and Integrated Performance Measurement (Laitinen, 2002). The other listed approaches are either a subtype of these archetypes (e.g., Manville's (2007) BSC implemented in a not for profit SME), implementation approaches or describing adoption of PMSs (e.g., Hudson, Lean, & Smart, 2001), or other accounting-related frameworks (e.g., Gunasekaran, Marri, & Grieve's (1999) activity-based costing in SMEs).

Figure 4 – Organizational Performance Measurement
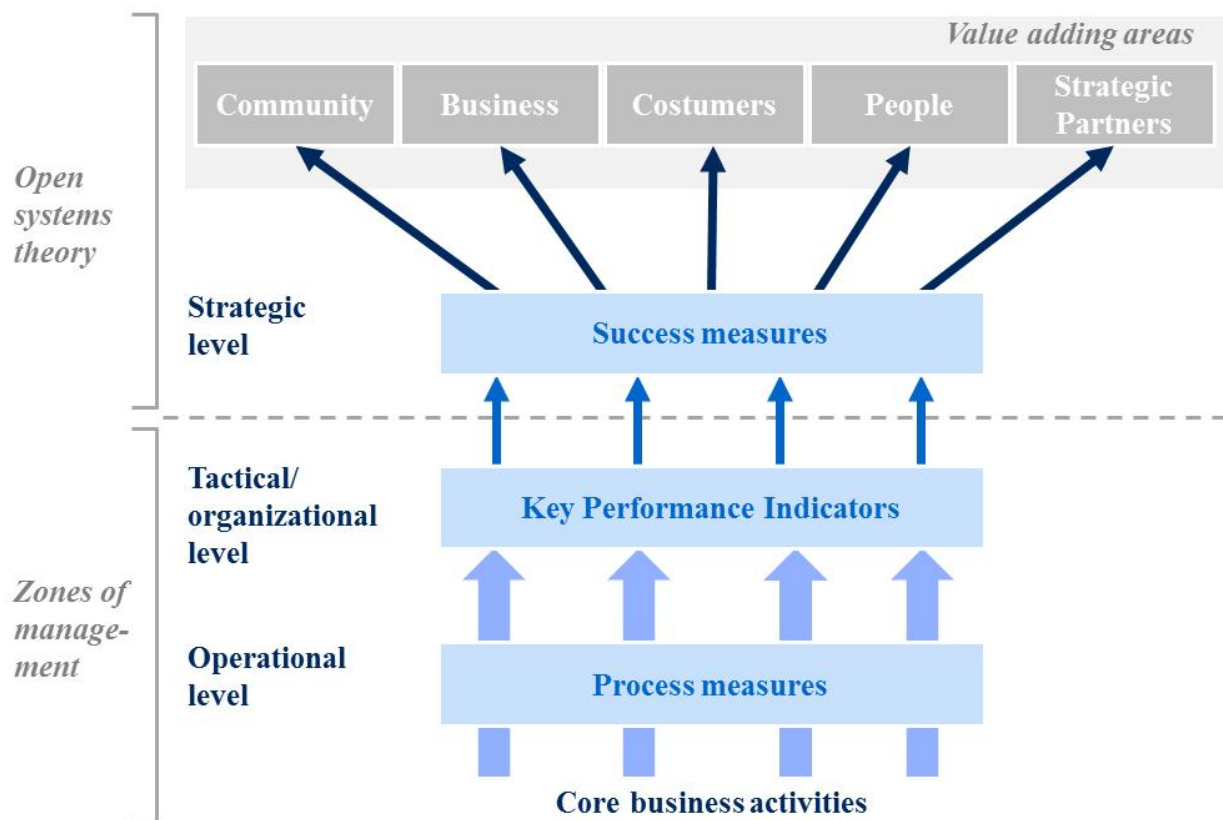
Source: Adapted from Chennell *et al.* (2000, p.6)

Chennell *et al.* (2000) designed their model based on three fundamental principles: (1) alignment, (2) process thinking, and (3) practicability:

- *Alignment*. Alignment is primarily associated with planning and deployment. In addition, selected measures support that people's activities are in line with company strategy.

- *Process thinking*. Measurement refers to the design and operation of organizational processes to deploy the strategic intent and value for stakeholders. The process-view rather than a (vertical) organizational structure supports understanding of the influences on and drivers of performance in all processes.

- *Practicability*. Translating the first two principles into an effective measurement system requires practicability. A standard and consistent process is required in companies to identify relevant measures that deliver high-quality and suitable information.

The OPM model is a measurement framework that is geared towards value-creation and is based on two management concepts, i.e., the "*zones of management*" and "*open systems theory*" (Chennell *et al.*, 2000, p.4).

The first concept represents the company-internal view. It comprises of the three conventional levels of management: strategic, tactical, and operational with clear authorities, responsibilities, and accountabilities. The second concept represents the company environment with a focus on the firm's stakeholders. The authors postulate five stakeholders, whom a company needs to satisfy in order to be successful in the long run (Garengo *et al.*, 2005, p.39). These stakeholders are business owners and shareholders, customers, employees, strategic partners and community, i.e., a wide range of professional, industry, and local groups.

Managers can link the open systems with the zones of management views through drivers that create value for external stakeholders and that represent internal priorities (Chennell *et al.*, 2000, p.5). With regards to the design of the PMS, Chennell *et al.* (2000, p.6) suggest three types of measures: strategic measures, leading indicators, and operational measures. Firstly, SMEs need to identify the factors that create value for each stakeholder group. These drivers need to be represented by strategic measures in the PMS. Secondly, strategic measures need to be deconstructed to identify leading indicators. These key performance indicators are the measures at the tactical/organizational level. The authors suggest reporting these measures on a monthly or quarterly basis. Lastly, SME managers need to identify process measures on the operational level that refer to core activities required to deliver products and services.

Garengo *et al.* (2005, p.13) conclude in their comparison of eight PMS models that the OPM is suitable for SMEs with regards to its focus on stakeholders, process orientation, horizontal structure, and breadth. However, they identify a lack of linkage to a firm's strategy with no causal relations. Therefore, the OPM might be more qualified for operational rather than Strategic Performance Management in SMEs.

Integrated Performance Measurement for Small Firms (IPMS)

The IPMS is the second model specifically developed for SMEs. It is balanced, process-oriented, horizontal, and suitable for technology as well as service firms (Laitinen, 2002). Unlike the OPM, it is also characterized by using more causal relationships between measures, is more intuitive, and it can be adapted easily. However, it has less breadth and depth (Garengo *et al.*, 2005, p.37).

Laitinen (2002) defines his model as a hybrid accounting system which refers to its proximity to traditional accounting and the integration of activity-based costing. It also emphasizes non-financial information both for customers and employees. The PMS

provides concrete suggestions for measures along a company's value chain for seven dimensions, two external and five internal ones as depicted in Figure 5.

Figure 5 – Integrated Performance Measurement System
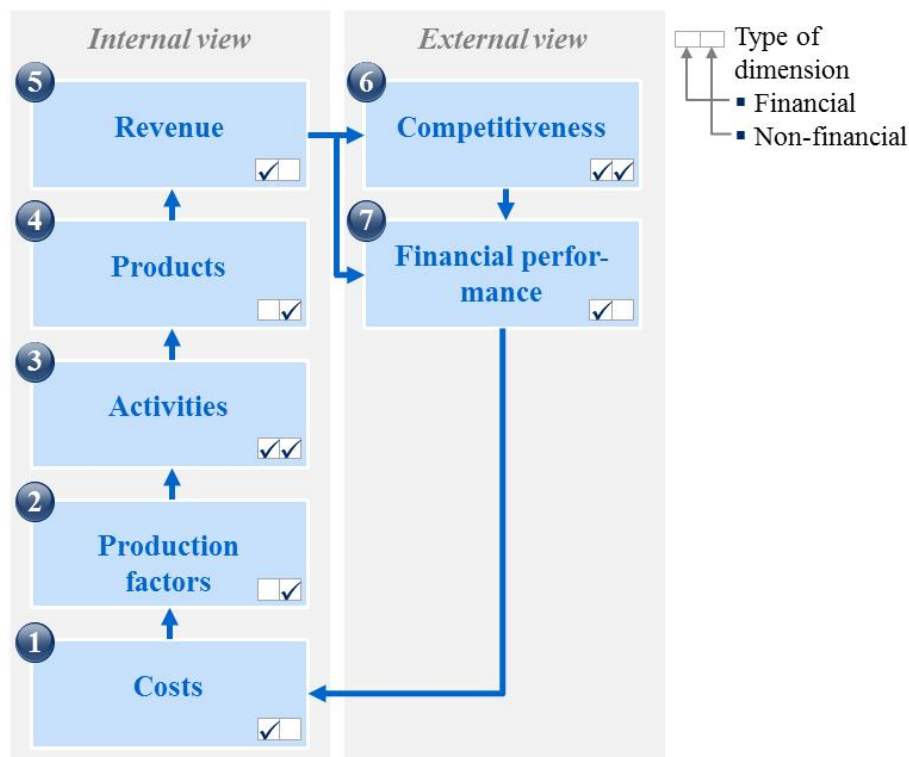
Source: Adapted from Laitinen (2002, p.79)

The internal dimensions are closely linked to the activity-based costing (ABC) approach. The framework emphasizes non-financial measures and suggests that SME managers populate it with measures causally connected along the value chain (Laitinen, 2002, p.77). The internal dimensions are linked to company performance in the fifth step of the value chain, i.e., revenue (and cost) of products. According to Laitinen (2002, p.78) this stage determines the financial performance and competitiveness of a company as the product revenue defines profitability and growth in revenue of these products. The two external dimensions comprise of competitiveness and financial performance. The internal perspectives allow for monitoring of the entire production process and efficient resource allocation between the production factors. The external perspectives address the environment and the company's market position.

Laitinen (2002) proposes concrete measures suitable for SMEs along the five internal and two external stages of his PMS as shown in Table 1.

**Table 1 – Proposed performance measurement for
internal and external performance**

Dimension	Measurement of performance	Proposed dimensions
		Budget (target) vs. actual values ...
1	Elementary (traditional) cost structure (production factors)	… based on traditional accounting methods
2	Capacity utilization × readiness to operate efficiently *with* readiness referring to the potential to which production-factors are ready to produce in the near future	… for the rate of capacity utilization and the degree of readiness to provide services in the near future. To find the degree of readiness among the personnel, measures of competence and motivation are used
3	Time × cost × quality	… for the time, cost and quality of the activities
4	Quality × flexibility × innovativeness *with* innovativeness = effort spent on innovation work × results	… for quality (ability to meet the standard needs of customers), flexibility (specific needs) and innovativeness (future needs)
5	Customer profitability × product profitability	… for product and customer profitability
6	Growth × market share	.. for growth of revenues and change in market share measured in revenues
7	Profitability × liquidity × capital structure *with* profitability of total assets and profitability of shareholder's assets Liquidity = static liquidity and dynamic liquidity Capital structure = static long-term and dynamic long-term solvency	… for profitability, liquidity and capital structure

Source: Based on Laitinen (2002, pp.80-85)

Laitinen (2002) tested his framework in small Finish technology firms and found that manufacturing companies in particular tended to emphasize customer-oriented financial information.

According to the assessment of Garengo *et al.* (2005, p.13) the IPMS is process-oriented, with causal relationships between measures, and horizontal. However, the authors suggest that it lacks amongst others breadth and linkage to firm strategy. Similar to the OPM, the suggested framework appears more suited for operational performance management rather than a means to operationalize firm strategy.

BSC application to SMEs

The introduction of the BSC by Kaplan and Norton (1992) has shaped the performance management research field. This framework emphasizes the importance of more than just a financial dimension when measuring an organization's performance. In particular, it contains in addition to financial metrics also measures that represent the firm's performance with regards to customers, internal processes, and employee learning (Kaplan & Norton, 1996a). Several scholars suggest that the BSC is applicable in SMEs (e.g., Chow, Haddad, & Williamson, 1997; Garengo & Biazzo, 2012; Manville, 2007; Phadtare, 2010). Alternative views emphasize that frequent changes in strategy of SMEs result in the failure of the BSC in SMEs (Rompho, 2011) and that the adoption of the BSC in SMEs results in a higher degree of mechanization and inflexibility (McAdam, 2000). This is especially challenging for firms in dynamic business environments, where organizations have "*to cope with increasing complexity, uncertainty, and volatility*" (Schläfke *et al.*, 2013, p.112). However, SME managers see the value of a broader measurement system, mainly in increasing measurement rigor and linking of strategy to operational processes (McAdam, 2000, p.319). The BSC has proven its effectiveness as a tool for long-term value creation in large manufacturing companies with firms showing above-average performance (Sim & Koh, 2001, p.24).

Kaplan and Norton (2001) suggest the applicability of their BSC framework to SMEs but do not provide details on an implementation approach that addresses specific SME needs. To the best of my knowledge, only one study provides a suggestion for the concrete development and design of BSC models in SMEs. Fernandes, Raja, and Whalley (2006) suggest a bottom-up approach which they claim to be better suited than the traditional BSC top-down design. [17, 18] The authors, together with a British

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[17]According to Hudson's studies (Hudson *et al.*, 2001b; Hudson-Smith & Smith, 2007) the main problem with applying models designed for large firms lies in the top-down approach. The identification of the critical success factors and subsequent key measures for several dimensions happens at the same time which does not reflect SME characteristics. The studies suggest an "*incremental*" implementation process that focuses on gradually implementing each strategic objective through appropriate measures.

manufacturing SME, developed a suitable PMS. In the first step, they created a strategy map, i.e., a matrix that shows on one axis the key pillars of firm strategy (e.g., high value technical service, diverse teams of professionals and employer of choice) and the four BSC dimensions (i.e., financial, customer, internal processes, learning and growth) on the other. As depicted in Figure 6, Fernandes *et al.* (2006) have identified in an exemplarily case study 16 relevant measures and then allocated these measures to each field of the strategy map that best represented each strategic objective. Lines represent the causal relationship between strategy map criteria and dotted lines represent that two criteria are of similar levels of importance (Fernandes *et al.*, 2006, p.629).

Figure 6 – Example for BSC in SMEs: Identification of measures
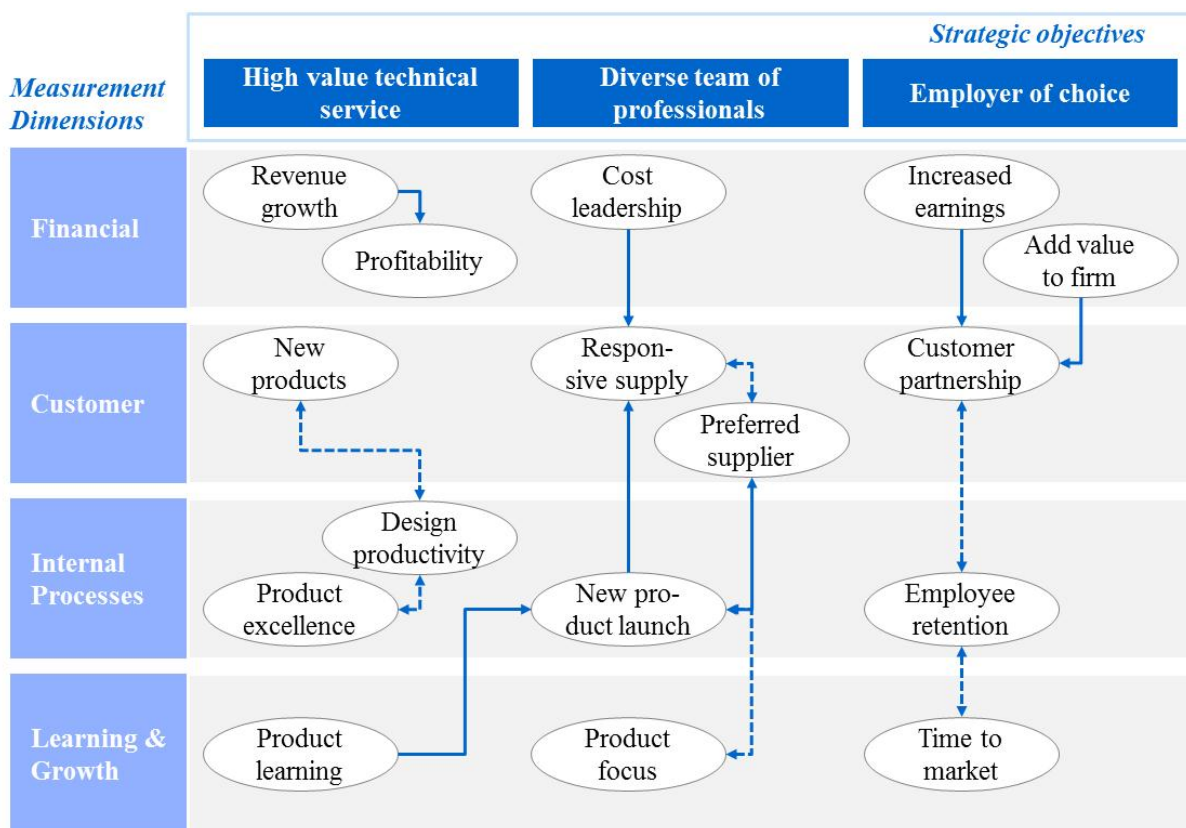
Source: Adapted from Fernandes *et al.* (2006), p.630

For each of these 16 measures along the four BSC dimensions, the company then defined concrete targets, initiatives for strategy execution, and review frequencies (e.g., yearly and quarterly; see also McAdam, 2000, p.308).

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[18]Their suggestion is less an adaptation of the BSC model to address SME characteristics but more an approach for successful implementation which reflects an individual organization's strategy. However, the authors do not address implementation obstacles, but solely focus on deriving relevant measures based on one case study in an SME in UK.

In addition, several authors have recommended guiding principles for implementing the BSC in SMEs (e.g., McAdam, 2000; Sousa & Aspinwall, 2010). [19] According to McAdam (2000, pp.319-321) SMEs that intend to adopt the BSC need to focus on the following factors:

- Linkage of system to strategic objectives
- Integration and representation of customer satisfaction and understanding by system
- Promotion of employee participation across entire organization
- Management commitment
- Emphasis on processes and measures

As SMEs have resource constraints, they should not focus on too many measures but continuously align selected measures and processes with strategy. In addition, measurement and reporting processes should not reduce flexibility as far as possible (McAdam, 2000, p.321).

To conclude, no common understanding exists in literature on whether or not the BSC is suitable in SMEs. Some researchers suggest that the BSC can actually be applied in SMEs (e.g., Manville, 2007; Phadtare, 2010). In contrast, several researchers have shown that many SMEs struggle in adopting comprehensive measurement system such as the Balanced Scorecard and emphasize the high efforts to implement and maintain such as system (e.g., Hudson, Smart, & Bourne, 2001). Other scholars suggest that besides its high linkage to firm strategy and comprehensive coverage of business activities, the framework is less process-oriented and lacks clarity and simplicity which might promote the perception that the PMS increases bureaucracy, causes rigidity, and is less suited when strategies change frequently (e.g., Garengo *et al.*, 2005, pp.13, 17; Rompho, 2011).

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[19]Sousa and Aspinwall (2010) suggest a framework consisting of eight steps, i.e., (1) overview, motivation and leadership commitment, (2) define and communicate vision, mission and strategy, (3) identify initial/current status, (4) define and prioritise objectives, (5) develop a performance measurement system, (6) planning implementation, (7) implement actions, and (8) review, standardize and learn.

3.4.2   Measures used in SMEs

Few researchers have conducted large-scale field studies to investigate what measures SMEs actually use. Sousa *et al.* (2006) analyzed 52 British SMEs operating in various industries. Looking at the perceived importance of the four BSC dimensions, SME managers clearly highlighted the importance of financial measures that are also widely used in practice. The other three dimensions, i.e., internal business process, innovation and learning as well as a customer-related one, were considered as of high importance, however these perspectives were less frequently represented by measures (Sousa *et al.*, 2006, pp.128-129).

Looking more in depth at measures that represent internal business processes, the authors identified that most SMEs consider the measures on-time delivery and in-process quality as the most important ones (Figure 7).

Figure 7 – Most important measures in SMEs

Assessment of importance of measures by SMEs
In percent of total respondents
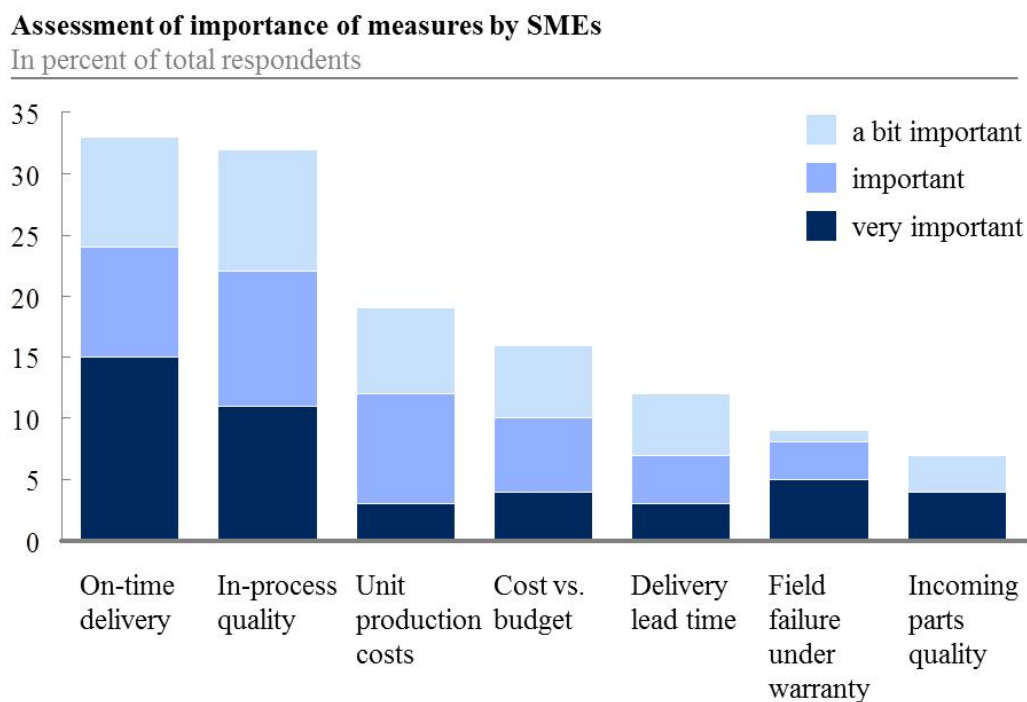
Source: Sousa *et al.* (2006, p.126)

A survey with 103 Portuguese SMEs using an identical research setting and survey design yielded similar findings (Sousa, Aspinwall, Sampaio, & Rodrigues, 2005) The importance of measures was assessed in almost the same order: on-time delivery (81%), in-process quality (77%), incoming parts quality (38%), unit production costs (34%), field failure under warranty (32%), and cost versus budget (21%).

The results for perceived importance of the four BSC perspectives and the actual measures used are not in line. A potential explanation for these differences is that SMEs face several challenges when adopting new measures. Participants of Sousa *et al.*'s (2006) study noted that they have difficulties in defining new measures, fear costs associated with measurement and implementation, and have insufficient IT systems to support measurement (Sousa *et al.*, 2006, p.128).

3.5 Conceptual model

The identified constructs and their hypothesized relationships are summarized in Figure 8. Note that all constructs are entirely defined in literature and the variables researched address comprehensively the inner model of Ferreira & Otley's (2009) framework. Their framework reflects the state-of-the-art knowledge on Strategic Performance Management and according to the authors it is a "*useful research tool for those wishing to study the design and operation of performance management systems*" (Ferreira & Otley, 2009, p.263). As a consequence, this research is likely to cover a broad range of essential dimensions within the Strategic Performance Management concept.

Figure 8 – The conceptual model
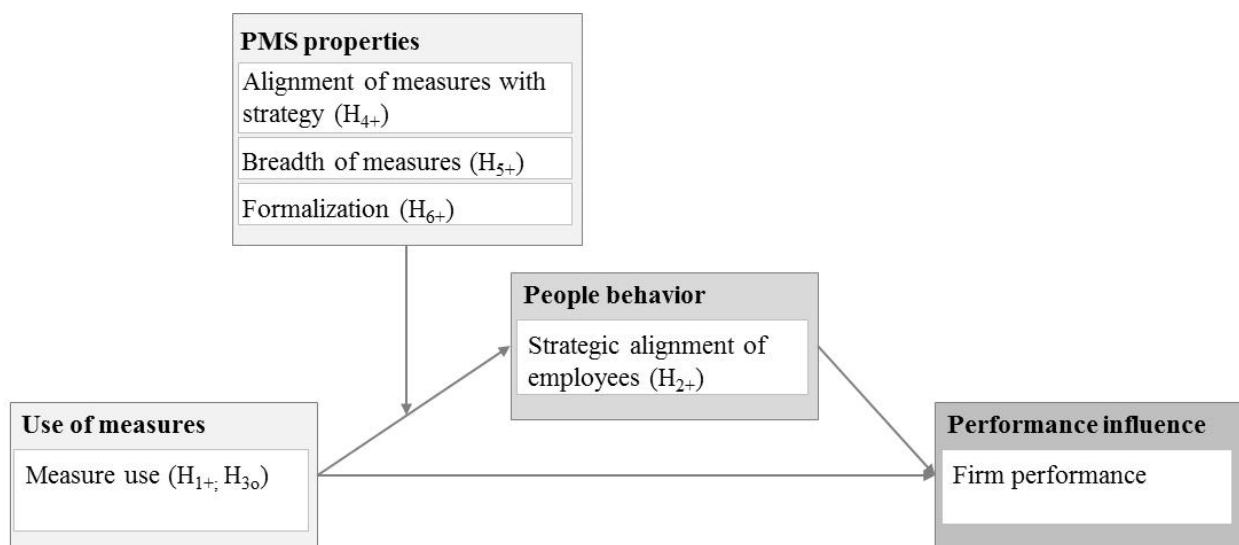
The conceptual model describes the association between the use of measures and firm performance via strategic alignment of employees. In addition, the two-way moderator model represents the contingency approach for the PMS properties. It is structurally consistent with prior work on PMS design influence models (e.g., Artz *et al.*, 2012). It also expands the hypotheses that the characteristics of the design of PMSs have interaction effects on the underlying association between use of measures and strategic alignment of employees (Table 2).

Table 2 – Summary of research hypotheses

No.		Hypotheses
Baseline model		
1	+	The greater the extent to which a company uses measures in its managerial processes the higher the strategic alignment of employees.
2	+	The effect of the use of measures on firm performance is positively mediated by strategic alignment of employees.
3	*np*	For small firms, the effect of the use of measures on strategic alignment of employees is minimal; as firm size increases beyond a critical level, the effect of the use of measures turns increasingly significant.
Contingency model		
		The association between measure use and strategic alignment of employees…
4	+	… increases with greater alignment of measures with strategy.
5	+	… increases the broader the performance measurement system.
6	+	… increases with greater formalization.

Note: + refers to a positive hypothesized effect; *np* = not predicted

To test these predictions, an empirical study was conducted. The next chapter provides details on the field study which was carried out in Switzerland and Singapore.

4   Research Methodology

The aim of the previous chapters was to introduce the focal constructs and to develop a conceptual model for Strategic Performance Management in SMEs. The following chapter provides details on the field study that was carried out in Switzerland and Singapore to empirically test the hypothesized associations. The chapter concludes with elaborating on how the constructs are measured and with a discussion on the partial least squares (PLS) approach to structural equation modeling (SEM) employed in this research.

4.1   Sample: Swiss and Singaporean manufacturing SMEs

To test my predictions, this study adopts a primary quantitative research approach. Primary analysis based on original data is particularly suited to test new constructs and hypothesized relationships (Punch, 2005, p.75). I collected data over a period of seven months, investing significant time in gaining access to targeted participants.

4.1.1   Rationales for choosing Switzerland and Singapore as research setting

Data gathering focused on small and medium-sized manufacturing firms in Singapore and Switzerland. The focus on manufacturing SMEs is in line with extant research in the field of performance management (e.g., Wijewardena *et al.*, 2004; O'Regan & Ghobadian, 2004). The choice of countries is based on similarities along three selection criteria: (1) one Asian and one European country each, (2) similar roles of SMEs in the economies, and (3) similar exogenous market factors that affect conduciveness of doing business.

The primary goal of this study is to analyze the effects of Strategic Performance Management on alignment of employees and SME performance. The conceptual model controls for cultural and economic differences by including a dummy variable for country. In addition to this goal, the study at hand also aims to identify avenues for further research in international business by developing propositions for the influence of national culture on Strategic Performance Management (chapter 6). For this purpose, I consider the selection of two countries that are comparable from an economic point of view but differ in national culture as appropriate. That said, the intention is not to offer a comprehensive view of country and cultural characteristics and their effect on Strategic Performance Management, as this would require a larger-scale, multi-country research methodology (Harrigan, 1983).

Secondly, SMEs in both countries show many similarities in terms of their roles in economy such as contribution to workforce and value add, export orientation, and types of industries. Table 3 provides an overview of characteristics of SMEs in general and manufacturing SMEs in both economies.

Table 3 – Roles of SMEs in Swiss and Singaporean economies

	Switzerland		Singapore	
	All SMEs	**SMEs[20]** (excl. micro)	**All SMEs**	**SMEs** (excl. micro)
Share of all companies[1], in percent	99[2]	13[2]	99[5]	n/a
SME contribution to total value add[1], in percent	n/a	n/a	48[5]	n/a
Share of workforce employed[1], in percent	67[2,3]	42[2]	62[5]	43[11]
Export-ratios manufacturing, in percent	48[6]	23 (small)[7] 38 (med.-sized)[7]	64[4]	n/a

	All companies	**All companies**
Contribution of manufacturing industry to total value add, in percent	19[9]	32[10]
Major manufacturing sub-industries	Machine tools, medical tech, biomedical technology	Biomedical technology, electronics, precision engineering
Major challenges	High labor (USD 57.8[11]) and rental costs Limited domestic market	Rising labor (USD 24.8[11]) and rental costs Limited domestic market

1) All sectors
2) Data for 2008; Source: Schweizer Bundesamt für Statistik (2010)

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[20]This study does not include micro companies with less than 10 employees as they tend not to have (a need for) management systems (Garengo *et al.*, 2005, p.26). The overall numbers including micro companies are shown in the table because often the few available figures on SMEs do not delineate between micro, small, and medium-sized enterprises.

3) Alternative source states 82%; Source: Schweizer Bundesamt für Statistik (2014b)

4) All manufacturing companies; data for 2011; Source: International Enterprise Singapore (2010), SPRING Singapore (2011)

5) Data for 2011; Source: SPRING Singapore (2011)

6) All companies in the secondary sector; Source: Schweizer Bundesamt für Statistik (2008b)

7) Across all industries; micro companies had an export share of 12%; Source: Schweizer Bundesamt für Statistik (2008a)

9) Data for 2012 and for all manufacturing companies ("*verarbeitendes Gewerbe*"); Source: Schweizer Bundesamt für Statistik (2014a)

10) 50% for SMEs from all industries; Data for 2012; Source: Singapore Ministry of Trade and Industry (2012, 2013)

11) Total hourly compensation costs in 2012; Source: U.S. Department of Labour (2013)

More than 315,000 market-oriented SMEs in the secondary and tertiary sector build the backbone of Switzerland's economy. They employ more than two thirds of overall employees of market-oriented companies (Schweizer Bundesamt für Statistik, 2008b, 2013). As a result of the moderate size of the domestic market, many companies internationalize their distribution. In 2005, the export ratio of all companies in the secondary sector was 48%. Many Swiss SMEs have established themselves as market leaders in their niches (Tinner, 2007). They are particularly strong in the fields of machine tools, medical technology, biotechnology, life science, manufacturing of watches and clean technology (Schweizer Eidgenössisches Department für Wirtschaft, Bildung [WBF], 2007, WBF & Staatssekretariat für Wirtschaft, 2012). High cost pressure has forced managers to aim for a clear strategic positioning and many Swiss SMEs have gained competitive advantage through innovative, high quality products and services in combination with high efficiency levels. As a result, Swiss SMEs compete successfully in their niches worldwide.

Similarly, Singapore's economy relies heavily on SMEs which account for 99% of the Republic's total number of establishments, employ about 62% of workforce and contribute 48% of total value added to the economy. Singaporean companies show high internationalization activities. The export ratio of manufactured goods was 64% in 2011 (International Enterprise Singapore, 2010; SPRING Singapore, 2011). Manufacturing focus lies on biomedical manufacturing, electronics, precision engineering, and transport

engineering (Singapore Ministry of Trade & Industry, 2012). Similar to their Swiss counterparts, managers of Singaporean SMEs face major cost challenges in factors beyond their control, i.e., salary hikes, rising costs of materials and rent (DP Information Group, 2012, p.5). In addition, the 2013 and 2014 Singapore Budgets aim to reduce foreign workers. To avoid higher foreign worker levies, SMEs will need to replace foreign manpower with local. Responding to these challenges, SMEs need to unlock untapped potential, e.g., by better leveraging existing resources and improving their managerial practices.

Thirdly, exogenous market factors for businesses are assessed almost identically for both countries by managers. According to the World Economic Forum the two countries show almost identical scores on 9 out of 12 dimensions that measure basic requirements, efficiency enhancers, innovation, and sophistication factors (Figure 9).

Figure 9 – Exogenous factors affecting firm competitiveness in Singapore and Switzerland

Global Competitiveness Index, 2013-2014
Score (1-7), higher score indicates greater sophistication

Global Competitiveness Rank, 2013-2014
Rank out of 148

	🇸🇬	🇨🇭
Basic requirements	**1**	**3**
Institutions	3	7
Infrastructure	2	6
Macroeconomic environment	18	11
Health and primary education	2	12
Efficiency enhancers	**2**	**5**
Higher education and training	2	4
Goods market efficiency	1	6
Labor market efficiency	1	2
Financial market development	2	11
Technological readiness	7	9
Market size	34	40
Innovation and sophistication factors	**13**	**1**
Business sophistication	17	2
Innovation	9	2

Source: Data from Schwab (2014)

In particular, both countries show similarities with regards to domestic and foreign market size, goods market as well as labor market efficiency and technological readiness. Smaller discrepancies exist with regards to business sophistication and innovation, where Swiss companies outperform their Singaporean peers. However, Singaporean firms have

easier access to loans in the area of financial market development (Schwab, 2014). In addition to this high similarity in scores, Switzerland and Singapore perform on most of these twelve dimensions amongst the best in the world, as indicated by the ranking of 148 countries on the right-hand side of Figure 9.

Overall, regardless of differences in national culture the Singaporean and Swiss economies feature striking similarities with regards to factors that describe SME contribution to economy and conduciveness of the business environment. Thus, I consider both countries as suitable for analyzing cultural effects on management practices as part of my third research question. As mentioned previously, country and cultural differences are controlled for in the following sections that address the first and the second research questions.

4.1.2   Data collection

I used a structured 27-questions questionnaire to obtain data. Relevant research questions are related to the "*what*", "*how many*", "*how much*", and "*who*" type (Yin, 2009, pp.8-9). Therefore, quantitative, survey-based research is proposed to study relationships between variables. The questions underlying each variable were adopted from previous research as detailed in chapter 5.1.2.

To gather data, I conducted structured telephone interviews. In cases upon the participants' request, they were interviewed face-to-face (see overview in Appendix 3). The interviews lasted each between 30 and 110 minutes with a median of 52 minutes. This approach allowed data collection for comparison of findings across a large body of data[21] and, at the same time, rendering flexibility to respondents. During the interviews, participants filled in a standardized questionnaire. In three instances, the questionnaire was sent in prior to the interview which led to significantly shorter interviews.

Although the questions provided a clear guideline, interviewees had the chance to elaborate on their assessments and to provide supporting examples and more details into potentially interesting ideas. This significantly increased the richness of the data collection and led to additional qualitative information. Participants declined requests to record interviews because of confidentiality reasons. As such, I took detailed interview notes and disseminated them together with the filled-in questionnaire to each interviewee afterwards for confirmation. The total compendium of interview notes consists of 587

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[21]For details on survey design options see Schnell, Hill, and Esser (2008, pp.358-360, 378-380).

pages. The recruiting of participants followed a three-step approach: (1) identification of relevant SMEs, (2) contacting of SME managers by email, and (3) follow-up calls.

Firstly, I identified relevant firms that fulfilled size and industry criteria. For Swiss SMEs I used contacts obtained from the publicly available SWISSMEM firm register (SWISSMEM, 2013), a leading association for manufacturing firms based in Switzerland. In Singapore, the starting point for lead generation was the overview of Top 1,500 SMEs ranked by revenue (DP Information Group, 2013), contacts made at the MTA Precision Engineering and RFID fairs in Singapore in April 2013, contacts provided by the Singaporean governmental agencies Enterprise Development Board (EDB), International Enterprise (IE), SPRING, the business associations Singapore Business Federation (SBF), Singapore Manufacturing Association (SMF), and by private contacts. The managers' names, email addresses and phone numbers were extracted from various sources such as the trade register, firm websites, and press publications. Almost all local manufacturing SMEs from the SWISSMEM and Top 1,500 SMEs firm registers, the ones that exhibited on both fairs as well as all contacts provided by governmental and business agencies were approached. As such, the drawing procedure did not follow a clear sampling plan (Punch, 2005, p.102), a constraint due to the lack of transparency on and in the SME segment. To derive at a meaningful sample, I geared my recruiting efforts towards achieving a balanced sample that reflects at its best the distribution of firm sizes of SMEs in the overall economy.

Next, I contacted the managing directors by email between August 2013 and May 2014. I attached the questionnaire and an overview of benefits for participants. The latter served as a trigger for participation and included the prospect of an individual firm benchmark and a document summarizing current practices and managerial implications with regards to Strategic Performance Management in SMEs.

As third step and three days after having sent the email, I conducted a follow-up via phone calls. Bypassing gatekeepers proved to be an essential skill for successful recruiting. A time-lagged follow-up was conducted at a later point of time for those firms, in which executives or respective gatekeepers indicated a better suited time period for contacting the SME managers. Once the targeted executive was reached, I followed up whether the email was received and used the talk to highlight benefits the participants would receive, to clarify questions, and to reassure the participant of their data confidentiality. This procedure resulted in an increase in participation rate. The procedure concluded for each target firm with scheduling an interview appointment or when a refusal was expressed.

In total, 94 interviews for both countries were conducted, each representing a single firm. This equals a participation rate of 38% of all 247 firms contacted or 48% of the 195 managing directors reached (Figure 10).

Figure 10 – Participants recruiting procedure
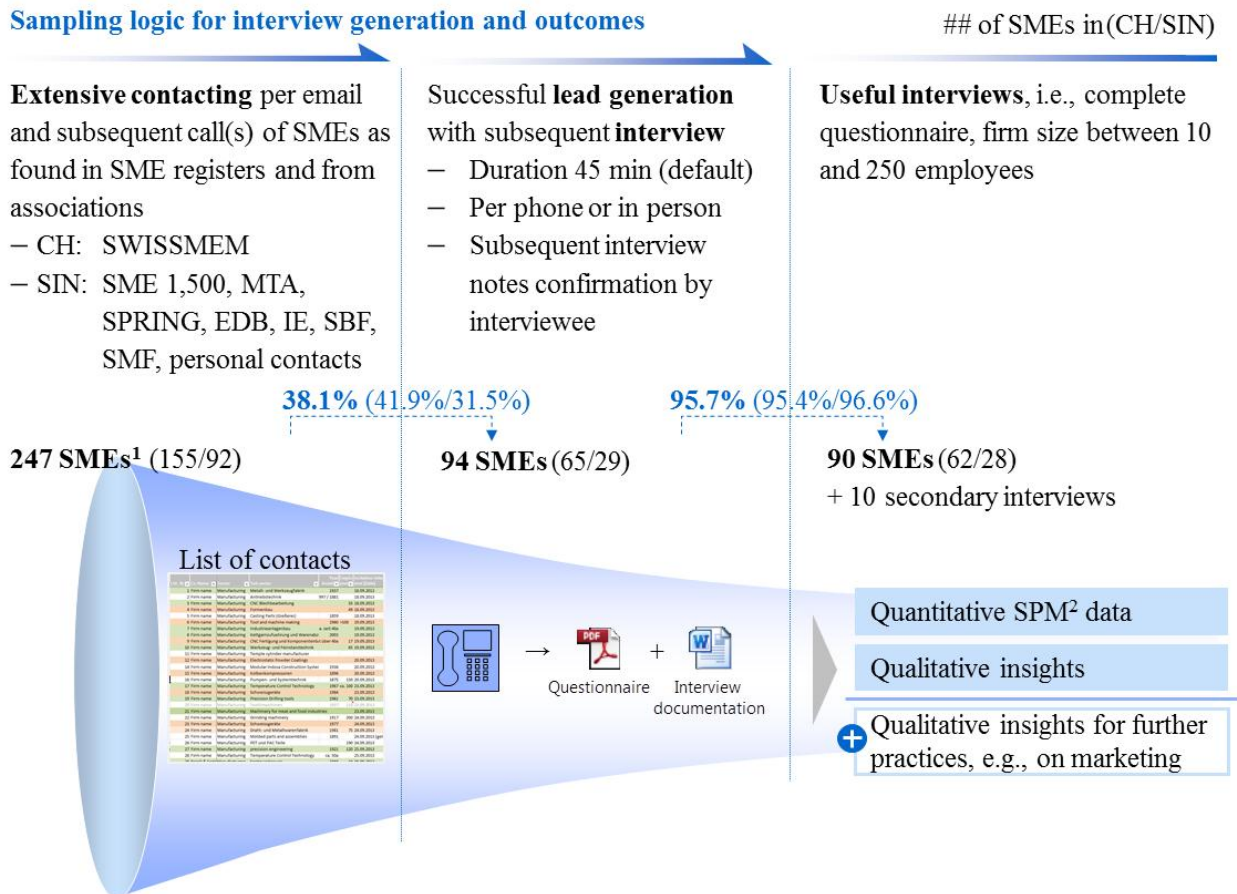
1) thereof 195 (111/84) owner-managers and managing directors could be reached resulting in a participation rate of 48.2% (58.6%/34.5%)

2) Strategic Performance Management

The participation rate can be considered as very satisfactory given the common response rates in SME-related research (often surveys with no specific requirements for role of respondent) in the range of 20% to 25% (e.g., Cocca & Alberti, 2008; O'Regan & Ghobadian, 2004; Wijewardena *et al.*, 2004) and taking the significant amount of time invested into account. Finally, I refrained from using four interviews that did not fulfill initial company selection criteria or that were incomplete. The final sample consists of 90 valid observations.

4.1.3 Descriptive sample characteristics

Firms interviewed reflected a wide range in firm size, firm age, and sub industries (Figure 11). In total, 62 Swiss and 28 Singaporean firms participated in this study. These numbers also reflect the challenges in recruiting Singaporean SMEs which seemed to be more conscious about sharing information and to be less interested in academic field studies. In particular, the sample consists of 38 (42%) small and 52 (58%) medium-sized firms. The majority of firms (84%) were family-owned businesses and only 16% had a third-party investment stake holding of at least 25%. This distribution was similar for interviewed SMEs in Switzerland (84%, 16%) and in Singapore (86%, 14%). Consequently, differences in management systems and style as a result of differing ownership structures that may affect strategic alignment of employees are less likely.

Figure 11 – Descriptive sample characteristics

	Total	🇨🇭	🇸🇬
n	90	62	28
Manufacturing SMEs		Abs.	Abs.
Firm size (employees)	Small (10-50)	27	11
	Medium (51-250)	35	17
Interviewee	Owner-manager	33	9
	Managing director	25	14
	Other member of the board	4	5
Sub-industries	PE - Tools & precision parts	22	12
	PE - Measurement & control systems	9	—
	Machinery and systems	13	4
	General manufacturing	14	12
	Others	4	—
Firm age	< 10	3	1
	10-29	11	15
	30-49	19	10
	50-69	9	1
	70-89	12	1
	≥ 90	8	—
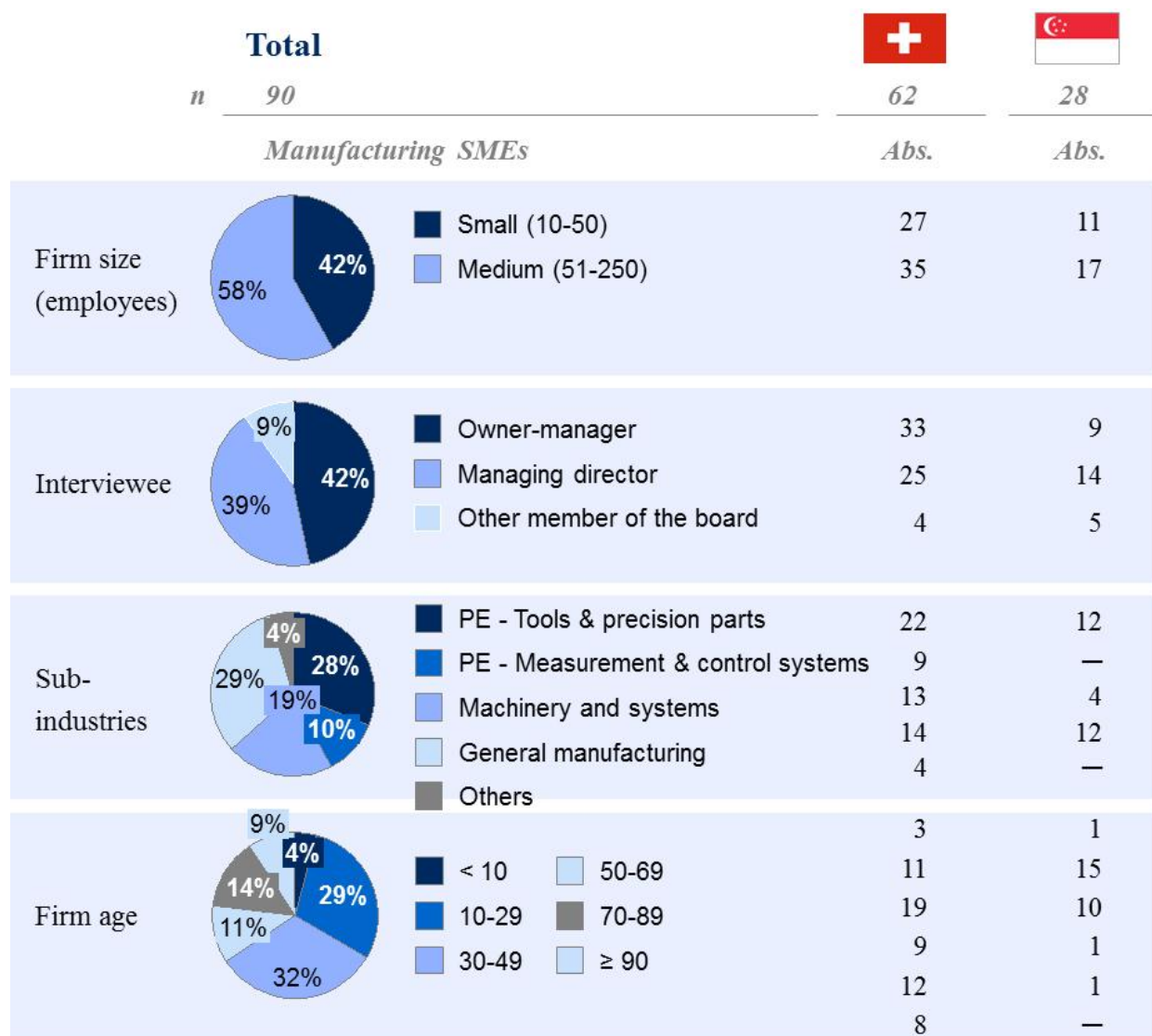
The interviewees had significant amount of work experience (average 26 years with a standard deviation of nine years)[22] and were best suited to provide information. The study participants were almost exclusively owner-managers (42%) or managing directors (39%) and therefore played a significant role in their organizations. The remaining 9% of participants were other members of the management board, for example production managers. As such, participants were best suited to oversee and to shape management practices in the entire organization (Waldman, de Luqe, & Wang, 2012) and to shape the strategic agenda (Aloulou & Fayolle, 2005, p.30).

In sum, the descriptive sample characteristics show that the sample is well-balanced, interviewees were appropriately positioned to provide valid information. In addition, this study represents at its best manufacturing SMEs in both countries because the interviewed firms operate in a wide range of manufacturing sub industries. Therefore, the data base appears suitable to investigate the effect of Strategic Performance Management on strategic alignment of employees, and ultimately firm performance.

4.2 Construct measurement

The conceptual model consists of five constructs and several control variables which are explained in the following. To measure the constructs, this study uses a questionnaire with a seven-point equidistant Likert scale. This approach assumes that variables measured differ in extent and that values are continuous reflecting the particular characteristics (Greving, 2007, pp.65-67).

Consistency between the German and English version in both countries is important. For this, the study applied the translation-back translation approach (van de Vijver & Leung 1997, p.39). To facilitate this consistency check, I translated the English version into German and a second independent native speaker then translated the German version back to English. In each round, words in the German version were slightly adapted. This procedure was repeated until the back translation was fully consistent with the original English version. After the completion of the questionnaire design, the questionnaire was tested for clarity, wording, and logic (Kromrey, 2009, pp.384-386) with managers of two

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[22] Interviewees in Singaporean SMEs had with 28 years, in average, slightly higher work experience (standard deviation of 7 years). The average work experience of participants in Swiss SMEs was 25 years (standard deviation of 9 years). This is likely to be caused by still many entrepreneurs of the manufacturing generation in the late 70's and 80's leading their firms in Singapore. Recent challenges in attracting young employees to the manufacturing sector in Singapore have led to critical challenges in finding *and* motivating talents to become successors, even within an entrepreneur's family.

Swiss and two Singaporean companies. Feedback was minor and incorporated, resulting in the completion of the questionnaire design.

The questionnaire captured independent, dependent, and control variables. Both the constructs and the measurement instruments draw on previous research (see chapter 5.1). The design of the questionnaire follows the structure of the conceptual model and consists of six main parts: strategic alignment of employees, three PMS properties, use of measures, and firm performance. In addition, it contained open questions to identify the measures used as well as further general information about the company such as firm size. In the following section details on the measurement of the major variables are provided.

4.3 Analytical approach and construct measurement

To estimate the relationships in the empirical model, this study employs variance-based advanced structure equation modeling (SEM) techniques, i.e., partial least squares (PLS). PLS-SEM is a causal modeling approach that focuses on maximizing the variance of the dependent latent constructs explained by the ones of independent variables. As depicted in Figure 12, PLS path modeling is applied in this study in four steps.[23]

The first section explains why PLS-SEM is best suited to test the predicted effects and introduces PLS-SEM in general. The analytical process starts in the second step with the operationalization of the constructs. Next, the measurement model is evaluated to ensure reliability and validity. Lastly, the analyses conclude with the evaluation of the structural model and with the testing of the hypothesized associations.

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[23]The interested reader may want to refer to Hair, Ringle, and Sarstedt (2011) and Marcoulides and Saunders (2006) for further details on advantages, disadvantages, and challenges in conducting PLS modeling approaches.

Figure 12 – PLS path modeling sequence

	Reflective indicators	**Formative indicators**
(a)		(b)
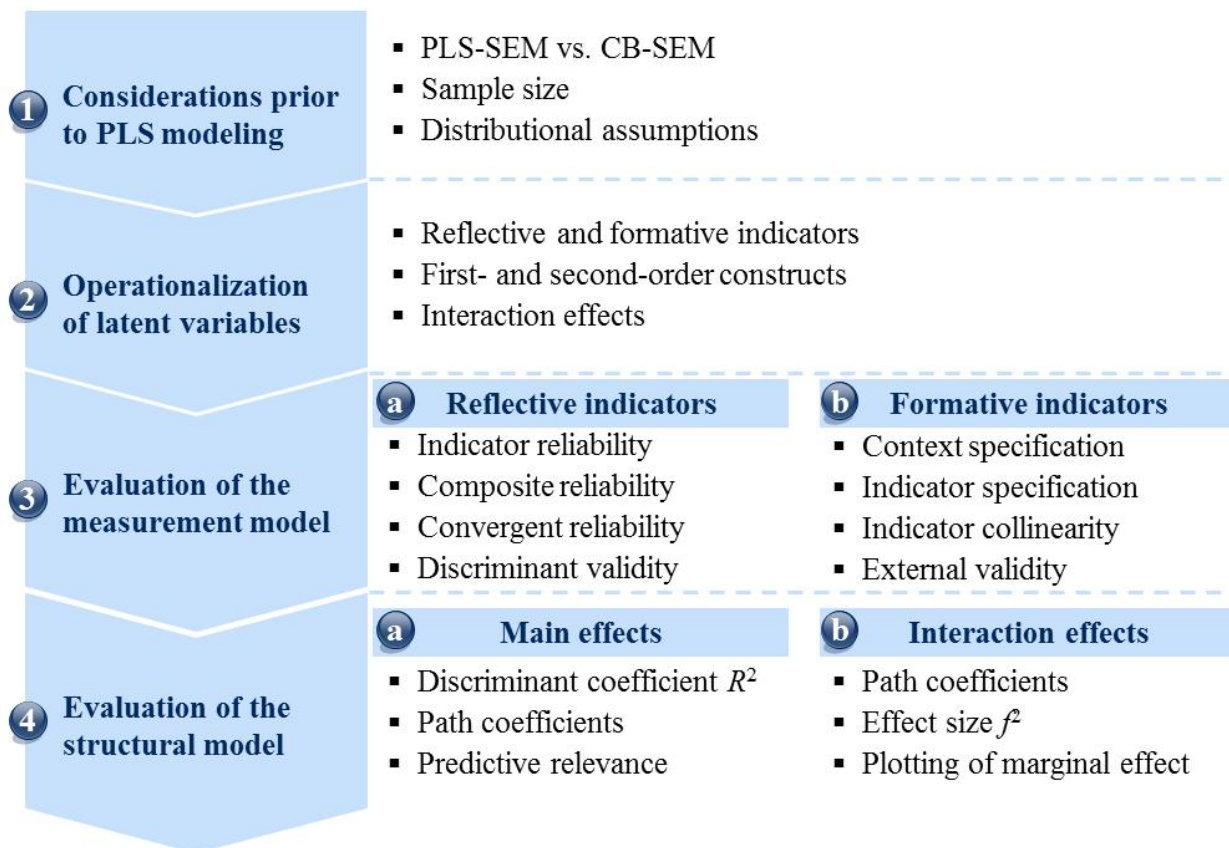
4.3.1   Considerations prior to PLS modeling

Structural equation models allow analyzing complex cause-effect relations between multiple independent and dependent constructs. Two useful approaches exist, i.e., covariance-based SEM (CB-SEM) and PLS-SEM. Despite its recent increase in popularity, PLS-SEM can only be applied in a meaningful way – and therefore serve as a "*silver bullet*" – when certain conditions are in place (Marcoulides & Saunders, 2006).

Hair, Ringle, and Sarstedt (2011, pp.143-144) provide an overview on criteria that favor PLS-SEM vs. CB-SEM. PLS-SEM is chosen in this study for four reasons (see Chin, 2010, pp.656-669; Hair *et al.* 2011, p.144). Firstly, PLS-SEM is best suited for theory elaboration as it is more concerned with the causal relationship. It is particularly strong in predicting key target constructs and to extend existing structural theory. Contrary, the widely used CB-SEM aims to minimize the differences between the covariance matrix of the sample with the one predicted by the underlying theoretical model by estimating the loadings of observable measures and path values. As such, CB-SEM emphasizes the overall model fit and is focused on testing a strong theory (Jöreskog, 1982, p.270). Secondly, PLS-SEM allows research on complex structural models with multiple relationships between independent and dependent variables. Thirdly, PLS-SEM is

recommended when constructs are operationalized using formative measures. Lastly, the authors recommend applying SEM-PLS when latent variable scores are used in subsequent analyses.

SEM-PLS is the best approach for this research as this study investigates the relationships between causal relationships in a new, so far quantitatively untested setting. That said, it aims to extend theory by analyzing the effects of the use of measures and PMS properties on strategic alignment of employees and firm performance. In addition, the construct use of measures is operationalized using formative measures and the conceptual model comprises interaction effects. Lastly, the sample size is with 90 cases comparably small for quantitative research. Scholars dealing with PLS-SEM have differing views on the minimum sample size. Hair *et al.* (2011) suggest that PLS-SEM is applicable when sample size is comparably small. The minimum number of observations for PLS-SEM algorithm should be at least "*the larger of the following: (1) ten times the largest number of formative indicators used to measure one construct or (2) ten times the largest number of structural paths directed at a particular latent construct in the structural model*" (p.144). In addition to this rule of thumb, other researchers state that PLS path modeling estimations is appropriate even at a sample size of 20 observations (Henseler, Ringle, & Sinkovics, 2009).

Partially contrary, Marcoulides and Saunders (2006) summarize another stream of thought that undermines the appropriateness of a general rule of thumb. They claim that "*a determination of the appropriate size depends on many factors, including the psychometric properties of the variables, the strength of the relationships among the variables, the model, and the characteristics of the data*" (Marcoulides & Saunders, 2006, p.iv). For example, the authors point to potential bias and deteriorating power when using too little indicators for each latent variable (consistency at large) or insufficient sample sizes (Marcoulides & Saunders, 2006, p.iv). In this study, each construct is measured with at least two indicators, mostly three to four, to avoid single-item measurement. This study's sample size of 90 is within the recommended range by Marcoulides and Saunders's (2006, p.iv) for adequate sample size of 71-147. [24,25]

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[24] Marcoulides and Saunders (2006, p.vii) provide an overview of a minimum sample size depending on factor inter-corrlelations, the power of the model, and given that data is normally distributed and complete. Screening of this study's data showed it to be normally distributed, complete, and with a model power of $R^2_{STA} = 0.36$ and $R^2_{PER} = 0.09$ (see chapter 5.2). As a result, this study's sample size of 90 is within the recommended range for adequate sample size of 71-147 ($\lambda > 0.7$; $R^2 = 0.3 - 0.4$).

Before providing details on the approach and on the operationalization of latent variables, the structural equation model is introduced following the usual notation (Figure 13).

Figure 13 – Structural equation model under study
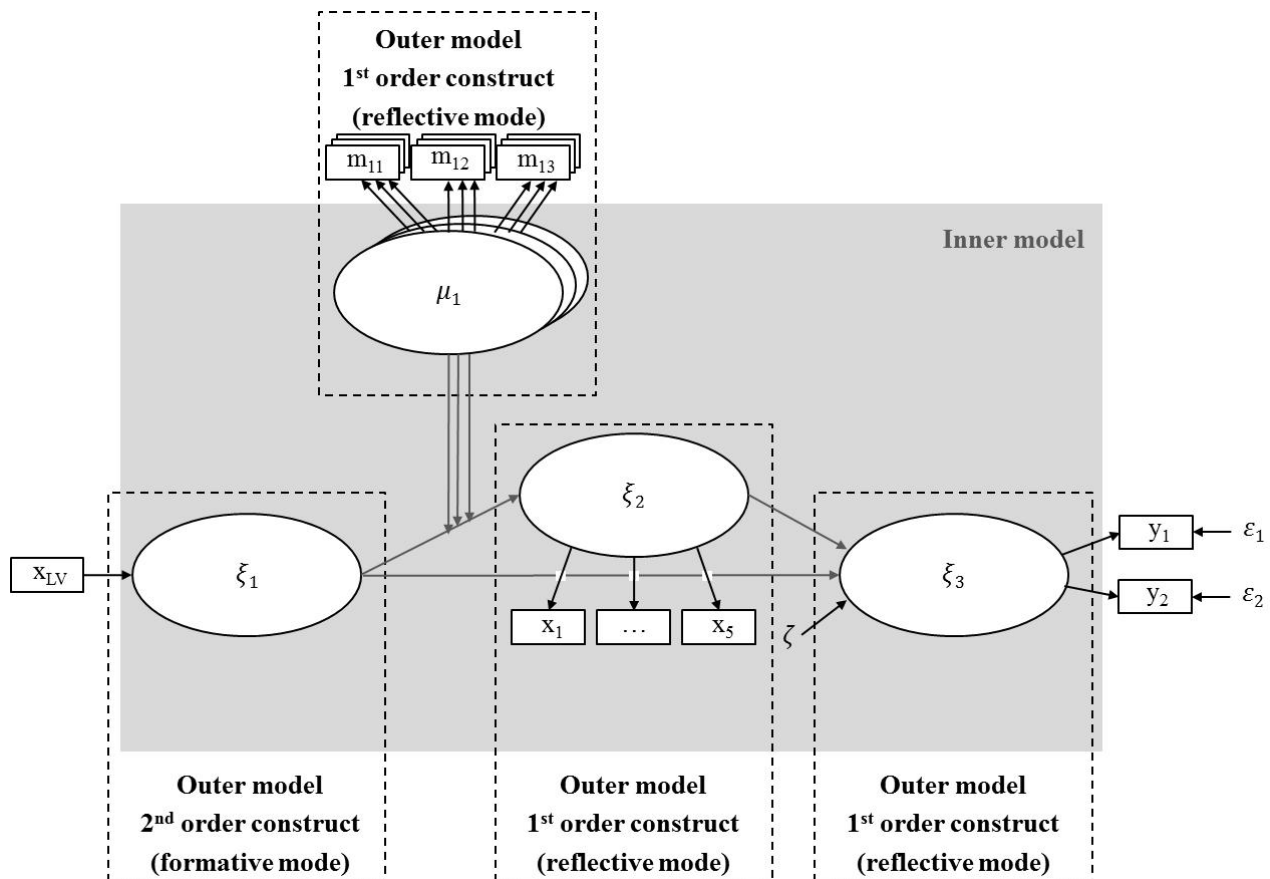
Note: Simplified illustration: Second-order construct (formative) consists of three first-order constructs (reflective) with each three to four indicators

Source: Own illustration following the usual notation from Henseler, Ringle, and Sinkovics (2009, p.285)

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[25] This study focuses on different subpopulations and therefore is prone to unobserved heterogeneity (Hair *et al.*, 2011, p.147). Finite-mixture partial least squares (FIMIX-PLS) is a derivate of the PLS-algorithm to treat potentially unobserved heterogeneity. It allows for capturing heterogeneity in the inner model (Sarstedt & Ringle, 2009, pp.1230, 1235).[25] The FIMIX-PLS algorithm is run with two segments first and thereafter the number of segments is successively increased (see Ringle, Sarstedt, & Schlittgen, 2010, p.171). The highest fit of this heuristic approach was found for $K = 4$ segments. This reduces the average sample size per segment to $n = 22$ which is too small given the number of variables chosen. Therefore, the standard PLS-algorithm is applied in this research.

A structural equation model is formally defined by two types of sub-models. The first component is the structural model (inner model) which represents the relationships between the latent constructs. The model consists of four exogenous constructs, i.e., latent constructs without any structural path relationships pointing at them: use of measures and the three properties for PMS. In addition, the model has two endogenous constructs, i.e., strategic alignment of employees and firm performance. Structural model relationships explain these two constructs (Hair *et al.*, 2011, p.141). The second type of components of the structural equation model is the measurement model (outer model). It is concerned with the operationalization of latent constructs.

4.3.2   Operationalization of latent constructs

Each latent construct in a structural equation model can be described by reflective or formative indicators. Reflective indicators are expressed as a function of their unobserved construct, as "*the latent variable determines its indicators*" (Bollen & Lennox, 1991, p.306). In the conceptual model, all first order constructs have reflective indicators, as indicated by arrows pointing from the construct to the indicators. In cases when the indicators are reliable, the variance of the construct fully determines the variance of the indicators. As a consequence, reflective indicators always show strong correlation (Hulland, 1999, p.201). Formative indicators define or cause a latent construct and are illustrated with arrows pointing from indicators to latent constructs. Changes in the indicators affect the value of the latent construct (Diamantopoulos & Winkelhofer, 2001, p.270).

The PLS algorithm calculates loadings for the indicators of reflective constructs and outer weights for indicators of formative constructs. The notion of outer weights for the associated coefficients indicates that changes in the value of the construct can be caused by changes in at least one of its formative indicators. That said, formative indicators do not necessarily correlate. Consequently, a change of value of a formative indicator is neither traceable to the variation of the construct nor to the variation of other indicators of the construct (Hulland, 1999, p.201).

Different types of constructs exist. Higher-order constructs build on multiple lower-order constructs. This study uses both first-order (strategic alignment of employees, the three latent constructs for PMS properties, and firm performance) and one second-order construct (use of measures). Second-order constructs are particularly suited to model and to test abstract theoretical concepts without losing the ability to distinguish the effects of their underlying first-order constructs (Albers & Götz, 2006, p.672).

Four archetypes to operationalize second-order constructs exist (Figure 14). They reflect all possible combinations of their two defining elements: (1) formative or reflective measurement model for first-order constructs, and (2) first-order constructs that can be either formative or reflective indicators of a second-order construct (Jarvis, Mackenzie, & Podsakoff, 2003, p.204).

Figure 14 – Archetypes of second-order factor operationalization
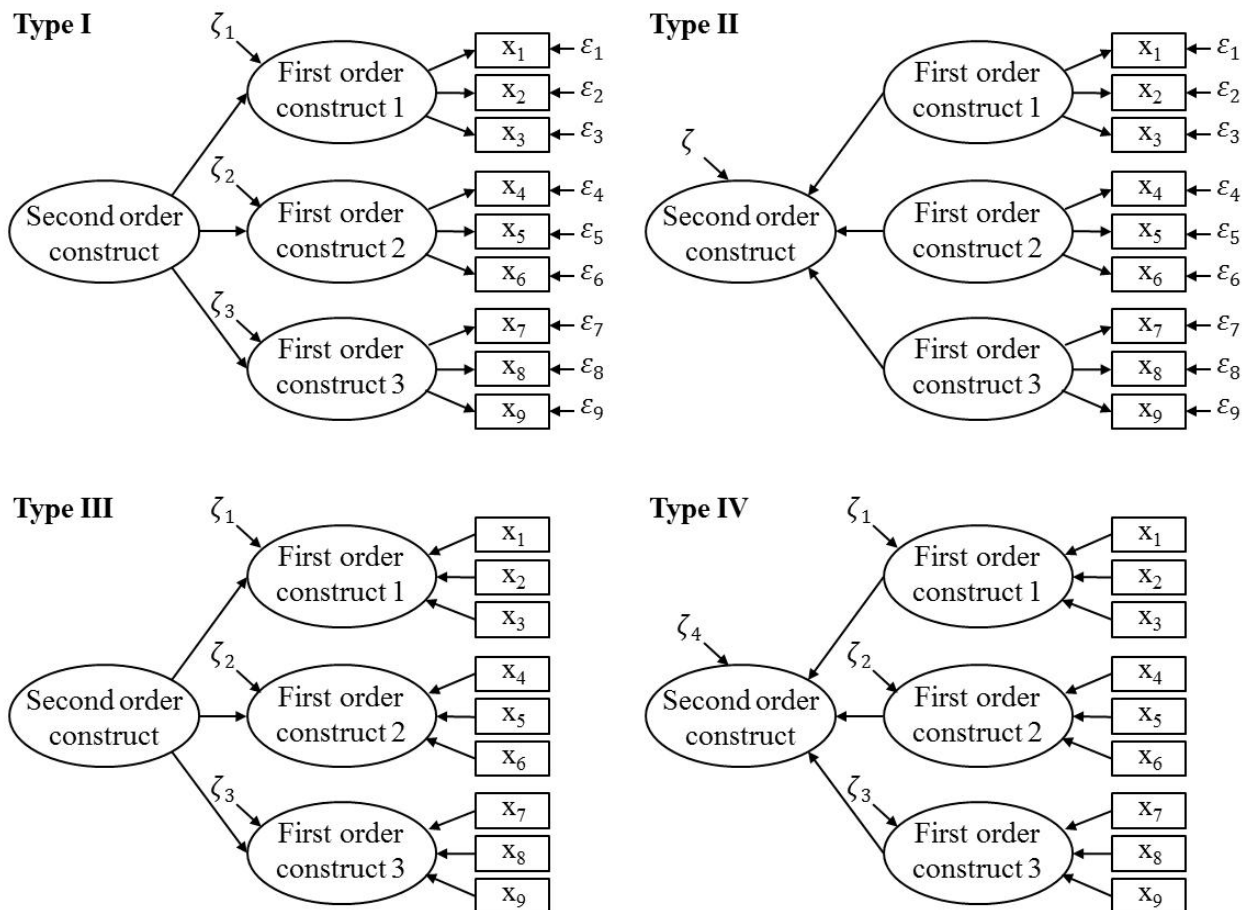
Source: With minor adaptations from Jarvis, Mackenzie, and Podsakoff (2003, p.205)

The use of these four models varies strongly in literature and a recommendation for one specific type depends strongly on the intended specification for the theoretical constructs.[26] This study makes use of archetype II (reflective first-order, formative second-order). Details on rationales and on its formation are provided in chapter 5.2.

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[26]For a detailed discussion on specific contexts and the appropriate use of the four archetypes the interested reader may want to read Jarvis, Mackenzie, and Podsakoff (2003, p.204) and Albers and Götz (2006, p.673).

As depicted in Figure 13 the three exogenous constructs referring to the PMS properties are modeled as moderators. Several approaches exist to operationalize two-way interaction effects. This study makes use of the product indicator approach.[27] In this approach, the interaction effect is built by including the product term between the independent and the moderating construct (Figure 15)

Figure 15 – Example for product indicator approach
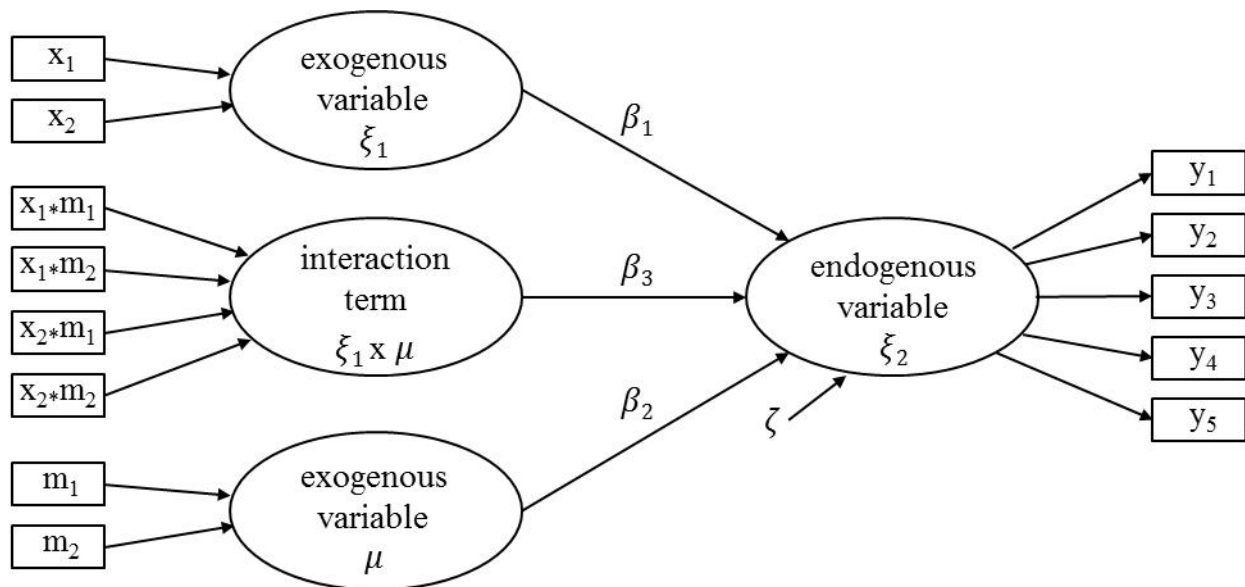
Source: With minor adaptations from Henseler and Chin (2010, p.85)

In this simplified example with one moderator only, the main effect:

$$\xi_2 = \beta_0 + \beta_1 \times \xi_1 + \beta_2 \times \mu + \zeta \,, \tag{1}$$

thus becomes

$$\xi_2 = \beta_0 + \beta_1 \times \xi_1 + \beta_2 \times \mu + \beta_3 \times (\xi_1 \times \mu) + \zeta \,, \tag{2}$$

with $\xi_1 \times \mu$ being the interaction term that contains all possible pairwise products of the indicators of the latent independent construct and of the latent moderator construct. The interaction term is added to the PLS path model as additional construct. The path coefficient β_3 of the interaction term represents the quantification of the interaction effect. In order to not overestimate the interaction effect all components of the product term need to be included in the structural path model in a direct form (Šarić, 2011, p.168).

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[27]Henseler and Chin (2010) assess four PLS-based approaches to analyze interaction effects: product indicator approach, a two-stage approach, a hybrid approach, and an orthogonalizing approach. They recommend for most circumstances the orthogonalizing and product indicator approach.

After including the interaction term in the PLS path model, scholars recommend to standardize the indicators, i.e., mean of zero and standard deviation of one, when producing the product indicators. This procedure is recommended to analyze interaction effects in complex causal PLS models (Henseler & Fassot, 2010, p.713). To adequately model the interaction term for formative measurement models, it requires to calculate and then standardize the factor scores for the independent and the moderator variables first. Then, one can calculate the product indicators by multiplying the standardized factor scores of the independent and the moderating constructs (Šarić, 2011, p.169).

4.3.3 Evaluation of the measurement model

The evaluation of the measurement model investigates the degree to which the observable indicators and their underlying latent constructs were measured precisely. The approach differs for reflective and formative measurement models. Focal items of interests are the indicator loadings in reflective constructs which are interpreted using traditional reliability and validity approaches in a principal component analysis. For formative constructs each indicator's relative importance in the formation of the construct is expressed by its weight. As such, the indicators create rather than reflect the construct which in turn does not allow the assumption of interdependencies among formative indicators. As a consequence, traditional assessment approaches are considered as inappropriate and evaluation of formative modes requires an alternative approach. Both approaches are outlined in the following (Barroso, Carrión, & Roldán, 2010, pp.432-434; Duarte & Raposo, 2010, pp.462-463; Götz, Liehr-Gobbers, & Krafft, 2010, pp.694-701).

Evaluation of reflective measurement models

In the reflective mode, the indicator value contains a measurement error which consists of a systematic and a random component. The first one occurs at each repetition, the latter one includes all factors that affect the construct measurement's results unsystematically. PLS scholars speak of full reliability when the random measurement error is zero and of full validity when both error parts equal zero (Churchill, 1987, pp.381-382). Based on this initial logic, PLS literature suggests four basic evaluation types that refer to reliability and validity (Götz *et al.,* 2010, pp.694-695):

(1) *Construct reliability:* Construct or composite reliability is an estimate of the internal consistency of the construct under study and reflects the degree to which the

indicators comprehensively measure their respective construct.[28] It can be quantified using the composite reliability measure that requires a construct's indicators to show high levels of correlation. Construct reliability values of above 0.70 are regarded as satisfactory for more advanced research fields and 0.60-0.70 for exploratory research (Nunnally & Bernstein, 1994 in Hair *et al.*, 2011, p.145). Contrary, no reliability can be assumed for values below 0.60 (Hair *et al.*, 2011, p.145). Composite reliability can be calculated as (Fornell & Larcker, 1981, p.45):

$$Composite\ reliability = \frac{\left(\sum_i \lambda_{ij}\right)^2}{\left(\sum_i \lambda_{ij}\right)^2 + \sum_i var(\varepsilon_{ij})}\ , \qquad (3)$$

with λ_{ij} being the loading of indicator i of a construct, ε_i referring to the measurement error of the construct to which i belongs, and j indicating the path index for the reflective measurement model.

(2) *Indicator reliability:* Indicator reliability refers to the extent to which the variance of an indicator can be explained by the construct that the indicator intends to measure. Each indicator's loading λ_i reflects the degree of reliability to its respective construct. Indicator loadings should be at least 0.70 (Hair *et al.*, 2011, p.145). However, indicators with loadings of at least 0.50 can be retained in the model if other indicators measuring the same latent construct show high reliability scores (Duarte & Raposo, 2010, p.462). Indicators with loadings between 0.50-0.70 should only be dropped from the model if this results in an increase of composite reliability (Hair *et al.*, 2011, p.145). In addition, indicator loadings need to be statistical significant, i.e., show *t*-test values of 1.96 or higher for a two-tailed significance test at a confidence level of 95% (Huber, Herrmann, Meyer, Vogel, & Vollhardt, 2007, p.104).

(3) *Convergent validity*: Convergent validity refers to the extent to which several indicators of a construct that should theoretically be related actually show a relation. It can be assessed by calculating the average variance extracted (AVE) which quantifies the amount of variance that a construct captures from its indicators in comparison to the amount resulting from measurement errors (Fornell & Larcker, 1981, p.45):

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[28]Composite reliability requires indicators not to be equally reliable which is why this measure is better suited for PLS-SEM compared to Cronbach's alpha (Hair *et al.*, 2011, p.145).

$$AVE = \frac{\sum_i {\lambda_i}^2}{\sum_i {\lambda_i}^2 + \sum_i var(\varepsilon_i)} \quad . \tag{4}$$

Convergent validity is indicated by AVE values of 0.50 and higher. This threshold signals that the latent construct explains more than half of the variance of its indicators (Hair *et al.*, 2011, p.146).

(4) *Discriminant validity.* This validity test assesses the extent to which indicators of their associated latent construct are unrelated to indicators of all other latent constructs. According to the Fornell-Larcker criterion, a necessary condition is given when the shared variance between a latent variable and its indicators is higher than the variance with other latent variables (Hulland, 1999, p.199). Sufficient high levels exist when the square roots of AVE for each construct are larger than the correlations between constructs. Formally:

$$\sqrt{AVE_m} - \max_{l=1,\dots,L}(corr_{ml}) > 0 \qquad \forall\, m \neq l \ (l = 1, \dots, L, m = 1, \dots, M), \tag{5}$$

where AVE_m is the convergent validity of the latent construct *m* and $\max_{l=1,\dots,L}(corr_{ml})$ refers to the maximum value of all correlations between construct *m* and all other latent constructs *l*.

Evaluation of formative measurement models

Correlation of indicators of formative constructs is not a necessary condition because each of them can measure a different circumstance. As a consequence, reliability assessments as introduced for reflective measurement models cannot be applied for formative ones. However, an indicator may not contribute to the formative construct. This is the case when the effect is not significant or when indicator collinearity exists (Henseler *et al.*, 2009, p.302). An assessment of validity is possible and necessary (Diamantopoulos & Riefler, 2008). Researchers therefore suggest to evaluate the validity of formative models with regards to content specification, significance of weights, and multicollinearity (Henseler *et al.*, 2009, p.302; Diamantopoulos & Winklhofer, 2001, p.271; Diamantopoulos & Riefler, 2008, pp.1191-1193).

(1) *Content specification.* Changing the indicators of formative constructs is likely to change the meaning of the construct. Therefore it is necessary to capture all required formative indicators based on previous research to describe the construct comprehensively prior the actual data collection (Diamantopoulos & Winklhofer, 2001, p.271).

(2) *Significance of weights.* As a consequence of content specification, the weights of the formative measurement model should be significant. Even if weights are not significant, the formative indicators should only be eliminated if this does not change the conceptual character of the construct under study (Henseler *et al.*, 2009, p.302).

(3) *Multicollinearity.* A test for multicollinearity of the formative indicators helps to assess whether the indicators carry redundant information and are therefore highly correlated. The variance inflation factor (VIF) allows for testing for multicollinearity. It is defined as

$$VIF_i = \frac{1}{1 - R_i^2} \, , \tag{6}$$

where R_i^2 represents the share of variance explained by indicator i that is explained by the remaining indicators. As a rule of thumb a VIF value higher than ten indicates a critical level of multicollinearity (Henseler *et al.*, 2009, p.302). Hair *et al.* (2011, p.147) suggest a more conservative threshold value of five.

Table 4 summarizes the criteria mentioned above that are used to evaluate reliability and validity of reflective and formative measurement models. Decisions to exclude indicators that do not reach recommended thresholds and/or are not significant should also take "*the theoretical underpinnings and interpretation of empirical results*" (Hair *et al.*, 2011, p.146) into account.

Table 4 – Criteria for evaluation of measurement models

Criterion	Requirement		
	Measure	**Ideal**	**Acceptable**
Reflective measurement model			
Indicator reliability	Indicator loadings	> 0.70	≥ 0.50
	t-value (two-tailed)	> 1.96	> 1.66
Construct reliability	Composite reliability	> 0.70	> 0.60
Convergent validity	AVE	--	≥ 0.50
Discriminant validity	n/a	$\sqrt{AVE_m} - \max\limits_{l=1,...,L}(corr_{ml}) > 0$	
Formative measurement model			
Content specification	Based on literature	n/a	n/a
Significance of weights	*t*-value (two-tailed)	> 1.96	> 1.66
Multicollinearity	VIF	< 5	< 10

4.3.4 Evaluation of the structural equation model

In the second step, the thorough assessment of PLS-SEM outcomes requires an evaluation of the structural model which focuses on the relationships between constructs. To assess the quality of the PLS estimates, non-parametrical tests of resampling are applied.[29] This study uses bootstrapping to calculate standard errors and *t*-statistics of the parameters. A general assessment criterion such as the Goodness-of-Fit-Index for LISREL applications does not exist. Moreover, a comprehensive evaluation of four dimensions helps to assess the model's overall quality (Barroso *et al.*, 2010, p.434-435; Hair *et al.*, 2011, p.147-148; Götz *et al.*, 2010, pp.701-703):

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[29]PLS-SEM does not use explicit functions to describe the model. In addition, it allows for formative indicators. Consequently, traditional Goodness-of-Fit measures cannot be applied because this would require the model to account for sample covariance which in turn requires all constructs to be reflective (Barroso *et al.*, 2010, p.434).

(1) *Combined predictiveness*. The determination coefficient R^2 represents the combined predictability of the model's exogenous constructs to explain the endogenous construct's variance. This measure is essential to evaluate the goodness of the structural model as the PLS-SEM algorithm aims to predict and to increase the amount of variance explained (Duarte & Raposo, 2010, p.466). The values of R^2 can range from 0 to 1. Different views exist in literature on the required threshold values for R^2. Some scholars suggest that the variance explained for each construct needs to be at least 0.10 (Duarte & Raposo, 2010, p.468), others recommend values of 0.19, 0.33, and 0.67 as limited, moderate, and strong (Chin, 1998, p.323). Hair *et al.* (2011, p.147) suggest that a generalization of acceptable levels of R^2 is not meaningful but depends on the specific research discipline and on the individual study. To conclude, no agreement on recommended values exists in literature. As a general recommendation, the greater the values of R^2 the more variance is explained and therefore the better the model's prediction.

(2) *Goodness of path coefficients*. Another important test analyzes the strength and significance of the beta path coefficients that are estimated by the PLS-SEM algorithm. Significance is tested by *t*-statistics which can be gained from resampling methods such as bootstrapping. Hypotheses for the causal relationships are supported if path coefficients are significant and show the hypothesized direction (Götz *et al.*, 2010, p.702). *T*-values for a two-tailed *t*-test for each path of 1.66 (1.96) or higher can be considered significant at a confidence level of 90% (95%).

(3) *Effect size*. The effect size f^2 captures the strength of influence from one latent construct on the endogenous construct. To calculate the respective effect size f^2 one needs to compare the R^2 of the model including the latent construct with the model without this construct (Henseler *et al.*, 2009, pp.303-305). Formally:

$$\text{Effect size } f^2 = \frac{R^2_{model\ with\ construct} - R^2_{model\ without\ construct}}{1 - R^2_{model\ with\ construct}} \ . \qquad (7)$$

Effect values lower than 0.02 are considered as weak, above 0.35 as strong and in between as moderate (Chin, 1998, p.316).

(4) *Predictive validity*. The model's predictive validity can be tested using the Stone-Geisser Q^2 criterion. It tests how well a model estimates each endogenous construct indicators by cross-validating two data sets: the entire data set and one with omitted

data points (blindfolding procedure).[30] It then uses the obtained parameter estimates from the full data set to reconstruct the missing data. This procedure therefore cross-validates data and prediction errors calculated as the difference between original data omitted and the predicted values (Götz *et al.*, 2010, p.702). Formally:

$$\text{Stone-Geisser test criterion:} \quad Q^2 \;=\; 1 - \frac{\sum_k E_{mk}}{\sum_k O_{mk}}, \tag{8}$$

where E_{mk} refers to the squares of the predictive errors, and O_{jk} represents the squares of the mean of the remaining data from the blindfolding procedure. Index m represents the endogenous measurement model, whilst k refers to the reflective indicators of the measurement model. Q^2 values larger than 0 indicate predictive validity of its explanatory latent constructs. Contrary, predictive validity cannot be inferred if Q^2 is negative (Fornell & Cha, 1994, p.73). Substantial, moderate and weak predictive relevance is given for values of 0.35, 0.15, and 0.02, respectively (Henseler *et al.*, 2009, p.305).

Table 5 summarizes the various assessment criteria and thresholds for evaluation of the structural model.

Table 5 – Criteria for evaluation of structural models

Criterion	Requirement		
	Measure	**Ideal**	**Acceptable**
Combined predictiveness	R^2	> 0.70	> 0.20[1]
Effect size	f^2	> 0.35	> 0.02
Goodness of path coefficients	*t*-value (two-tailed)	> 1.96	> 1.66
Predictive validity	Q^2	> 0.15	> 0

1) No agreement on threshold in literature

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[30] The blindfolding procedure is only applied for exogenous constructs with reflective measurement models. The omission distance d should be between five and ten. In addition, it is necessary that the number of observations divided by d is not an integer (Hair *et al.*, 2011, p.147).

4.3.5 Evaluation of interaction effects

Two approaches exist to interpret the actual moderating effect: (1) visual interpretation of the marginal effect, and (2) estimation of path coefficient and its statistical significance. If the interaction effect measured is significant, plotting of the marginal effect of the moderating construct allows for interpretation. The marginal effect of the independent construct in a multiplicative interaction model such as equation (2) is calculated as (Brambor, Clark, & Golder, 2005, p.73)

$$\frac{\partial \xi_2}{\partial \xi_1} = \beta_1 + \beta_3 \times \mu. \tag{9}$$

Depending on the gradient of the linear slope the researcher can, in general, assess whether the moderator has a positive or negative effect and infer its strength. However, the reader needs to take also the confidence intervals into consideration to derive at a meaningful conclusion. A significant marginal effect can only be inferred for those sections on the horizontal axis (predictor variable) for which both the plotted marginal effect and the plotted confidence interval are entirely positive or entirely negative (Brambor *et al.*, 2005, p.76). Calculation and plotting the confidence interval requires considering the combined effect of both constructs and therefore adjusting for the standard errors (Aiken & West, 1991):

$$\sigma^2_{\frac{\partial \xi_2}{\partial \xi_1}} = var\,(\beta_1) + \mu^2 \times var\,(\beta_3) + 2\mu \times cov\,(\beta_1\beta_3) \,. \tag{10}$$

The second way is to interpret the estimation of the path coefficient and its significance. Statistical significance of the path coefficient β_3 is a necessity to support the hypothesized interaction effect, regardless of the value of the coefficient itself (Baron & Kenny, 1986, p.730). In addition, the researcher should investigate the interaction effect by calculating the effect size f^2. For this, the scholar needs to compare the R^2 of the main effects model including all direct single effects with the R^2 of the contingency model which includes the interaction terms. Formally:

$$\text{Effect size } f^2 = \frac{R^2_{model\,with\,moderator} - R^2_{model\,without\,moderator}}{1 - R^2_{model\,with\,moderator}} \,. \tag{11}$$

5 Results

Having laid the theoretical foundation, this chapter focuses on the operationalization of the measurement model and the structural model. After establishing confidence in reliability and validity of each construct measured in section 5.1, the following section operationalizes second-order constructs and the structural model with a focus on hypotheses testing. Next, the robustness of results is tested and endogeneity is addressed. This chapter concludes with a discussion which compares results with previous findings from empirical research in large firms.

5.1 Operationalization and validation of first-order constructs

The process of defining the relationships between each latent construct and its assigned observed indicators is also known as operationalization (Henseler *et al.*, 2009, pp.284-285). After designing the model, the analysis of a structural equation model begins with the PLS-SEM algorithm in two steps: (1) the iterative estimation of latent construct scores to assess reliability and construct validity of the measurement model, and (2) the estimation of coefficients for the indicators and structural model relationships using the ordinary least squares method (see Hair *et al.*, 2011, p.142). Following the introduced procedure, data analysis starts with the evaluation of the measurement model for both first-order constructs and control variables.[31] This requires first the elimination of indicators with cross-loadings.

5.1.1 Elimination of indicators with cross-loadings

A principal components analysis (PCA) serves to eliminate indicators that load on more than one construct. The PCA is run on the 27-questions questionnaire that measured Strategic Performance Management characteristics on 90 SME executives. The suitability of PCA is assessed prior to analysis. After the first PCA iteration, indicators EVA1 and ALS2 are removed from the sample because more than one component loaded on each indicator.[32] In the subsequent iteration, inspection of the correlation matrix shows that all indicators have at least one correlation coefficient greater than 0.50. The overall Kaiser-Meyer-Olkin (KMO) measure is 0.82 with individual KMOs measures all

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[31] Prior to the PCA, indicators STA5 and STA2 were subsequently removed because their loadings were below the recommended minimum threshold of 0.50 and elimination led to higher construct reliability (see chapter 5.1.2). For the introduction of indicators and their abbreviations see section 5.1.2.

[32] ALS1 loaded on no construct but was retained to avoid single-item measurement of the ALS-construct (Churchill, 1979, p.66).

greater than 0.53, classifications of mostly "*meritorious*" and few "*mediocre*" but still above the acceptable threshold according to Kaiser (1974). Bartlett's Test of Sphericity is statistically significant (p < 0.0005), indicating that the data is likely factorizable.

PCA reveals six components that had eigenvalues greater than one which explains 34.7%, 12.7%, 8.0%, 5.8%, 5.4%, and 4.6% of total variance, respectively. Visual inspection of the scree plot indicates that six components should be retained (Cattell, 1966). In addition, a six-component solution meets the interpretability criterion. As such, six components are retained.

The six-component solution explains 75.4% of the total variance. A varimax orthogonal rotation is employed to aid interpretability. The rotated solution exhibits "*simple structure*" (Thurstone, 1947). The interpretation of the data is consistent with the Strategic Performance Management attributes the questionnaire was designed to measure (see chapter 4.2). Strong loadings of the PMS property breadth indicators occur on Component 1, PMS property formalization indicators on Component 2, target setting indicators on Component 3, incentive setting indicators on Component 4, strategic alignment of employees on Component 5, and firm performance on Component 6. Component loadings and communalities of the rotated solution are presented in Table 6 few indicators such as EVA3 loaded on the same generic construct developed in the PCA as other indicators. A potential explanation is the proximity of the respective questions in the questionnaire to adjacent constructs, e.g., target setting in this example. Due to their conceptual underpinnings in literature and given the high reliability and validity of constructs (see chapter 5.1.2) these indicators are kept in the sample. All first-order constructs are defined in a reflective mode because only their indicators can be observed directly. They represent reflective constructs as the causal linkage is from the constructs to the respective indicators (Fornell & Bookstein, 1982, p.292). Consequently, indicators can be eliminated without changing the overall construct. To avoid challenges caused by using only single-item measurement (Churchill, 1979, p.66), this study uses for each latent construct at least two indicators.

Few indicators such as EVA3 loaded on the same *generic* construct developed in the PCA as other indicators. A potential explanation is the proximity of the respective questions in the questionnaire to adjacent constructs, e.g., target setting in this example. Due to their conceptual underpinnings in literature and given the high reliability and validity of constructs (see chapter 5.1.2), these indicators are kept in the sample. All first-order constructs are defined in a reflective mode because only their indicators can be observed directly. They represent constructs as the causal linkage is from the

constructs to the respective indicators (Fornell & Bookstein, 1982, p.292). Consequently, indicators can be eliminated without changing the overall construct.

Table 6 – Rotated structure matrix for PCA with varimax rotation[33]

Indicators	Rotated component coefficients						Communalities
	1	**2**	**3**	**4**	**5**	**6**	
BAL1	**.723**	.283	.064	.249	.343	.016	.787
BAL2	**.612**	.183	-.036	.287	.301	-.194	.620
BAL3	**.653**	.314	.303	.271	.201	-.069	.735
TAR2	**.773**	.058	.199	.081	-.116	.040	.663
EVA3	**.612**	.466	.322	.050	.099	-.076	.714
FOR1	-.063	**.657**	.339	.286	.317	-.055	.736
FOR2	.240	**.760**	.277	-.078	.104	.101	.739
FOR3	.352	**.746**	-.021	.266	.210	.132	.813
ALS3	.333	**.668**	.056	.405	.159	-.101	.759
ALS1[1]	.464	.067	.298	.266	.400	.017	.540
TAR1	.109	.060	**.851**	-.016	.033	.137	.759
TAR3	.156	.287	**.760**	.172	-.037	.092	.724
TAR4	.269	.422	**.565**	.221	.194	.173	.686
EVA2	.157	.043	**.777**	.062	.220	.089	.690
INC1	.258	.277	.149	**.739**	-.051	-.116	.728
INC2	.215	.173	.032	**.653**	.022	-.239	.561
INC3	.071	-.028	-.010	**.713**	.084	-.286	.603
INC4	.124	.125	.177	**.753**	.141	.236	.705
STA1	.224	.141	.148	-.019	**.627**	-.138	.505
STA3	.067	.114	.099	.151	**.835**	.185	.781
STA4	.053	.174	.009	.007	**.868**	-.038	.787
PER1	.012	-.001	.160	-.152	-.051	**.910**	.879
PER2	-.098	.082	.163	-.147	.053	**.887**	.855

Note: Major loadings for each item are bolded

1) ALS1 was kept in the subsequent analyses despite low loadings and communality to avoid single-item measurement of the ALS construct

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[33] For the definition of the items see section 5.1.2.

5.1.2   Operationalization of first-order constructs

The following chapter elaborates on the operationalization and validation of the three moderating first-order constructs referring to PMS properties, the mediator construct strategic alignment of employees, and the dependent construct firm performance. In addition, details are provided on the three constructs that later on build the second-order construct. The control variables firm size, country, and organizational complexity are included in this study to account for contextual factors that are likely to affect the mediating and dependent variable. The operationalization and validation of the constructs is conducted using the software SmartPLS (Ringle, Wende, & Will, 2005).

Target setting

The operationalization of the first-order construct target setting which serves as one of the three components of the second-order construct use of measures later on, is conducted based on previous measurement instruments of Artz *et al.* (2012) and Sousa and Aspinwall (2010). The respective questions measure the extent to which SMEs use measures for target setting and planning. In particular, the four questions capture the use of measures for budgeting/financial target setting (TAR1), short-term production planning (TAR2), and the extent to which performance goals are communicated to the management team (TAR3) as well as to all employees (TAR4; Table 7).

Indicator loadings are statistically significant and above 0.70. As an exception, indicator TAR2 has a loading value of 0.63 which is below the ideal 0.70 threshold but well above the minimum acceptable level of 0.50. It is kept in the data set for further analyses because it loads on the target setting construct as shown in the PCA. On the construct level, reliability and validity is ensured as indicated by a composite reliability of 0.86 and AVE of 0.61.

Table 7 – Evaluation of target setting construct

Use of measures – Target setting		
I. Indicator assessment	**Criteria**	
Indicators	**Indicator loadings**	***t*-value**
Please indicate whether performance measures are used in your firm for the following:		
TAR1 Budgeting/financial target setting	0.75	8.68
TAR2 Short-term production planning	0.63	6.98
TAR3 Communication of performance goals to management team	0.86	27.29
TAR4 Communication of performance goals to employees of all company levels	0.86	41.41
II. Construct assessment		
Composite reliability	Average variance extracted	
0.86	0.61	

Source: TAR1: Artz *et al.* (2012); TAR3 and TAR4: Sousa and Aspinwall (2010)

Performance evaluation

Operationalization of the performance evaluation construct draws on the measurement model of Artz *et al.* (2012). This construct contributes later on to building the second-order construct use of measures. Along three questions, the interviewees provided insights on the use of measures for evaluation firm and department performance such as variance analyses of planned production output (EVA1), of target achievement for long-term company goals (EVA2) as well as weekly/monthly production output (EVA3). *T*-values of all three indicators are well above 1.96 and loadings were strong (Table 8).

Table 8 – Evaluation of performance evaluation construct

Use of measures – Performance evaluation

I. Indicator assessment	**Criteria**	
Indicators	**Indicator loadings**	***t*-value**
Please indicate whether performance measures are used in your firm for the following:		
EVA1 Variance analyses of planned production output	*eliminated*	
EVA2 Evaluation of target achievement for long-term company goals	0.81	14.28
EVA3 Evaluation of target achievement for weekly/monthly production output	0.86	29.29
II. Construct assessment		
Composite reliability	Average variance extracted	
0.82	0.70	

Source: EVA1 and EVA2: Artz *et al.* (2012)

Indicator EVA1 is eliminated because more than one component loads on this indicator as identified in the PCA. Both composite reliability (0.82) and AVE (0.70) are well above the recommended values, indicating reliability and validity of this construct.

Incentive setting

The measurement of the incentive setting constructs captures four aspects (Bloom *et al.*, 2010). Respective indicators measure the extent to which measures are used to evaluate individual employee performance (INC1), for non-financial rewarding (INC2), to determine compensation practices (INC3), and to apply sanctions (INC4). Indicators INC1 and INC4 are well above 0.70. In addition, all indicators are statistically significant, well above the minimum acceptable level of 0.50, and load on one component only as indicated by the results of the PCA. Therefore, all indicators are kept in the sample (Table 9).

Table 9 – Evaluation of incentive setting construct

Use of measures – Incentive setting		
I. Indicator assessment	**Criteria**	
Indicators	**Indicator loadings**	***t*-value**
Please indicate whether performance measures are used in your firm for the following:		
INC1 Evaluating employee performance	0.86	22.48
INC2 Non-financial rewarding employee performance (e.g., training, promotion)	0.69	10.05
INC3 Determining compensation practices	0.63	8.07
INC4 Applying sanctions (e.g., concerning decision rights, budgets)	0.88	35.60
II. Construct assessment		
Composite reliability	Average variance extracted	
0.85	0.59	

Source: Bloom *et al.* (2012)

The construct incentive setting is reliable and valid as indicated by sufficiently high composite reliability (0.85) and AVE values (0.59).

Alignment of measures with firm strategy

The operationalization of the first construct that refers to the design of the measurement system used is based on findings in literature for large companies. Previous research suggests that measures should reflect firm strategy which results on employee level on focusing on value adding activities. The construct is measured with three indicators. The first two indicators (ALS1, ALS2) capture the extent to which measures are derived from the company's strategic priorities and are connected with the main focus of long-term goals (building on Garengo *et al.*, 2005). The third question (ALS3) assesses whether the measures used encourage employees to focus on important activities (Neely *et al.*, 1996).

As depicted in Table 10, all indicators load statistically significant and strong on the construct. Indicator ALS2 is dropped for the subsequent PLS analysis as two components load on the indicator ($r_i > 0.50$) as shown in the PCA. ALS1 is kept in the subsequent analyses despite not loading on any of the six components in the PCA. This is to avoid single-item measurement. On construct level, reliability and validity is given as indicated

by a composite reliability value of 0.84 and AVE of 0.72 which are both well above the respective thresholds.

Table 10 – Evaluation of alignment with firm strategy construct

Measure properties – Alignment of measures with firm strategy

I. Indicator assessment	**Criteria**	
	Indicator	
Indicators	**loadings**	***t*-value**
Performance measures…		
ALS1 … are derived from the company's strategic priorities	0.89	10.50
ALS2 … are connected with the main focus of long-term goals	*eliminated*	
ALS3 … encourage our employees to focus on important activities	0.81	8.56
II. Construct assessment		
Composite reliability	Average variance extracted	
0.84	0.72	

Source: Building on the dimensions in Garengo *et al.* (2005); Neely *et al.* (1996) for ALS3

Breadth

All indicators that measure the PMS property breadth build on Garengo *et al.* (2005). The three indicators assess whether measures used cover financial- and non-financial dimensions (BAL1), cover firm-internal and -external dimensions (BAL2), and represent strategic and operational objectives (BAL3;Table 11).

All indicators fulfill the respective criteria and show indicator loadings of 0.95, 0.89, 0.86 and *t*-values higher than 1.96. The breadth construct has a composite reliability of 0.93 and AVE of 0.81, and therefore, is considered as reliable with convergent validity.

Table 11 – Evaluation of breadth construct

Measure properties – Breadth		
I. Indicator assessment	**Criteria**	
	Indicator	
Indicators	**loadings**	*t*-**value**
Performance measures…		
BAL1 … cover financial- and non-financial dimensions	0.95	109.72
BAL2 … cover firm-internal and -external dimensions (e.g., internal process efficiency vs. customer satisfaction)	0.89	35.43
BAL3 … represent strategic and operational objectives (e.g., profitability vs. production lead time)	0.86	19.17
II. Construct assessment		
Composite reliability	Average variance extracted	
0.93	0.81	

Source: Building on the dimensions in Garengo *et al.* (2005)

Formalization

The operationalization of the third moderating construct formalization reflects the extent to which measures are clearly assigned to responsible individuals (FOR1), are formally documented (FOR2), and are formally communicated to employees (FOR3). It entirely draws on previous research (Neely *et al.*, 1996). On indicator level, all three loadings showed high values, all above 0.70. Similarly, all indicators were statistically significant ($p < 0.05$) with *t*-values above 1.96.

The composite reliability (0.87) and AVE (0.69) are above their recommended values indicating acceptable levels of construct reliability and convergent validity.

Table 12 – Evaluation of formalization construct

Measure properties – Formalization		
I. Indicator assessment	**Criteria**	
	Indicator	
Indicators	**loadings**	***t*-value**
Performance measures…		
FOR1 … are clearly assigned to responsible individuals (i.e., who is responsible for acting on each measure)	0.82	13.25
FOR2 … are formally documented	0.81	10.59
FOR3 … are formally communicated to employees (e.g., using dashboards, graphs)	0.85	23.25
II. Construct assessment		
Composite reliability	Average variance extracted	
0.87	0.69	

Source: Neely *et al.* (1996)

Strategic alignment of employees

The mediating construct was operationalized based on the measurement instrument developed by Hanson, Melnyk, and Calantone (2011). The interviewees were asked to assess five dimensions. The first two indicators and indicator five refer to awareness and understanding. They capture the extent to which employees are aware of the strategic direction of the company (STA1). In addition, they assess whether employees can derive operational goals from the strategic goals (STA2) and see a strong cause-and-effect relationship between their daily work and the higher goals of the organization (STA5). Indicators three and four focus on acceptance. They measure the extent to which employees accept that their operational goals are appropriate and reflect a sound strategic direction (STA3) and to which they sense that the goals are consistent with their sense of how things should be done (STA4; Table 13).

On indicator level, not all items load strongly on the construct. Indicators STA5 and STA2 are both significant on a 95% confidence interval. However, their loadings are lower than the recommended minimum value of 0.50. Therefore, both indicators are subsequently removed from the model as this leads to an increase of construct reliability. The strategic alignment of employees construct shows sufficiently high values for composite reliability (0.85) and AVE (0.66).

Table 13 – Evaluation of strategic alignment of employees construct

Strategic alignment of employees		
I. Indicator assessment	**Criteria**	
Indicators	**Indicator loadings**	***t*-value**
Employees in my company…		
STA1 … are aware of the strategic direction of the company	0.64	5.54
STA2 … can derive operational goals from the strategic goals	*eliminated*	
STA3 … accept that their operational goals are appropriate and reflect a sound strategic direction	0.91	33.00
STA4 … sense that the goals are consistent with their sense of how things should be done	0.87	18.14
STA5 … see a strong cause and effect relationship between their daily work and the higher level goals of the organization	*eliminated*	
II. Construct assessment		
Composite reliability	Average variance extracted	
0.85	0.66	

Source: Hanson *et al.* (2011)

Firm performance

The operationalization of the dependent construct firm performance refers to the perceived financial success of the company. It reflects the interviewee's assessment on the relative performance with regards to revenue growth (PER1) and profit margin (PER2) of his company in comparison to its competitors over the last three years (Šarić, 2011, p.181). As depicted in Table 14 both indicators had loadings above 0.70 and were statistically significant with *t*-values above 1.96.

On construct level, composite reliability is calculated 0.88 and AVE 0.78, indicating both reliability and validity of the construct. An assessment is gathered for all Swiss SMEs but could not be completed entirely for some Singaporean SMEs due to time constraints. I apply the "*case wise replacement*" mechanism in SmartPLS to estimate the missing values.

Table 14 – Evaluation of firm performance construct

Firm performance

I. Indicator assessment	Criteria	
	Indicator	
Indicators	**loadings**	**_t_-value**
How do you rate your company's performance in relation to its competitors during the past 3 years?		
PER1 Growth in revenue	0.85	8.35
PER2 Profit margin	0.92	12.15

II. Construct assessment	
Composite reliability	Average variance extracted
0.88	0.78

Note: Due to time constraints and confidentiality issues performance data could be gathered for only 66 of the 90 SMEs

Source: Šarić (2011)

Control variables

Control variables are included in the PLS model to control for contextual factors, as recommended in the performance management literature. The number of controls is constrained by the degrees of freedoms in my model, i.e., three controls are chosen. They are measured by single indicators only. In particular, three firm-related and respondent-specific factors that are likely to affect the dependent variable are controlled for: firm size, organizational complexity, and country (e.g., Chenhall, 2003; Ferreira & Otley, 2009).

Firstly and with regards to firm-related factors, I control for firm size by the logarithm of number of employees as the maturity of PMS tends to be greater with increasing firm size (Chapman, 1997; Speckbacher *et al.*, 2003). Next, organizational structure of a firm is controlled for (Ferreira & Otley, 2009). I assess the organizational complexity by the number of production sites it has. Multiple production set-ups are likely to aggravate aligning employees towards firm strategy. In addition, complexity of strategy is likely to increase as well because firms with multiple production sites tend to have dedicated sub-strategies for each site. For example, a Swiss manufacturer focuses on research and development as well as manufacturing of high-end quality parts in its headquarter. In contrast, its subsidiary in China focuses on production of lower-quality, lower-cost

items. Next, I use dummy variables to control for country. By this, I account for differing management practices across countries (Bloom *et al.*, 2012) and social desirability bias as a result of differences in national culture of my sample countries (Hanges, Javidan, Dorfman, & Gupta, 2004). This is important because the effects of Strategic Performance Management on strategic alignment of employees and firm performance (research question one and two) are analyzed across countries. The effects of national culture on Strategic Performance Management are focus of the analyses in chapter 6 (research question three).

5.1.3   Test for discriminant validity on construct level

The operationalization of first-order constructs closes with testing of discriminant validity on construct level. As described in chapter 4.3.3, the Fornell-Larcker criterion is applied. Sufficiently high levels indicate that indicators associated with one latent construct are unrelated to indicators of all other latent constructs. As summarized in Table 15, the square roots of AVEs for all constructs are higher than their respective correlation coefficients. One exception is the construct target setting (square root AVE of 0.78) which has a slightly higher value for the correlation with the performance evaluation construct ($r_{12} = 0.80$). The high correlation between the target setting and

Table 15 – Discriminant validity on the construct level

	1	2	3	4	5	6	7	8	9	10	11
1. TAR	0.78										
2. EVA	0.80	0.83									
3. INC	0.52	0.41	0.77								
4. ALS	0.60	0.56	0.57	0.85							
5. BAL	0.57	0.65	0.51	0.71	0.90						
6. FOR	0.57	0.60	0.55	0.74	0.65	0.83					
7. STA	0.30	0.40	0.30	0.41	0.47	0.47	0.82				
8. PER	-0.02	0.02	0.22	0.07	0.20	0.00	0.27	0.89			
9. COU	-0.06	-0.08	0.26	-0.01	0.03	-0.09	-0.20	0.10	1.00		
10. SIZ	0.34	0.42	0.24	0.23	0.43	0.31	0.18	0.10	-0.03	1.00	
11. ORG	0.27	0.29	0.36	0.33	0.33	0.36	0.07	0.08	0.31	0.26	1.00

Note: Values for square root of AVE are inserted in the table and highlighted in grey shadings; COU = country; SIZ = firm size; ORG = organizational complexity

performance evaluation construct is not surprising. For example, firms that rely heavily on target setting are also more likely to review these targets. Given the small difference I conclude that adequate levels of discriminant validity on the construct level can be expected for all constructs.

The low correlation values between independent and the dependent variable firm performance indicate that Common Method Bias (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003, p.879) is not an issue in this study.

5.2 Operationalization and validation of second-order constructs

After the operationalization of the first-order constructs and the evaluation of the respective measurement models, the next step foresees the operationalization and validation of the second-order construct. The second-order construct use of measures is modeled as a reflective first-order, formative second-order (type II) construct.

This construct is computed in a formative mode for two reasons. Firstly, use of measures is "*conceived as explanatory combinations of indicators (such as [...] 'marketing mix') which are determined by a combination of variables*" (Fornell & Bookstein, 1982, p.292). In particular, it consists of the three first-order constructs target setting, performance evaluation, and incentive setting. Ferreira and Otley (2009, p.267) summarize these three managerial processes as part of a "*coherent framework [...] to facilitate the description of PMSs design and use in practice*". In addition, the researchers state that the existence of all suggested dimensions is ideal for a comprehensive analysis of research in this field (p.267). This indicates that the underlying first-order constructs comprehensively define the second-order construct. An elimination of one of the first-order constructs is in general possible. However, this is likely to change the conventional content of the second-order construct. For example, removing incentive setting shifts the emphasis of the second-order construct towards a target and control focus. As a consequence, the first-order constructs referring to the use of measures do not necessarily need to and do in fact show low correlation, especially with incentive setting ($r_{13} = 0.52$, $r_{32} = 0.41$).

Secondly, the second-order construct use of measures is not the cause of the observed indicators for the three first-order constructs. In contrast, the causality runs from the first-order constructs to the second-order construct. As depicted in Figure 16, all three first-order constructs load positively and significantly on the use of measures construct.

Figure 16 – Operationalization of second-order construct
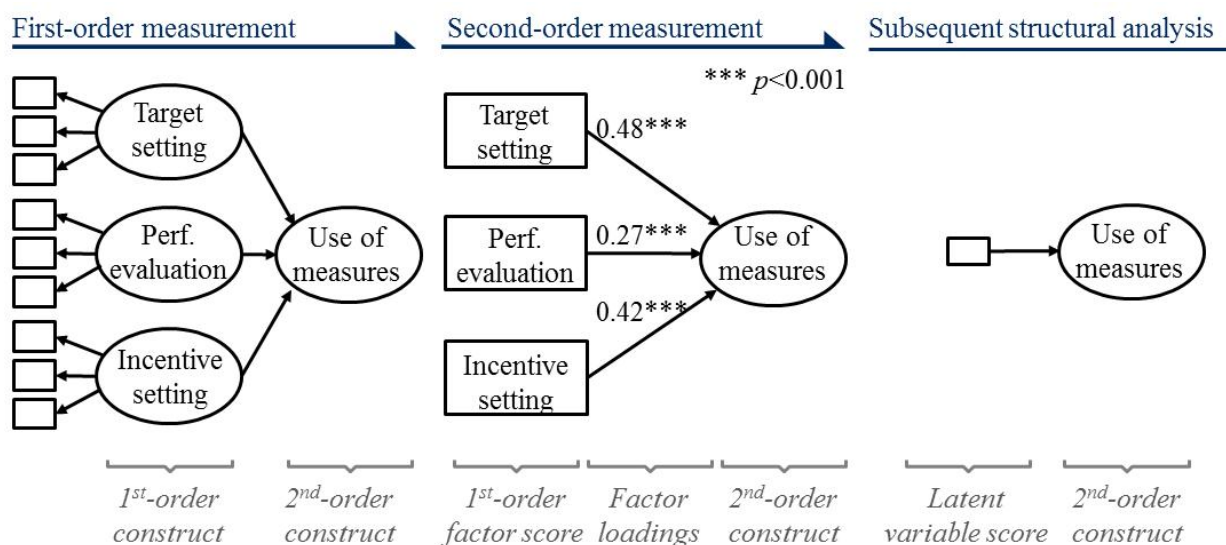
Next, the second-order construct is tested for multicollinearity among its indicators by calculating the VIF. The calculated VIF values were 2.62, 2.57, and 1.20 for target setting, performance evaluation and incentive setting, respectively. These values indicate that multicollinearity is not an issue in this study as the values are below the critical threshold of five.

5.3 Analysis of structural model and hypotheses testing

The evaluation of the measurement models has established confidence in reliability and validity of constructs. Next, the structural models for the baseline and contingency models are analyzed based on which of the developed hypotheses can be confirmed or rejected. Table 16 summarizes the results and reports the three models path coefficients, their respective t-values, the coefficient determination R^2, the effect size f^2, and the Stone-Geisser criterion Q^2 for predictive relevance.[34]

Model 2 represents the baseline model which aims to investigate the general association between the use of measures, the mediator strategic alignment of employees, and the dependent construct firm performance. The use of measures has a statistically significant and positive effect on strategic alignment ($\beta = 0.38$, $p < 0.01$). Strategic alignment of employees in its mediating role is statistically significantly associated with perceived firm performance ($\beta = 0.32$, $p < 0.01$). The combined predictiveness R^2 value of 0.20

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[34] Since the Stone-Geisser criterion Q^2 refers to the structural model, the values for cross-validated redundancy of main dependent constructs are shown. Blindfolding procedure was applied to all endogenous constructs with reflective measurement models with an omission distance of seven.

(0.10) indicate that the model's explanatory power for the mediating construct (endogenous construct) is moderate (limited). The model's predictive validity Q^2 is moderate with values of 0.20 and 0.12, respectively.

Table 16 – PLS path values and significance

	Strategic alignment[1]			Performance		
	1	*2*	*3*	*1*	*2*	*3*
Baseline model						
Measure use		0.38***			-0.04	
Strategic alignment[1]		--			0.32***	
Main effects model						
Measure use			0.32*			-0.04
Strategic alignment[1]						0.31***
Alignment of measures with strategy (ALS)			-0.05			
Breadth (BAL)			0.30***			
Formalization (FOR)			0.19(*)			
Contingency model						
Measure use * ALS			-0.06			
Measure use * BAL			0.38*			
Measure use * FOR			0.11			
Controls						
Orga. Complexity	0.10	-0.01	-0.11			
Firm size	0.16*	0.03	-0.09			
Country	-0.28**	-0.22**	-0.21**	0.12(*)	0.17*	0.10*
R^2	0.01	0.20	0.36	0.11	0.10	0.09
Q^2	0.05	0.20	0.37	0.01	0.12	0.11

Note: 1) Mediating variable strategic alignment of employees; Path coefficients (two-tailed *t*-test): *$p < 0.10$; **$p < 0.05$; ***$p < 0.01$; (*)$p < 0.20$

The use of measures construct has a moderate effect on both strategic alignment ($f^2 = 0.14$) and on firm performance ($f^2 = 0.09$). The use of measures in managerial processes has a positive effect on strategic alignment of employees which in turn affects firm performance. Therefore, hypotheses H_1 and H_2 are confirmed. In addition, strategic alignment of employees positively mediates the relationship between use of measures and firm performance. However, the low values for the structural model's quality criteria

indicate that more variables exist that govern the relationship between the use of measures, strategic alignment of employees, and firm performance.

The contingency model (Model 3) introduces PMS properties as moderators to describe the underlying association between the use of measures and strategic alignment of employees. Again, the main effect of use of measures on strategic alignment of employees is positive and significant (β = 0.32; p < 0.10). In addition, strategic alignment of employees is positively and significantly associated with firm performance (β = 0.31, p < 0.01). The model proves to have moderate predictability for strategic alignment (R^2 = 0.36) and limited predictability for firm performance (R^2 = 0.09). Predictive validity increases compared to Model 2 for strategic alignment to a substantial level (Q^2 = 0.37) and remains moderate for firm performance (Q^2 = 0.11). Lastly, the effect size f^2 for the use of measures on strategic alignment is 0.07, and of strategic alignment on firm performance is 0.09. In sum, the quality criteria indicate that model three including PMS properties is better suited to describe the effects of use of measures on strategic alignment of employees.

In all models the control variable country indicates that strategic alignment of employees is significant lower in Singaporean than in Swiss SMEs (e.g., β = -0.21, p < 0.05 in Model 3).[35] Contrary, the financial performance over the last three years is, yet on a 90% confidence level, slightly higher in Singaporean SMEs (e.g., β = 0.10, p < 0.10 in Model 3).

Of the three interaction effects in Model 3, only the breadth of PMS has a significant effect: with greater breadth of PMS the association between performance measure use and strategic alignment of employees increases (β = 0.38; p < 0.10; f^2 = 0.04). The respective t-value is 1.94 and therefore close to the recommended value for the 95% confidence interval. The marginal effect of this PMS property is depicted in Figure 17.

The solid line represents the computed marginal effect of the breadth of PMS on strategic alignment of employees, i.e.,

$$\frac{\partial STA}{\partial MeasureUse} = 0.3149 + 0.3815 \times \mu \ . \tag{12}$$

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[35]This control variable is modeled as a dummy with Swiss SMEs being the reference group.

Figure 17 – Marginal effect of changes in breadth of PMS on
strategic alignment of employees

Breadth of PMS
(standardized latent variable scores)
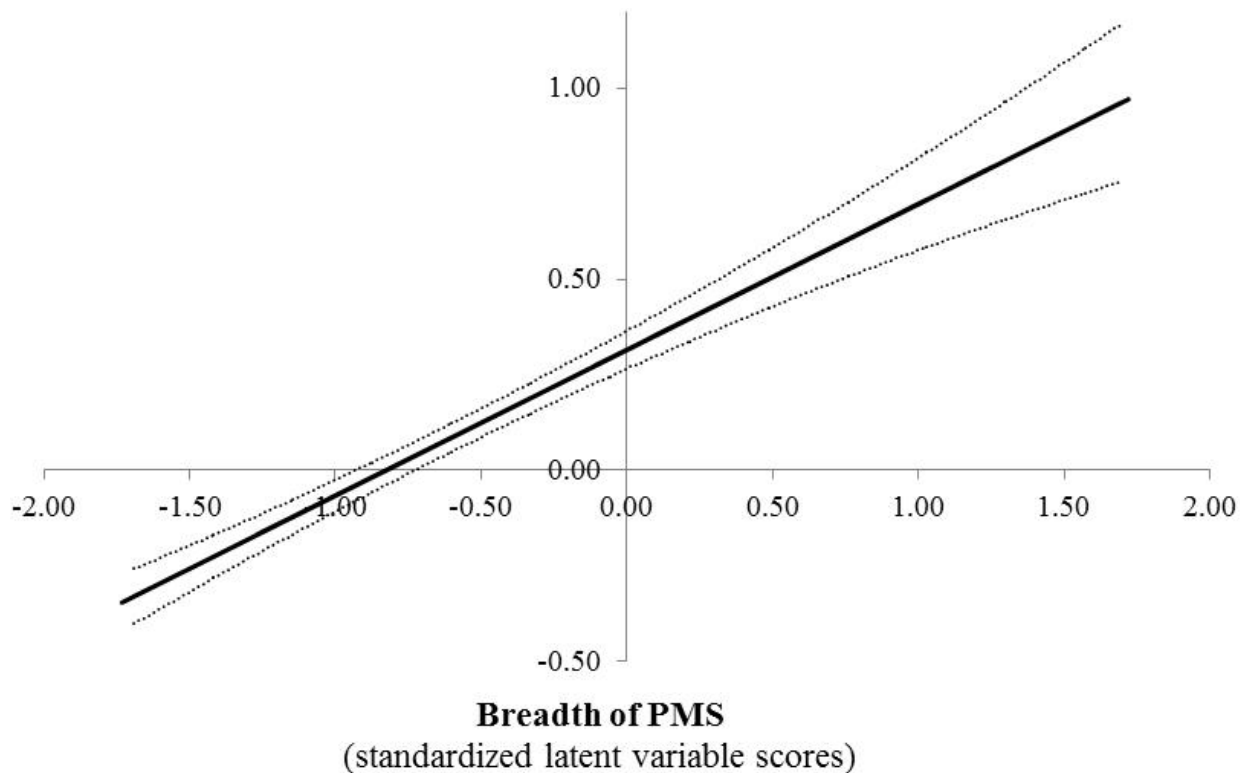
The dotted lines visualize the 90% confidence interval for the combined effect which allows for determining the conditions under which the breadth of PMS has a statistically significant effect on strategic alignment of employees. Once the standardized latent variable score of an observation for the moderating construct breadth of PMS has a value $\mu > -0.75$, the lower bound of the 90% confidence interval is above the zero line. Simplified and from a measurement view, firms tend to benefit from the use of broader PMSs only if their managers at least "*somehow agreed*" (average score on Likert scale 4.69) to their PMSs covering financial and non-financial dimensions (BAL1), firm-internal and external dimensions (BAL2), and represent strategic and operational objectives (BAL3).[36]

The effects of the other constructs describing PMS properties are not statistically significant. The respective *t*-values for the moderating constructs alignment of measures with firm strategy and formalization are 0.46 and 0.99 respectively with weak effects ($f^2_{ALS} = 0.00; f^2_{FOR} = 0.01$).

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[36]This calculation uses the standardized latent variable scores of the construct breadth (i.e., mean of zero and standard deviation of one) and the mean value (4.69) of all observations for the indicators referring to breadth.

To summarize the interaction effects, this field study finds supporting evidence for hypothesis H_5 on a 90% confidence level. The use of broader PMSs positively moderates the underlying association between the use of measures and strategic alignment of employees. Contrary, no supporting evidence could be found for hypotheses H_4 and H_6 that refer to the PMS properties alignment of measures with firm strategy and formalization. Findings for the contingency model (Model 3) are visualized in Figure 18.

Figure 18 – Structural model results for contingency model
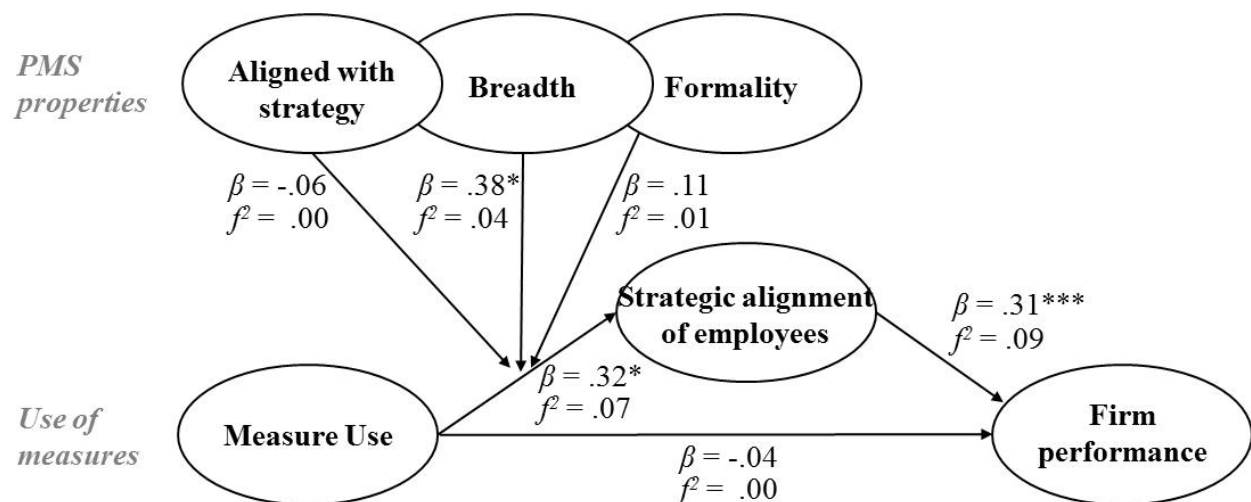
Note: Control variables are not shown to simplify visualization; Path coefficients (two-tailed *t*-test) *$p < 0.10$; ***$p < 0.01$

Most frequently used measures

Managing directors and owner-managers of Singaporean and Swiss SMEs rely mainly on financial measures when they review performance. Amongst the top ten measures focused on are the lagging metrics revenue (74% of Swiss SMEs, 74% of Singaporean SMEs), profit (61%, 59%), liquidity (45%, 19%), profit contribution (40%, 26%) and labor and material cost (44%, 44%) (Figure 19). The use was similar in both countries. Order intake as a leading financial measure was used by only 58% of interviewed Swiss SMEs. Most interviewees mentioned in the qualitative part of the interview that they had transparency on these measures on firm level. Remarkably, many Swiss SMEs are currently trying to gain transparency on product or product line level.

Figure 19 – Comparison of measures used per country

Key measures reviewed by managing directors/owner-managers
Mentioning[1], in percent

Switzerland		Singapore	
Revenue	74	Revenue	74
Profit[2]	61	Profit[2]	59
Order intake	58	Labor & material cost	44
Liquidity	45	Customer satisfaction	33
Labor & material cost	44	Profit contribution	26
Profit contribution	40	Cash flow	26
Cash flow	39	Productivity[3]	26
Productivity[3]	34	On-time delivery	22
Revenue share new products	29	Quality[4]	22
On-time delivery	29	Liquidity	19

Finance ✓	Internal processes ✓	Customer ✗	Learning & growth ✗	Finance ✓	Internal processes ✓	Customer ✓	Learning & growth ✗

Note: 1) Multiple mentioning possible
2) EBIT/EBITDA
3) Machine and employee productivity
4) Quality measures, excluding on-time delivery

Less emphasized is the focus on internal processes in the measurement system. The factors productivity (34%, 26%) and on-time delivery (29%, 22%) are amongst the most commonly reviewed metrics. With regards to productivity, only 6% of Swiss and 4% of Singaporean SMEs focused on value add per employee. Singaporean SMEs focus more often on other quality measures such as scrap rate, mistakes per worker, or costs for mistakes, or customer complaints (22%).

Lastly, several Singaporean SMEs measure explicitly customer satisfaction (33%), whereas this metric is ranked 22nd for Swiss SMEs (13%). Therefore, the measurement systems of Singaporean SMEs tend to be, in average, broader because they often cover besides a financial and internal process also a customer perspective.

In sum, SME managers from both countries focus mainly on lagging financial measures and few operational metrics such as on-time delivery. The overall level of use of measures appears to be higher in Swiss SMEs, whereas Singaporean SMEs tend to

measure customer satisfaction more often. No other dimensions such as employee learning and growth are found amongst the top ten measures reviewed.

Critical firm size

To address the third hypothesis and to identify a critical firm size above which PMS properties effectively increase strategic alignment of employees, a three-step analysis is conducted. First, a multiple regression analysis helps to identify the respective size cluster. Then, an iterative difference in differences analysis is used to further narrow the firm size cluster. Lastly, the PLS-algorithm is run separately for the two subsamples with firm size below and above the identified critical size.

Five dummy variables for firm size clusters were used for the regression analysis:

$$STA_i = C + D_{1i}\beta_1 + \cdots + D_{5i}\beta_5 + UseMeasure_i \cdot \beta_6 + BAL_i \cdot \beta_7 + \varepsilon_i \, , \qquad (12)$$

with i referring to each observation, C being the intercept, and β_i the regression coefficients. *STA* and *BAL* refer to the latent variable scores of the first-order constructs as described above. Of the three PMS properties constructs, only breadth (*BAL*) was considered in this analyses for two reasons: (1) reflecting the degree of freedom given the relatively small sample size and adding the five dummy variables, and (2) only this construct showed significant values in the PLS analysis. *UseMeasure* refers to the latent variable scores of the second-order construct use of measures. The dummies D_{1i}, D_{2i}, …, D_{5i} are included in the regression analysis and refer to the firm sizes 10-29, 30-49, 50-69, 70-89, and 90-250, respectively.[37]

A multiple regression analysis is run to predict strategic alignment of employees from firm size dummies, the use of measures, and the breadth of measurement system. The assumptions of linearity, independence of errors, homoscedasticity, unusual points, and normality of residuals are met. These variables statistically significantly predict strategic alignment of employees, $F(6, 84) = 4.87$, $p < 0.0005$, adj. $R^2 = 0.21$. Variables D_1, D_4 and BAL added statistically significantly to the prediction, $p < 0.05$ ($p < 0.20$ for D_1). D_5 was chosen as reference group and therefore removed. Regression coefficients β and standard errors can be found in Table 17. D_2 and D_3 show the lowest standardized regression coefficients which indicate low association with strategic alignment of employees. However, the significance of both coefficients is not within recommended confidence intervals.

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[37]The sizes of the sub-samples were $n_{D1} = 22$, $n_{D2} = 15$, $n_{D3} = 11$, $n_{D4} = 8$, and $n_{D5} = 34$.

Table 17 – Summary of multiple regression analysis

Variable	*B*	s.e.	*β*
Intercept	-.254	.159	
D_1	.395	.265	.170$^{(*)}$
D_2	.265	.282	.099
D_3	.288	.318	.094
D_4	.881	.358	.251*
Measure use	.067	.128	.067
Breadth (BAL)	.447	.128	.447*

Note: * $p < .05$; $^{(*)}p < 0.20$; *B* = unstandardized regression coefficient; s.e. = standard error of the coefficient; *β* = standardized coefficient

The subsequent difference in differences analysis focuses on the firm size clusters D_2 and D_3. To address the coefficients' insignificance, an iterative approach is chosen to examine a broad range of firm sizes. Table 18 provides an example for the calculation of the difference in differences value of the extent to which employees are strategically aligned for a firm size of 50 employees.

Table 18 – Difference in differences analysis for a critical firm size of 50 employees

Use of measures, in median latent variable score	Strategic alignment per firm size		Difference
	≤ 49 employees	≥ 50 employees	
≥ 0	0.43	0.76	0.33
< 0	-0.30	-0.77	-0.47
		Difference in differences	**0.80**

The median latent variable scores for strategic alignment with employees are calculated. Median values are deemed appropriate given the small size of the four subsamples. The standardized latent variable scores for strategic alignment of employees and use of measures are extracted from the PLS-algorithm.

Observations are classified into four segments according to the following two criteria: (1) standardized latent variable score for the use of measures positive or negative, and (2) number of employees higher or lower than the critical firm size under study. Next, the median values of standardized latent variable scores for strategic alignment of employees for each segment are computed. Table 18 shows that firms that use measures

(standardized latent variable score ≥ 0) show higher strategic alignment of employees: the median of latent variable scores are with values of 0.43 (firms with less than 50 employees) and 0.76 (firms with at least 50 employees) higher than the two negative median values for firms that rely less on measures (standardized latent variable score < 0). Next, the difference in differences value is calculated. This value takes the differences resulting from the two classifying dimensions into account: (1) the difference of the median values of strategic alignment of employees between firms that rely more than average on measures and those that do not, and (2) of the median values of the two firm size clusters.

This procedure is conducted nine times, each in intervals of five employees. The resulting difference in differences values are plotted in Figure 20.

Figure 20 – Identification of critical firm size for the use of measures

| Sample[1] | 30 | 31 | 34 | 37 | 38 | 41 | 43 | 47 | 52 |
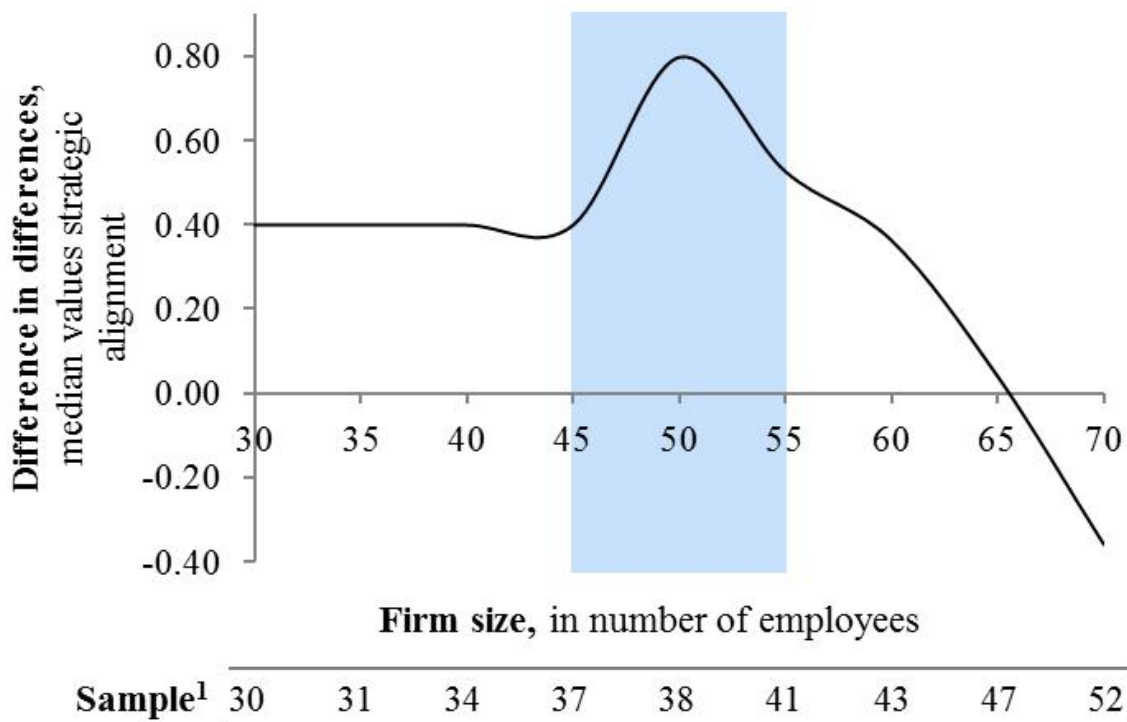
1) Number of firms equal or smaller than the critical firm size under study

In general, SMEs that use measures achieve, in median, higher strategic alignment of their employees. When measures are used less, small firms tend to achieve moderate strategic alignment levels. This effect turns at a firm size of 45-55 when the negative effect of absence of measures on strategic alignment of employees becomes stronger. In general, the median values for strategic alignment of employees decrease with increasing

firm size.[38] As a result, the difference in differences value decreases beyond this critical firm size and finally turns negative. The described effect is robust for an alternative measurement using average values.

As third step, the PLS-algorithm is computed for the two subsamples to triangulate the findings above: firms above (medium-sized firms) and below (small firms) the identified critical firm size of 50 employees. The results for the baseline model which describes the effects of the use of measures in SMEs, are depicted in Table 19.

Table 19 – Effect of use of measures above/below critical firm size

	Less than 50 employees (n = 37)		At least 50 employees (n = 53)	
Effect on	*STA*	*PER*	*STA*	*PER*
Baseline model				
Measure use	0.43*	-0.21	0.34**	0.32**
Strategic alignment	--	-0.19	--	-0.00
Controls				
Orga. Complexity	0.01	--	-0.16$^{(*)}$	--
Firm size	0.05	--	0.11	--
Country	-0.26	-0.63***	-0.02	-0.53***

Note: Path coefficients (two-tailed *t*-test): *$p < 0.10$; **$p < 0.05$; ***$p < 0.01$;
$^{(*)}p < 0.20$

Hypothesis H_3 describes the effect of the use of measures depending on firm size. Despite the small subsample size and in line with the findings in the difference in differences analysis, the use of measures is positively associated with strategic alignment of employees for small ($\beta = 0.43$, $p < 0.10$) and medium-sized firms ($\beta = 0.34$, $p < 0.05$). In medium-sized companies the use of measures also has a direct positive effect on firm performance ($\beta = 0.32$, $p < 0.05$). Please note that the interpretability of the PLS

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[38]The graph reflects also a mathematical trend effect. With an increasing firm size, the median values for the segments below this threshold contain more and more larger firms. As such, the effects of small and medium-sized firms are increasingly mixed. For example, the calculation for a firm size of 70 employees results in almost equally high strategic alignment values for firms that use measures and that are larger and smaller than 70 employees. This is because the calculation of the subsample smaller than this firm size contains also values for firms that have already, for example, more than 50 employees.

algorithm values might be limited given the small sizes of the subsamples for small (n = 37) and medium-sized firms (n = 53).

No statistically significant effects are found for the two subsamples, i.e., for smaller firms with less than 50 employees ($\beta = 0.01$, $p = n.s.$) and for medium-sized firms with at least 50 employees ($\beta = 0.00$, $p = n.s.$). When analyzing the contingency model for the two subsamples, the effect of the PMS property alignment of measures with strategy on strategic alignment of employees is for small companies positive on a low significance level ($\beta = 0.45$, $p < 0.20$). Notably, formalization reduces strategic alignment of employees for small firms but on an 80% confidence level only ($\beta = -0.26$, $p < 0.20$). This effect turns for medium-sized firms which show an increase of strategic alignment of employees with an increase of formalization ($\beta = 0.28$, $p < 0.20$).

To conclude, hypothesis H_3 is confirmed given the positive coefficient values in both segments, the increase of statistical significance for medium-sized firms, and the results of the difference in differences analysis. H_1, H_2, and H_5 are confirmed as well, as described above. This study's findings are summarized in Table 20.

Table 20 – Results of hypotheses testing

No.		Hypotheses	Result
Baseline model			
1	+	The greater the extent to which a company uses measures in its managerial processes the higher the strategic alignment of employees.	✓
2	+	The effect of the use of measures on firm performance is positively mediated by strategic alignment of employees.	✓
3	*np*	For small firms, the effect of the use of measures on strategic alignment of employees is minimal; as firm size increases beyond a critical level, the effect of the use of measures turns increasingly significant.	✓
Contingency model			
		The association between performance measure use and strategic alignment of employees…	
4	+	… increases with greater alignment of performance measures with strategy.	✗
5	+	… increases the broader the performance measurement system.	✓
6	+	… increases with greater formalization.	✗

Note: No supporting evidence is found for the subsamples of small and medium-sized enterprises

It provides an overview of the research hypotheses and empirical results.

5.4 Robustness of results

I conduct several sensitivity analyses to assess the robustness of results. Three variations of the construct use of measures allow for analyzing the sensitivity of findings: a second-order construct that examines the effect of excluding a single type of managerial process. As shown in Table 21, my findings for the effect on strategic alignment of employees are robust to these alternative formations of the second-order construct. The effects of the use of measures on strategic alignment is positive and on a 99% confidence level in the baseline model, and on a 90% (80%) level for the modified target setting construct (modified performance evaluation and incentive setting constructs) in the contingency model. The effect of the moderator breadth of PMS was positive for all three modifications on a 90% (80%) confidence level for the constructs without target setting and incentive setting (construct without performance evaluation).

This underlines the importance of a comprehensive measurement of the construct use of measures as suggested in literature (Ferreira & Otley, 2009). These findings are in line with the results of the main effects. The direct effect of breadth of measurement system on strategic alignment was positive and significant in all three analyses. The formalization construct has a direct and positive effect at a confidence level of 90% for the modified target setting construct ($\beta = 0.25$, $p < 0.20$).

Table 21 – Sensitivity analyses using alternative compositions for use of measures

	Construct without target setting		Construct without performance evaluation		Construct without incentive setting	
Model	**2**	**3**	**2**	**3**	**2**	**3**
Baseline model						
Measure use	0.36***		0.30***		0.31***	
Contingency model						
Measure use		0.23*		0.20[(*)]		0.25[(*)]
Measure use x ALS		-0.08		0.03		0.02
Measure use x BAL		0.24*		0.22[(*)]		0.34*
Measure use x FOR		0.01		-0.05		-0.16

Note: Path coefficients (two-tailed *t*-test) *$p < 0.10$; **$p < 0.05$; ***$p < 0.01$; [(*)]$p < 0.20$; Simplified: shows only values for the effect on strategic alignment of employees, and no coefficients for main effects or control variables

With regards to the effects on firm performance, all modified constructs for use of measures show no significant direct effect in both the baseline and contingency models. Similarly, the effects of strategic alignment of employees on firm performance do not meet required confidence levels.

In addition, I assess the sensitivity of results to different sets of measurement instruments because this may have an influence on results. For this, I run the PLS analyses with each first-order construct being measured only by the respective two indicators with the highest loadings. Lastly, I assess the effects of removing high and low measurement scores ($\pm 5^{th}$ and $\pm 10^{th}$ percentile of latent variable scores of use of measure construct). As depicted in Table 22, the findings in the baseline model are robust to these alternative specifications, but the ones in the contingency model are not, i.e., are not significant. The findings for the main effect of breadth of measurement system are consistent with previous results. Results are positive and significant ($p < 0.05$) across all modifications. The reduced set of instruments results in positive direct effects of alignment of measures with firm strategy ($\beta = 0.20$, $p < 0.20$) and degree of formalization ($\beta = 0.21$, $p < 0.20$), yet on low confidence levels.

Table 22 – Sensitivity analyses for the effects of changes in use of measures on strategic alignment of employees

	Reduced set of instruments		$\pm 5^{th}$ percentile removed		$\pm 10^{th}$ percentile removed	
Model	*2*	*3*	*2*	*3*	*2*	*3*
Baseline model						
Measure use	0.33***		0.54***		0.40***	
Contingency model						
Measure use		-0.01		0.14		0.13
Measure use x ALS		0.00		-0.13		-0.09
Measure use x BAL		0.12		0.10		0.09
Measure use x FOR		0.04		-0.04		0.11

Note: Path coefficients (two-tailed *t*-test) *$p < 0.10$; **$p < 0.05$; ***$p < 0.01$;
Simplified: shows only values for the effect on strategic alignment of employees, and no coefficients for main effects or control variables

With regards to the effects on firm performance, the findings for the direct effect of use of measures and strategic alignment on firm performance are consistent with previous

results of this study, i.e., are not significant and positive and on a 95% confidence interval, respectively. The only exception is the reduced set of instruments case, where the effect of strategic alignment on firm performance is not significant.

5.5   Addressing endogeneity

The dependent variable in equation 1 (firm performance) could be correlated with the independent variable (use of measures) which then drives strategic alignment of employees. This is because organizations that show lower organizational performance are likely to focus their resources on directly value adding activities such as business development, sales, and production. For example, an SME that struggles to match customer requirements with regards to on-time delivery and flexibility is likely to focus its resources primarily on the production process, e.g., by dedicating more employees to the production process. Therefore, SMEs that show lower performance are likely to have fewer resources available for non-directly value adding activities such gathering, processing, and analyzing measures.

Similarly, the dependent variable in equation 2 (firm performance) could be correlated with the interaction effects (PMS properties). This is because organizations that show high performance have more financial resources available to invest in systems that support increasing strategic alignment of employees. In the context of Strategic Performance Management, such a system is the IT system that serves as an enabler to generate a broad set of measures without high efforts. This is important because SMEs have scarce financial resources and this lack of resources often hinders them in implementing and maintaining broad measurement systems (chapter 2.3).

To test for endogeneity two approaches are applied: Firstly, I exclude ten SMEs for which the interviewees stated that they had established a comprehensive measurement system such as the Balanced Scorecard, or a key performance indicator cockpit with more than 20 measures. For the second approach, 23 SMEs are excluded that had implemented a company-wide IT system such as ERP, SAP, or InfoZoom. Enterprises that were about to or planned to implement such a system are not excluded in the revised sample because the reduction of efforts to gather and analyze data has not yet come effective.

Next, I run the PLS algorithm on both revised subsamples, i.e., one sample that consists of SMEs that had no comprehensive measurement system and the other one with enterprises that gathered and analyzed data predominantly manually when using measures in their managerial processes. As depicted in Table 23, the effect between the

use of measures and strategic alignment of employees remains positive in the baseline model (Model 2) for both subsamples (sample 1: $\beta = 0.29$, $p < 0.05$; sample 2: $\beta = 0.25$, $p < 0.05$). This indicates that the use of measures is positively associated with strategic alignment of employees even in firms with less comprehensive measurement systems or in the absence of an enabling IT system. In line with findings for the total sample, the direct effects of use of measures on firm performance are not significant for both samples. Contrary, the effects of strategic alignment of employees on firm performance are insignificant.

Table 23 – Endogeneity tests

	Sample 1 (n = 80) excl. firms with comprehensive PMS systems				Sample 2 (n = 57) excl. firms with IT system			
	Strategic alignment		**Performance**		**Strategic alignment**		**Performance**	
Model	*2*	*3*	*2*	*3*	*2*	*3*	*2*	*3*
Baseline model								
Measure use	0.29**		0.05		0.25**		0.08	
Strategic alignment			-0.08				0.05	
Contingency model								
Measure use		-0.00		0.01		-0.23$^{(*)}$		0.09
Strategic alignment				-0.10				0.03
Measure use * ALS		0.04				0.06		
Measure use * BAL		0.22$^{(*)}$				0.06		
Measure use * FOR		0.04				0.06		

Note: Path coefficients (two-tailed *t*-test) *$p < 0.10$; **$p < 0.05$; ***$p < 0.01$; $^{(*)}p < 0.20$; Simplified: shows values only for the effect on strategic alignment of employees, and no coefficients for control variables

Results of the contingency model differ slightly. The results for the first subsample that excludes SMEs with comprehensive measurement systems show on a very low confidence interval that breadth of measurement system positively moderates the underlying association between use of measures with strategic alignment of employees ($\beta_1 = 0.22$, $p_1 < 0.20$). This indicates that broader measurement systems tend to have a positive interaction effect on strategic alignment of employees even when no

comprehensive measurement systems are adopted. This is consistent with the study's overall finding that the effect of breadth of measurement system is on a lower confidence level only and conditional on the value of the underlying predicting variable (chapter 5.2).

For the second sample, the main effects in the contingency model (Model 3) of breadth of measurement system ($\beta = 0.27$, $p < 0.05$), alignment of measures with strategy ($\beta = 0.30$, $p < 0.10$), and formalization ($\beta = 0.27$, $p < 0.10$) are positive and significant. The interaction terms for these constructs then turn insignificant. Therefore, no conclusion can be drawn whether broader measurement systems (and the other two PMS properties) increase strategic alignment of employees when analyzing only the subsample of firms that have no supporting IT system.

In sum, the effects of use of measures on strategic alignment of employees are robust to changes in the sample. Findings for breadth of measurement system for the subsample that excludes firms that had enough resources to implement a comprehensive measurement system are consistent with this study's overall findings. No conclusion can be drawn for the second subsample that focused on SMEs without IT systems.

To conclude, an endogeneity problem is less likely given the robust effect of use of measures on strategic alignment of employees in firms that had no resources to adopt comprehensive PMS (sample 1) or an IT system (sample 2). After the statistical assessment of the structural model and hypotheses testing, the next chapter focuses on the discussion of the results including a comparison with existing theory.

5.6 Discussion of results

To this point, the interdisciplinary literature on performance management in SMEs has transferred the findings from research in large firms, whilst at the same time claiming that fundamental differences between SMEs and large firms exist. The study at hand contributes to the SME literature by exploring the effects of the use measures and PMS design in SMEs. I suggest and find that the use of measures has important second-order effects on firm performance by influencing how effectively employees can be strategically aligned. The study results have several implications. Firstly, I elaborate on supporting evidence for the use of measures in SMEs. Secondly, this study contributes with insights on the design of PMSs in SMEs. Thirdly, insights on how the use of measures and PMS design affect firm performance are offered.

The use of measures in SMEs

The study results indicate that the use of measures in SMEs leads to a higher strategic alignment of employees. This is in line with findings in research focusing on large firms (e.g., Chenhall, 2005; Grafton *et al.*, 2010; Kolehmainen, 2010). It is also consistent with the argument that the use of measures in managerial processes increases employees' awareness of firm strategy and understanding of cause-effect chains between an individual's work and overall firm goals. Results for the use of measures are also in line with Artz *et al.*'s (2012) study, in which a structurally similar model was applied to analyze the effect of the use of measures on functional decision influence in the context of large firms.

The results are strong and robust for changes in the second-order construct use of measures and to changes in the measurement instrument. That said, the robustness of results does not imply that further research may adopt a measurement approach that captures only single dimensions of Ferreira and Otley's (2009) comprehensive Performance Management framework. Based on their framework, this study shows that target setting, performance evaluation, and incentive setting collectively and formatively build the second-order construct use of measures. The weights of all three first-order constructs are significant and strong. As a consequence, this study contributes to further research by providing an operationalization of the theoretical framework.

SMEs of both countries tend to focus primarily on the lagging financial measures revenue, profit, and labor and material cost as well as on selected operational metrics such as on-time delivery (see Figure 19). Few SMEs focus on leading financial measures such as order intake or customer visits which would allow them to react earlier to changes in demand. These findings are in line with previous research which has identified on-time delivery, production costs, and budget vs. costs as most important metrics in SMEs (Sousa *et al.*, 2005; Sousa *et al.*, 2006). Next, Singaporean SMEs tend to measure customer satisfaction more often. No other dimensions such as employee learning and growth are found for firms in both countries amongst the top ten measures reviewed. The analysis of key measures focused on indicates a higher level of use of measures in Swiss SMEs.

At a deeper level, this study finds a critical firm size of 45-55 employees for the use of measures. Regardless of firm size, the strategic alignment of employees is positively associated with the use of measures. However, the significance of results for firms with less employees is lower than the one for firms beyond this critical firm size. This result

supports the idea that in general the use of measures increases transparency on current developments inside and outside the firm.

These findings are important because practitioners commonly are concerned that the use of measures is not only unnecessary in SMEs but even harmful to success factors such as innovativeness and flexibility. This is because SMEs tend to have flexible processes (Ghobadian & Gallear, 1997) which may be confined by the use of measures. On the contrary, this study finds supporting evidence that the use of measures in managerial processes is beneficial for the strategic alignment of employees, and ultimately firm performance.

The role of PMS properties

As predicted, and consistent with prior research in large firms, results show a positive moderating effect of the breadth of PMS. The strength of the relationship between measure use and strategic alignment of employee depends on the breadth of PMS. The design element breadth is particularly important in the context of SMEs given the scarcity of resources (Doole *et al.*, 2006) and associated efforts to establish and maintain *broader* measurement systems. As predicted, the breadth of PMS has no direct effect on firm performance but is a moderator of the effect of use of measures on strategic alignment of employees. This finding supports the view within resource-based theory, proponents of which argue that measurement systems constitute a resource which is difficult to imitate and that enhances organizational outcomes (e.g., Grafton *et al.*, 2010). This broader focus provides information on a firm's environment, resulting in more information available to decision-makers which in turn can increase the strategic alignment of employees. For example, a firm with a strong strategic emphasis on technological leadership aims to incentivize its employees to innovate both on product- and process-levels as well as on incremental and disruptive improvements. The use of relevant measures that represent not only the financial perspective but also quality- and efficiency-related outcomes of innovation are likely to increase awareness of the importance of innovation within this firm.

The reference study mentioned above which focused on the properties of reliability and functional specificity in the context of large firms (Artz *et al.*, 2012), suggests that the effectiveness of use of measures depends on measures' characteristics. In line with this view, the study at hand supports in general the hypothesized argument that a broader PMS is important to increase focus on more than just the financial perspective. The finding concerning breadth of a PMS is particularly important for academics as it

provides justification for a large stream of research that promotes and designs broad measurement systems in the context of SMEs (e.g., Fernandes *et al.*, 2006; Garengo *et al.*, 2005). However, as indicated by the low effect size f^2 and shown in the marginal effect analysis, the results need to be interpreted carefully. Similarly, the results are sensitive to changes in the measure use construct and in the measurement instrument. As such, this study's findings suggesting broader measurement systems in SMEs should be considered as first supporting evidence on a moderate confidence level.

That said, the findings do not necessarily imply that an SME requires an in-depth measurement system. They indicate that a *broader* set of measures positively contributes to strategic alignment of employees. The use of over-dimensioned PMSs may ultimately lead to an unnecessarily high supply with information. This is particularly challenging when gathering and analyzing respective measures is not supported by respective IT capabilities which tend to be low in SMEs (Bititci *et al.*, 2002). In this case, the negative effects of resources required to maintain the PMS may outweigh the associated benefits and result, for example, in lower flexibility and innovativeness.

Future research needs to pay particular attention to the design of constructs. As seen in the sensitivity analysis for changes in the construct measure use, the effects remain positive, but do not match recommended significance standards. This suggests that researchers in the field of performance management in SMEs need to carefully design their measurement instruments and draw from previous research that entirely covers the constructs under study. In conclusion, the use of measure construct needs to be comprehensively designed as the omission of one of its formative indicators affects the significance levels of the moderator and even the direction of the interaction effect as shown in the sensitivity analyses (Table 22).

No empirical support is found for the other two commonly recommended properties of a PMS: alignment of measures with firm strategy and formalization. Results are insignificant in the contingency model as well as in all sensitivity analyses. Based on the study's findings, one could theoretically infer that the alignment of measures is a prerequisite for the choice of relevant measures. Because this study finds the use of measures to be beneficial in SMEs, it appears intuitive that an SME needs for an effective measurement to tie measures chosen to firm strategy.

No contribution is made to the opposing views in literature on the required level of formalization of PMS in SMEs (see section 3.3.3). However, high reliability and validity values for all constructs indicate that the design and measurement approach was conducted properly. Therefore, formalization remains a field of interest for further

research. On the one side the need for formalization might be lower because "*things (such as delays, customer complaints, breakdowns) in SMEs [could be] more visible, people get to know and hear about these without the need for a formalized PMS*" (Garengo *et al.*, 2005, p.41). On the other side, supporters of formalization in SMEs emphasize its positive effect on building organizational capabilities (Terziovski, 2010) and a greater need with increasing firm size (Mazzarol, Rebound, & Volery, 2010). In sum, no recommendations can be given in favor or against this PMS property based on this field study.

How the use of measures and the design of PMSs affect firm performance

Consistent with this study's expectations, I find the impact of the use of measures to be mediated by the strategic alignment of employees. This supports the view in literature that a PMS "*enables a company to align its management processes and focuses the entire organization on implementing long-term strategy*" (Kaplan & Norton, 2007, p.161). In addition, the results of the baseline model show that the use of measures is not a direct predictor of firm performance. Both the effect of the use of measures on strategic alignment of employees and the subsequent effect of the strategic alignment of employees on firm performance are positive and significant. This finding supports the idea that influencing people behavior ultimately affects firm performance. Given their scarce human resources (Doole *et al.*, 2006) it is therefore important that SMEs align employees to achieve strategic goals.

That said, PMSs themselves have no direct effect on firm performance. They enable an SME's management team to increase transparency on business activities and facilitate communication to employees. This allows for improved strategic decision-making and for better aligning employees to achieve strategic goals.

Overall, this study finds in line with previous research (e.g., Bloom *et al.*, 2012) strong variation in management practices across manufacturing organizations within and across the two countries which is mirrored by differences in financial performance. Unlike previous studies on management practices[39], this study does not find a direct effect on financial performance. However, the effect for measure use on firm performance is indirect, mediated by strategic alignment of employees.

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[39]For example, Bloom *et al.* (2012) find a direct effect of management practice on sales ($\beta = 0.23$, $p < 0.01$) and ($\beta = 1.95$, $p < 0.01$) on profitability.

Results differ slightly for firms below and above the critical firm size. For firms above the critical firm size the effect of use of measures on the mediator strategic alignment of employees is more significant. In addition, an additional direct effect of the use of measures on firm performance is found. A plausible explanation for this finding is that with an increase in firm size it is more and more difficult to align employees as the distance between leaders and employees as well as strategic and organizational complexity increase. For example, an SME with 200 employees and multiple production sites across countries has a higher strategic complexity given its sub-strategies for each production site. At the same time, the organizational complexity is higher than in an SME with less employees operating only in Switzerland. As a result, aligning employees becomes more challenging and the use of measures supports in management the company effectively.

Key informant reliability

Key informant reliability could be a critical issue in this research. Assessments by owner-managers and managing directors might be subject to biased perceptions and overconfidence. To account for this potential bias, an additional person in ten SMEs of my sample filled in the questionnaire. This equals 11% of the total sample. Key informants in these secondary interviews were employees that had a similar good overview of the managerial system, e.g., production managers or other board members. The second assessment served to validate the responses of the managing directors and owner-managers. Both informants were asked not to share their answers prior to completing both interviews.

The consistency of responses between both informant groups is assessed by computing the interrater agreement value (r_{WG}) for each observation pair.[40] The lowest r_{WG} value is 0.83. This suggests that only up to 17% of the observed variance among respondents can be credited to random answering. Therefore, all values are well above the recommended

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[40] The calculation bases on the formula for more than one parallel measurement item, i.e.,

$$r_{WG(J)} = \frac{J\left(1-\frac{\bar{S}_j^2}{\sigma_E^2}\right)}{J\left(1-\frac{\bar{S}_j^2}{\sigma_E^2}\right)+\frac{\bar{S}_j^2}{\sigma_E^2}},$$ where J is the number of items measured, $\bar{S}_j^2$ is the mean of the response

variances across items, and σ_E^2 refers to the variance obtained from a theoretical null distribution (see Liu *et al.*, 2011, pp.10-11). The latter represents a random response pattern and is operationalized by using the uniform null approach (LeBreton & Senter, 2008, pp.829-830).

threshold of 0.70 (Liu, Amini, Babakus, & Stafford, 2011, p.10). To conclude, this consistency test establishes confidence in the chosen measurement approach.

With these findings in mind, the following chapter addresses the third and final research question. It examines the effects of national culture on Strategic Performance Management and provides detailed descriptive characteristics for SMEs in Switzerland and Singapore.

6 Strategic Performance Management and national culture

In this chapter the third research question is addressed. Propositions are developed by analyzing differences in national culture with differences in the use of measures and design of PMS. [41] To develop meaningful propositions, a two-step approach is applied. At first, differences in cultural dimensions between both countries are identified. Based on existing national culture theory, I theoretically *predict* how these differences affect both the use of measures and the design of measurement systems. In the second step, the predicted effects are compared with the *actual*, statistically significant differences of the use of measures and PMS design in Swiss and Singaporean SMEs. Section 6.3 then provides the interested reader with further details on Strategic Performance Management in SMEs.

6.1 Cultural differences between Swiss and Singaporean societies

Strategic Performance Management is likely to change the way an organization's employees interact (Bisbe & Otley, 2004; Henri, 2006a). In turn, cultural values affect managers' and employees' perceptions about PMSs (de Waal, 2006, p.63). This builds on the belief that national culture influences organizational cultures and people values (Tsang, 2007, p.274). National culture can be "*broadly defined as values, beliefs, norms, and behavioral patterns of a national group*" (Leung *et al.*, 2005, p.357). More specifically, national culture is "*the collective programming of the mind that distinguishes one group or category of people from others*" (Hofstede & Hofstede, 2005, p.4). Culture is important because it leads to different use of similar performance information by an organization's individuals and therefore affects Strategic Performance Management (Merchant & van der Stede, 2007, pp.729-730). As a consequence, management practices need to be adapted to fit cultural values (Mendonca & Kanungo, 1996, p.68).

House, Hanges, Javidan, Dorfman, and Gupta (2004) present in their widely-cited *GLOBE* study an assessment of cultural characteristics for 62 societies. According to

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[41]In this chapter, propositions rather than hypotheses are developed. The reason for this is that variance in observations exists only for the dependent variables, i.e., the observed Strategic Performance Management data. Contrary, the independent variables capturing the cultural dimensions draw on the GLOBE study, are static, and therefore identical for each SME within one country. This could be relaxed by a larger-scale, multi-country research design (Harrigan, 1983) which however is beyond the scope of this study.

them, societies in Singapore[42] and Switzerland show major differences in national culture with regards to four dimensions:[43] (1) collectivism, (2) assertiveness, (3) uncertainty avoidance, and (4) power distance (Figure 21).

This study focuses primarily on differences in societal values. The underlying assumption for this is that both the use of measures and the design of PMSs are affected by the beliefs of people on what behavior is desirable. Notably, whereas these major differences refer to what each society values, the differences in actual practices are much lower.

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[42]The Singaporean society consists of many sub-cultures but its values and practices are predominantly shaped by Han-Chinese, i.e., people with an ethnic Chinese background. This group accounts for 70% of the overall population. Han-Chinese societies have three underlying value systems that affect their social values and practices: Confucianism, *Guānxi,* and *Miànzi.*

(1) Confucianism is a complex humanistic philosophy which focuses on harmony in human relations and social structure. According to Confucius, harmony requires a set of defined social roles, relationships, and mutual obligations. Confucianism emphasizes the need for showing high respect in primary and hierarchical relations (Wang, Waldman, & Zhang, 2005).

(2) Confucianism has fostered thinking in relationships and networks of relationships (Langenberg, 2007, p.27). The Chinese term *guānxi* therefore refers to more than just relationships. Moreover, it is all-encompassing relationships which include trust, connections, as well as formal and informal social obligations (Melvin, 2007, p.153). The importance of *guānxi* is particularly evident in business when firms reach out to prospective customers, and for safeguarding existing relationships.   .

(3) Protection of *miànzi* (concept of face) is a typical value of Confucianism and central to managing interactions. It refers to "*the recognition by others of one's social standing and position*" (Lockett, 1988, p.488). It is important for interpersonal relationships because people need to mutually show respect to and protect each other's dignity and prestige in relationships (Buckley, Clegg, & Tan, 2006, p.276). Activities that incur loosing face are more important to Han-Chinese than Western people. These activities are felt more deeply and are more likely to destroy trust and to harm relationships.

[43]The selection criteria was the relative difference between the scores for society values of Singaporean and Swiss societies with a difference of values of at least 15%. A serenity check with the assessment of cultural characteristics of Hofstede yields very similar results (see http://geert-hofstede.com/countries.html).

Figure 21 – Cultural characteristics of Singaporean and Swiss societies

Singapore vs. Swiss[1] national culture characteristics
Likert scale 1-7; higher score indicates greater dominance of characteristic

Singapore | % Relative Δ compared to Singapore score ≥15% differences
Switzerland

Society values

	Singapore	Switzerland	%
Collectivism	5.6	4.0	-30
Assertiveness	4.4	3.2	-27
Uncertainty avoidance	4.2	3.2	-25
Power distance	3.0	2.4	-20
Future Orientation	5.5	4.8	-13
Gender egalitarism	4.5	4.9	9
Humane orientation	5.8	5.5	-4
Performance Orientation[2]	5.7	5.8	2

Society practices

	Singapore	Switzerland	%
Collectivism	4.9	4.1	-17
Assertiveness	4.2	4.5	8
Uncertainty avoidance	5.3	5.4	1
Power distance	5.0	4.9	-2
Future Orientation	5.1	4.7	-7
Gender egalitarism	3.7	3.0	-20
Humane orientation	3.5	3.6	3
Performance Orientation	4.9	4.9	1

1) non-French speaking

2) Note that this dimension has not received much attention in literature.[44]

Source: Data from House, Hanges, Javidan, Dorfman, and Gupta (2004)

Collectivism vs. individualism

Individualism "*implies a loosely knit social framework in which people are supposed to take care of themselves and their immediate families only, while collectivism is characterized by a tight social framework in which people distinguish between in-groups and out-groups; they expect their in-groups (relatives, clan, organizations) to look after them, and in exchange for that they feel they owe absolute loyalty to it*" (Hofstede, 1980, p.45). As depicted in Figure 22 Singapore's society is strongly collectivistic, whereas the Swiss one shows no clear tendency.

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[44]Performance orientation "*reflects the extent to which a community encourages and rewards innovation, high standards, and performance improvements*" (Javidan, 2004, p.239).

Figure 22 – Predicted effects on Strategic Performance Management: Collectivism
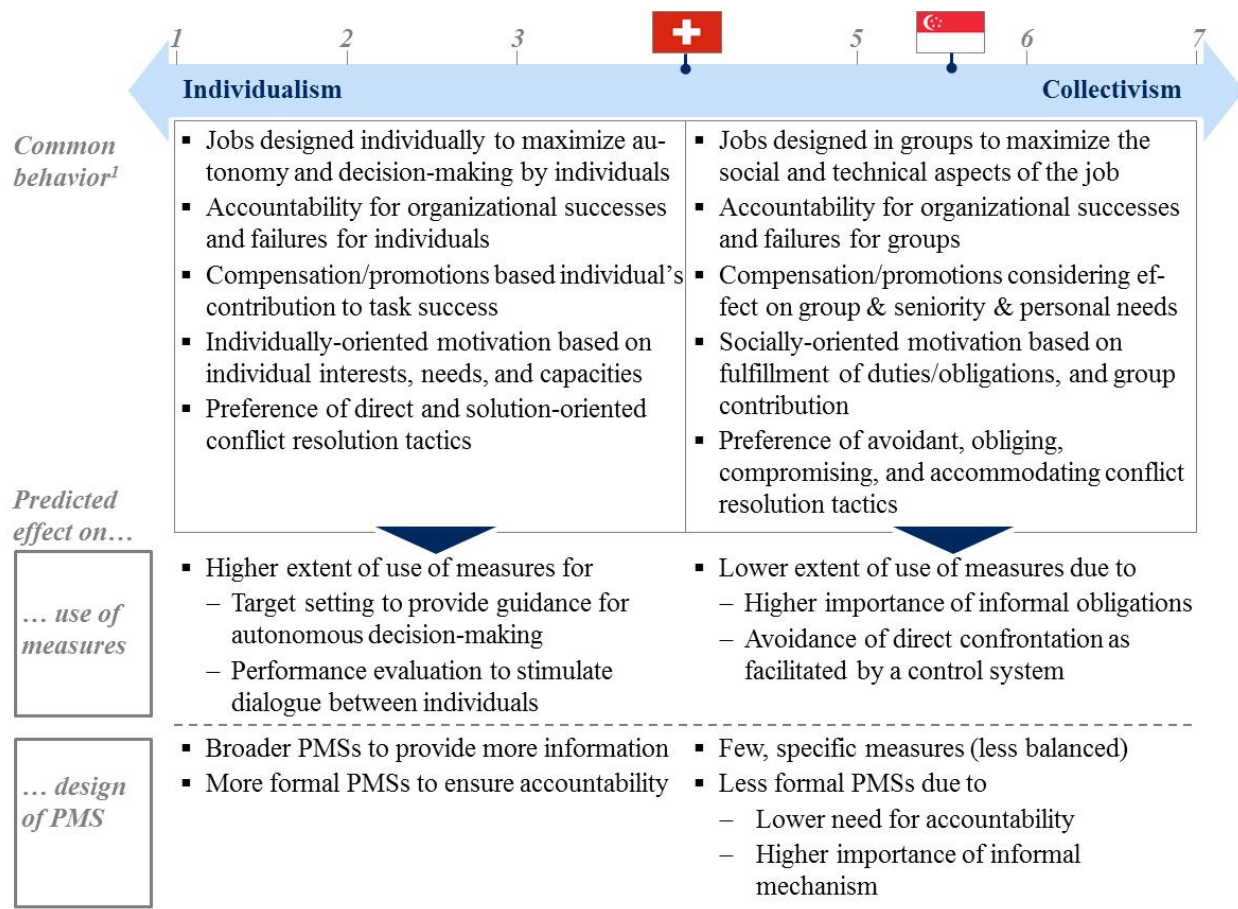
1) Common behavior in organizations

Source for common behavior: Gelfand, Bhawuk, Nishi, and Bechtold (2004, p.459)

Collectivistic values are expressed in people's behaviors in organizations in several ways. According to Gelfand, Bhawuk, Nishi, and Bechtold (2004, p.459) collectivism emphasizes thinking in social groups. This results in the design and definition of job roles, interactions, and accountabilities in a way that focuses on social and technical aspects (Gelfand *et al.*, 2004, p.459). Decisions are made by the leader for the group or collectively by a group, resulting in clear duties for each individual. Achievements are seen as the result of group-efforts, in which each person feels highly responsible for group contribution and fulfillment of duties. Collectivistic societies tend to focus less on written agreements with detailed specifications.

Collectivism affects Strategic Performance Management in two ways: through the performance contract[45] between individuals and the organization and how managers

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[45] Strategic Performance Management leads to performance contracts that contain expected contributions of each individual to the organization's goals.

incentivize their employees. Firstly, employees in collectivistic societies rely less on written agreements on activities and expected outcomes. To save "*face*" they tend to emphasize more on shared values and verbal agreements based on trust, courtesy, and shared expectations (Rubienska & Bovaird, 1999, pp.253-258). The naturally high obligation towards others results in less focus on hard criteria for performance management (Keleş & Aycan, 2011, p.3091).

Contrary, more individualistic societies aim to design jobs to enable autonomous working, in which individuals rather than groups take decisions required for their day-to-day work (Gelfand *et al.*, 2004, p.459). These societies rely on written agreements for activities and for expected outcomes. Each individual is accountable to achieve her pre-defined goals regardless of the achievements of others. Personal interests, needs, and capabilities dominate the thinking of each individual. As a consequence, it is common to directly approach and confront others with a (often) solution-oriented mindset to resolve operational and tactical issues. This behavior is less common in the collectivistic – especially Han-Chinese – societies as direct conflicts within a network of close relationship bear the risk of losing "*face*".

Secondly, managers in collectivistic societies put lots of emphasis on social motivators such as role modeling, interpersonal relationships, and organizing social events such as dinners and joint trips with their employees. As a result, work and private lives of employees in collectivistic societies are less sharply delineated compared to individualistic societies (Tsang, 2007, pp.297-281). With regards to Han-Chinese societies, the importance of being recognized by others (*miànzi*) is higher than in Western societies which value more recognition through monetary compensation (Lockett, 1988, p.498).

Collectivistic and individualistic values are likely to affect the use of measures and design of PMS in several ways. Firstly, organizations in collectivistic societies are likely to use measures to a lower extent in their managerial processes. The use of measures may collide with avoidance of direct confrontation if PMS are seen as means of control. Contrary, more individualistic societies are likely to show a higher use of measures to enable and facilitate autonomous working of employees. This is because autonomous working requires guidance to be able to make decisions which are in line with the overall strategic direction. Desired behavior is likely to be translated into clear targets. Furthermore, in this mode of operations frequent evaluation of performance is necessary to facilitate exchange between the works of individuals and/or to review achievements.

In sum, I expect individualism to enhance the use of measures for target setting and performance evaluation for two reasons. Firstly, employees need guidance since job roles are designed to allow for independent working (Gelfand *et al.*, 2004, p.459). Secondly, employees that work independently have a higher need for information about recent performance of the company, of their department and/or of their team to better understand the context when making decisions. Thus:

P₁: The more a society values individualism, the greater the use of measures for target setting and firm performance evaluation.

Secondly and following the logic above, organizations operating in more individualistic societies tend to have a higher need for measures to facilitate individualistic working. Broader PMS capture information on a wider range of activities and topics. Thus:

P₂: The more a society values individualism, the broader the performance measurement systems.

As informal mechanisms are weaker than in collectivistic societies, each individual requires more information about actual firm, department, and team performance. Formalized PMSs ensure that information is communicated frequently to respective employees, e.g., by using dashboards on shopfloor level. More individualistic societies aim for higher accountability and for forthright problem-solving (Gelfand *et al.*, 2004, p.459). Therefore, the need for formal and transparent systems is likely to be higher. Consequently, it is reasonable to argue that more individualistic societies tend to show higher levels of formalization of PMSs. In conclusion, I expect higher individualism to result in broader PMS with higher levels of formalization. Formally:

P₃: The more a society values individualism, the greater the degree of formalization of performance measurement systems.

Assertiveness

Assertiveness reflects "*the beliefs as to whether people are or should be encouraged to be assertive, aggressive, and tender in social relationships*" (Den Hartog, 2004, p.395). Though overall moderate, Singapore's society shows higher values for assertiveness than the Swiss on (Figure 23). Den Hartog (2004, p.405) finds that common behavior in organizations in assertive societies emphasizes competition and success. As a consequence, leaders set challenging targets. Results are considered as very important

and performance is rewarded. Contrary, societies with low values of assertiveness tend to value cooperation and harmony rather than control. Too high emphasis on results and performance as, for example, incentivized by "*merit pay*" is seen as threat to harmony. In people's eyes, equality, solidarity, and quality of life are desirable goals both for private life and organizations.

Figure 23 – Predicted effects on Strategic Performance Management: Assertiveness
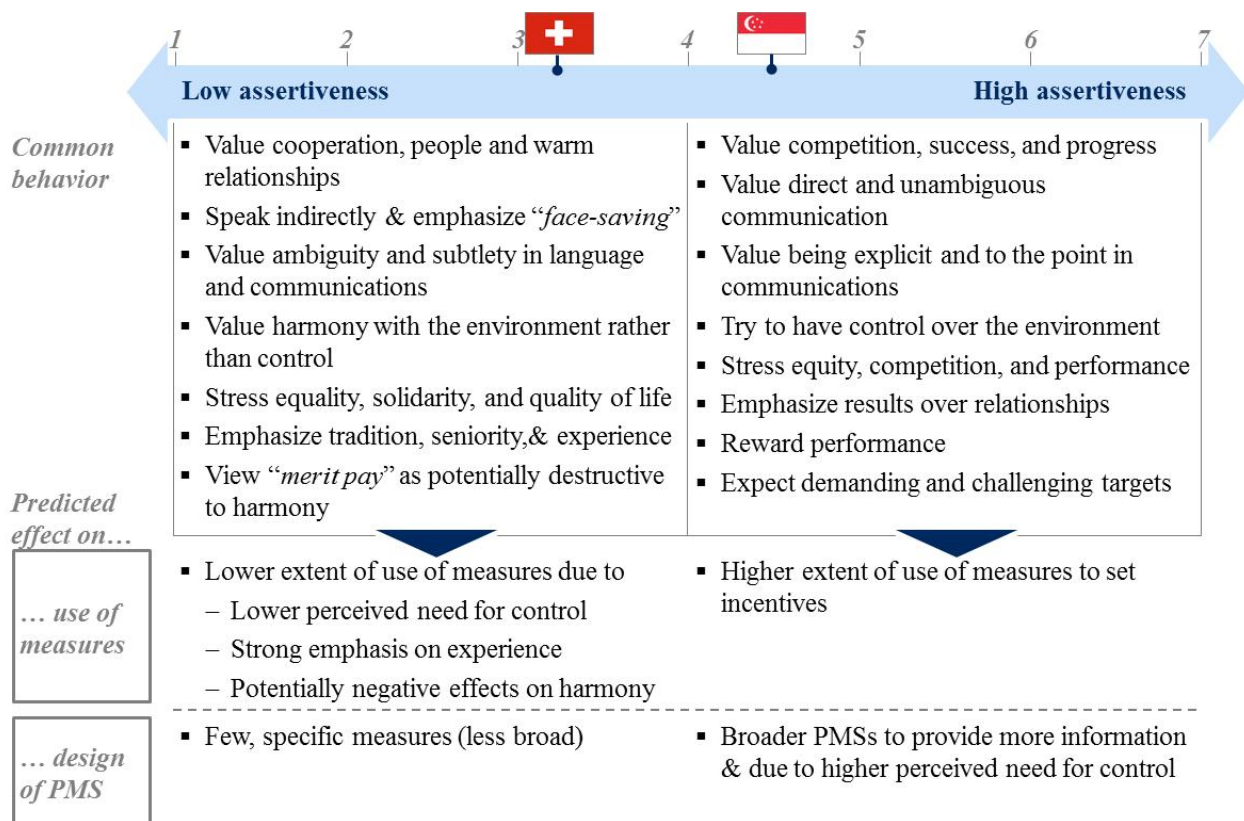
Source for common behavior: Den Hartog (2004, p.405)

The extent to which a society values assertiveness is important for Strategic Performance Management because it is likely to influence the emphasis on achieving targets. Firstly, high assertiveness shows in high target orientation which tends to translate to tying financial and non-financial rewards to individual performance. A clear and transparent link between measures and strategic goals is likely given the high focus on result orientation on all hierarchical levels.

I expect assertiveness to be associated with the use of measures for incentive setting for two reasons. Firstly, members in societies that value assertiveness tend to be more performance-oriented and stress on results (Den Hartog, 2004, p.405). Secondly, this mindset translates into a strong orientation to reward performance (Den Hartog, 2004, p.405).

Contrary, organizations in societies with low assertiveness are likely to make less use of measures in their managerial processes for three reasons. Firstly, the perceived need for control is much lower. This means that information on current performance is more likely to be gained through discussions rather than using quantitative indicators. Secondly, employees are likely to rely more on their tradition, experience, and feelings to assess the current business situation. Lastly, high use of measures can be considered as threat to harmony. This is because individuals may fear that measures are primarily used for control which may be considered as unnecessary or even undermine existing relationships as well as intra- and inter-organizational cooperation. In sum, I expect assertiveness to be associated with the use of measures for incentive setting. Thus:

> **P$_4$:** The more a society values assertiveness, the greater the use of measures for incentive setting.

Societies that value assertiveness are likely to gather and to share more information to satisfy their need for control. It is reasonable to argue that firms in these societies design, in average, their PMSs so that they provide a broader range of information and therefore respond to the higher perceived need for control. Societies with high assertiveness levels try to have control over things (Den Hartog, 2004, p.405) which in turn, translates to a higher need for transparency of business and task performance. In addition, members of these societies value explicit and to-the-point communication (Den Hartog, 2004, p.405). Broader PMSs are likely to facilitate these discussions by providing relevant information and facts. Thus:

> **P$_5$:** The more a society values assertiveness, the broader the performance measurement systems.

Uncertainty avoidance

Uncertainty avoidance describes "*the extent to which a society feels threatened by uncertain and ambiguous situations by providing career stability, establishing more formal rules, not tolerating deviant ideas and behaviors, and believing in absolute truths and attainment of expertise*" (Hofstede, 1980, p.46). The Swiss society shows low uncertainty avoidance (Figure 24). People in Singapore avoid uncertainty more but still on a moderate level. According to de Luque and Javidan (2004, p.618) societies with low uncertainty avoidance tend to be less risk averse, and rely more on informal interactions, trust, and word of mouth. Employees in such organizations have, in average, fewer formalized policies and procedures and show higher tolerance towards breaking of rules.

They perceive change less as a threat. Contrary, societies with high uncertainty avoidance tend to document agreements as they rely more on formalized policies, on procedures and verify communications in written form. Such societies are more inclined to take risks.

Figure 24 – Predicted effects on Strategic Performance Management: Uncertainty avoidance
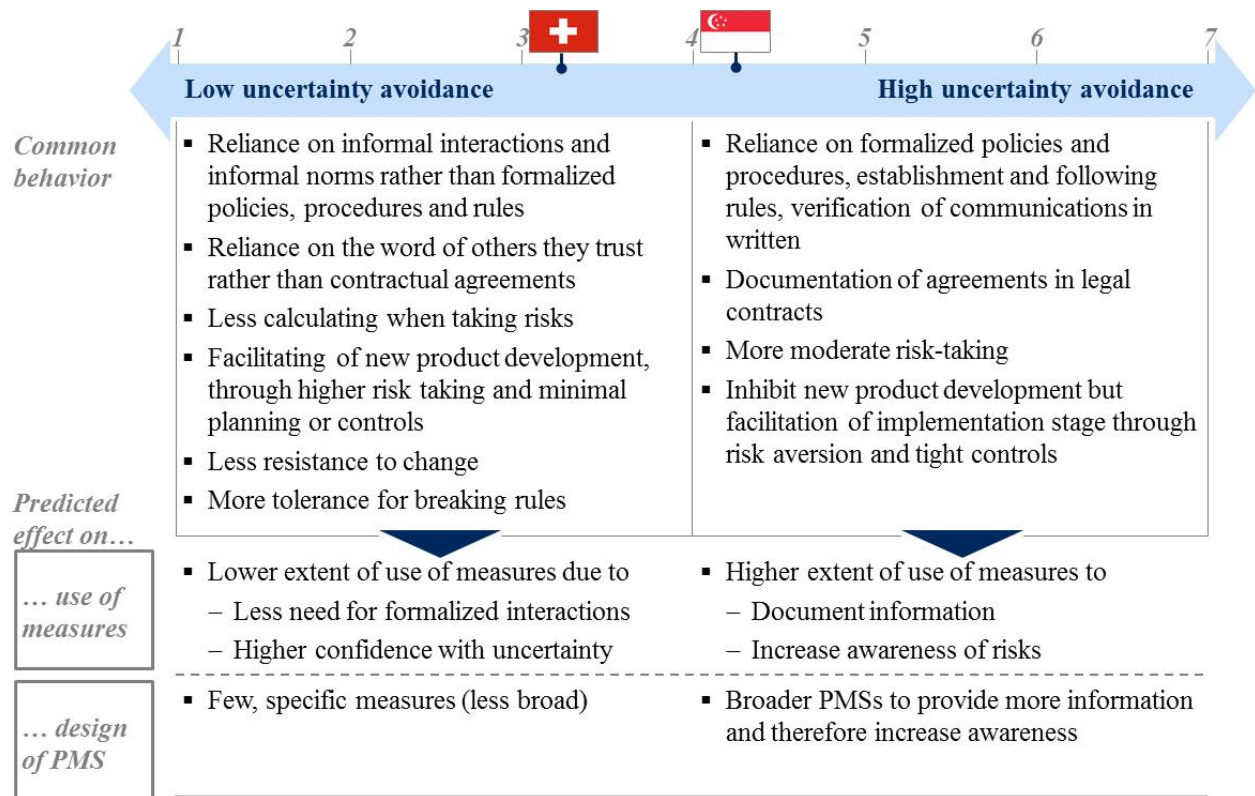
Source for common behavior: de Luque and Javidan (2004, p.618)

Uncertainty avoidance is important for Strategic Performance Management because it is likely to affect the design of PMS. I expect high uncertainty avoidance to result in broader PMSs for the following reason. Societies with low uncertainty avoidance feel more comfortable with few, specific measures that inform members of an organization about key topics and developments. For further information, they draw on informal networks and rely on the word of others (de Luque & Javidan, 2004, p.618). Contrary, societies with high uncertainty avoidance feel a greater need for proactive information gathering and dissemination. In addition, they evaluate risks in a more in-depth manner which results (de Luque & Javidan, 2004, p.618) in a need for more information. Thus:

P₆: The higher a society's uncertainty avoidance, the broader the performance measurement systems.

Power distance

Power distance is "*the extent to which a society accepts the fact that power in institutions and organizations is distributed unequally*" (Hofstede, 1980, p.45). Both Singaporean and Swiss societies show relatively low levels of power distance (Figure 25). Common values and practices that reflect low power distance include, for example, the perception that all groups are equal and that therefore everyone needs to have the same opportunities. As a result, people perceive power to enable and promote corruption, coercion, and dominance. To ensure that everyone has the same chance to acquire capabilities and to follow independent activities, societies with low power distance aim to provide access to resources and tools to everyone (Carl, Gupta, & Javidan, 2004, p.536).

Figure 25 – Predicted effects on Strategic Performance Management: Power distance
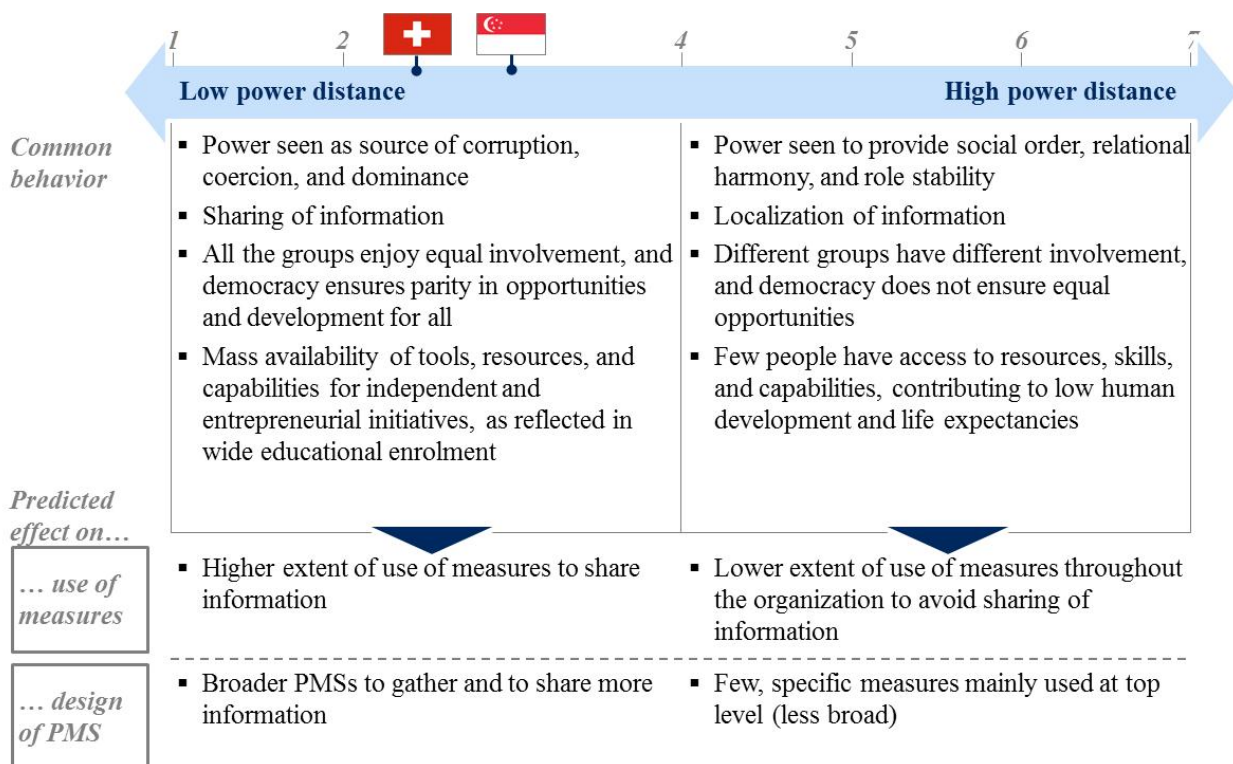
Source for common behavior: Carl, Gupta, and Javidan (2004, p.536)

Power distance is important for Strategic Performance Management because it is likely to affect the way information is shared in the company. High power distance leads to obligation-oriented behavior and respect is earned primarily by seniority of roles rather than abilities and expertise (Rubienska & Bovaird, 1999, p.252; Luft & Shields, 2003, p.209). Power translates into different levels of involvement and access for group

members (Carl *et al.*, 2004, p.536). Sharing of information can be a means to maintain hierarchical power and control.

I expect societies with low (high) power distance to be associated with less broad (broader) PMSs for the following reason. The sharing of information in low power distance societies is likely to be considered as a facilitator to empower employees to better fulfill their activities. Recent and past performance on activity, team, and/or firm level are discussed in regular "*Performance Dialogues*" to understand and to eliminate the root causes for self-inflicted volatility in outcomes. This is important to ensure that all group members feel equally involved and have access to relevant information. Therefore, low power distance organizations are likely to have broader PMSs as individuals demand sharing of information. Formally:

   P$_7$: The lower a society's power distance, the broader the PMS.

In summary, the review of literature on national culture allows hypothesizing the effect on Strategic Performance Management. The theoretical predictions are summarized in Figure 26.

Figure 26 – Summary of predicted effects of national culture
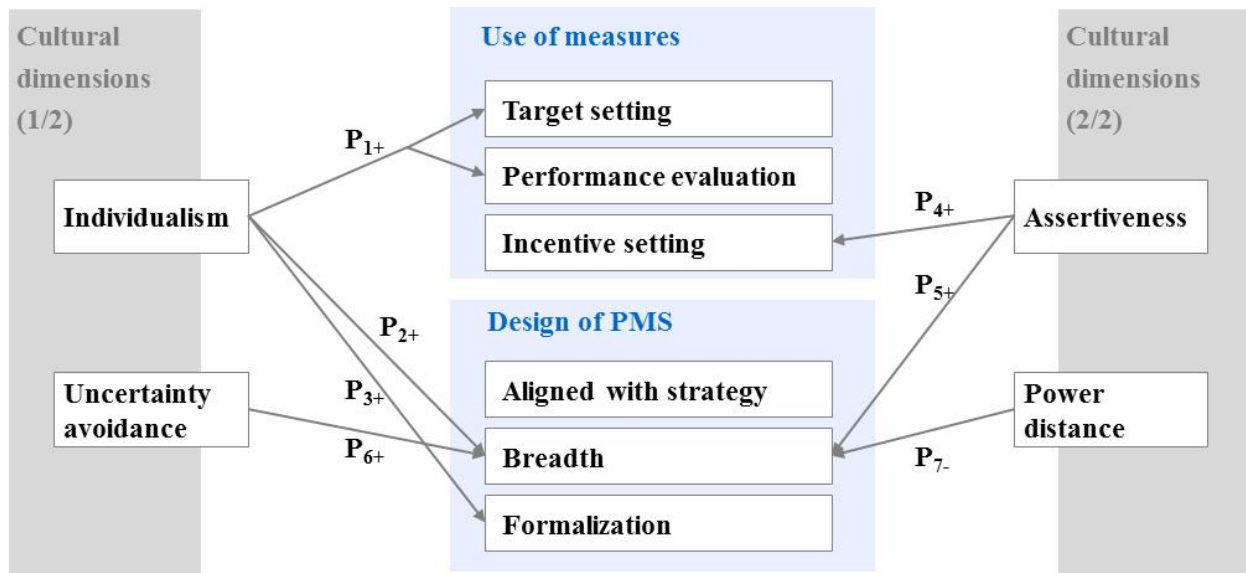
Of the four differing cultural dimensions, Singapore and Switzerland differ most with regards to collectivism, with Singapore's society being highly collectivistic and the Swiss one on the verge between individualism and collectivism. Consequently, I expect this dimension to have the strongest effect on Strategic Performance Management.

6.2 Differences in Strategic Performance Management in Swiss and Singaporean SMEs

Next, statistically significant differences in Strategic Performance Management between Swiss and Singaporean SMEs are analyzed. For this, I conducted six one-way ANOVA analyses to assess the differences between both groups for the variables referring to the use of measures and referring to the design of PMS.

6.2.1 Differences in use of measures in managerial processes

Target setting

A one-way ANOVA was conducted to determine if target setting (mean value of three target setting indicators from measurement instrument) was different for Swiss and Singaporean SMEs. Four outliers[46] were removed from the sample after inspection of a boxplot for values greater than 1.5 box-lengths from the edge of the box. Participants were classified into two groups: Switzerland ($n = 58$) and Singapore ($n = 28$). Data was normally distributed for each group, as assessed by Q-Q plot (Switzerland) and Shapiro-Wilk test ($p > 0.05$, Singapore). Homogeneity of variances was violated, as assessed by Levene's Test of Homogeneity of Variance ($p = 0.005$). Average target setting score was statistically different between both groups, Welch's $F(1, 38.198) = 6.744$, p = 0.013. Average target setting score decreased from the Swiss ($M = 5.94$, $SD = 0.72$) to the Singaporean ($M = 5.34$, $SD = 1.12$) groups.

Performance evaluation

The next ANOVA analysis[47] was conducted to determine if the evaluation of company performance (mean value of three evaluation of performance indicators from measurement instrument) was different for Swiss and Singaporean SMEs. Three outliers[48] were removed from the original sample after inspection of a boxplot for values greater than 1.5 box-lengths from the edge of the box. Participants were classified into two groups: Switzerland ($n = 59$) and Singapore ($n = 28$). Data was normally distributed for each group, as assessed by Q-Q plot (Switzerland) and Shapiro-Wilk test ($p > 0.05$, Singapore). There was homogeneity of variances, as assessed by Levene's test of

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[46]Observations 6, 28, 35, and 44 due to significant lower average target setting scores, i.e., larger than 1.5 box lengths.
[47]Note that all ANOVA analyses are independent from each other.
[48]Observations 6, 43, and 48 due to significant lower average performance evaluation scores, i.e., larger than 1.5 box lengths.

homogeneity of variances ($p = 0.079$). Data is presented as mean ± standard deviation. Average evaluation of performance score was statistically significantly different between both groups, $F(1,85) = 6.088$, $p < 0.05$. Average evaluation of performance score decreased from the Swiss ($M = 5.46$, $SD = 1.11$) to the Singaporean ($M = 4.76$, $SD = 1.48$) groups.

Incentive setting

The third one-way ANOVA analyzed whether incentive setting (mean value of four incentive setting indicators from measurement instrument) was different for Swiss and Singaporean SMEs. One outlier[49] was removed from the original sample after inspection of a boxplot for values greater than 1.5 box-lengths from the edge of the box. Participants were classified into two groups: Switzerland ($n = 62$) and Singapore ($n = 27$). Data was normally distributed for each group, as assessed by Shapiro-Wilk test ($p > 0.05$). Homogeneity of variances was violated, as assessed by Levene's Test of Homogeneity of Variance ($p = 0.004$). Average incentive setting score was statistically different between both groups, Welch's $F(1, 78.161) = 33.694$, $p < 0.005$. Average incentive setting score increased from the Swiss ($M = 4.29$, $SD = 1.21$) to the Singaporean ($M = 5.49$, $SD = 0.73$) groups.

Table 24 – Overview of differences between countries: Measure use

	$N(0,\text{σ})$		Homogeneity of variance[3]	Significantly different[4]		Mean (SD)	
	CH	**SIN**				**CH**	**SIN**
TAR	✓[1]	✓[2]	✗ $p = 0.005$	✓	$F(1, 38.198) = 6.744$, $p = 0.013$	5.94 (0.72)	5.34 (1.12)
EVA	✓[1]	✓[2]	✓ $p = 0.079$	✓	$F(1, 85) = 6.088$ $p < 0.05$	5.46 (1.11)	4.76 (1.48)
INC	✓[2]	✓[2]	✗ $p = 0.004$	✓	$F(1, 78.161) = 33.694$ $p < 0.005$	4.29 (1.21)	5.49 (0.73)

1) As assessed by Q-Q plot

2) As assessed by Shapiro-Wilk test ($p > 0.05$)

3) Levene's Test of Homogeneity of Variance

4) Tested with ANOVA significance if homogeneity of variance is given, otherwise with Welch's robustness test

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[49]Observation 83 due to significant lower average incentive setting score, i.e., larger than 1.5 box lengths.

Table 24 summarizes the ANOVA results and shows that the use of measures for target setting, performance evaluation, and incentive setting was statistically different ($p < 0.05$) between Singaporean and Swiss SMEs. Swiss SMEs used, in average, measures more for target setting and performance evaluation, whereas Singaporean SMEs showed higher levels for incentive setting.

6.2.2 Differences in design properties of measurement systems

Alignment of measures with strategy

Next, differences in the three PMS properties are analyzed. First, a one-way ANOVA was conducted to determine if alignment with strategy (mean value of three alignment with strategy indicators from measurement instrument) was different for Swiss and Singaporean SMEs. Two outliers[50] were removed from the original sample after inspection of a boxplot for values greater than 1.5 box-lengths from the edge of the box. Participants were classified into two groups: Switzerland ($n = 62$) and Singapore ($n = 26$). Data was normally distributed for each group, as assessed by Q-Q plot (Switzerland) and Shapiro-Wilk test ($p > 0.05$, Singapore). Homogeneity of variances was violated, as assessed by Levene's Test of Homogeneity of Variance ($p = 0.039$). There were, in average, no statistically significant differences between SMEs in the two countries, Welch's $F(1, 60.141) = 2.145$, p $= 0.148$.

Breadth of measurement system

Next, differences with regards to the breadth of measurement system (mean value of three breadth of measurement system indicators from measurement instrument) were analyzed using a one-way ANOVA. Three outliers[51] were removed from the sample after inspection of a boxplot for values greater than 1.5 box-lengths from the edge of the box. Participants were classified into two groups: Switzerland ($n = 62$) and Singapore ($n = 26$). Data was normally distributed for each group, as assessed by Q-Q plot (Switzerland) and Shapiro-Wilk test ($p > 0.05$, Singapore). Homogeneity of variances was violated, as assessed by Levene's Test of Homogeneity of Variance ($p = 0.032$). Average breadth of PMS score was statistically different between both groups, Welch's $F(1, 61.869) =$

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[50]Observations 75 and 83 due to significant lower average alignment of measures with firm strategy score, i.e., larger than 1.5 box lengths.
[51]Observations 3, 75, 83 due to significant lower average breadth of PMS scores, i.e., larger than 1.5 box lengths.

11.727, p = 0.001. Average breadth of PMS score increased from the Swiss ($M = 4.49$, $SD = 1.43$) to the Singaporean ($M = 5.43$, $SD = 1.01$) groups.

Formalization

The final one-way ANOVA analysis focused on differences in formalization levels of measurement system (mean value of three formalization indicators from measurement instrument) between Swiss and Singaporean SMEs. Two outliers[52] were removed from the original sample after inspection of a boxplot for values greater than 1.5 box-lengths from the edge of the box. Participants were classified into two groups: Switzerland ($n = 62$) and Singapore ($n = 26$). Data was normally distributed for each group, as assessed by Q-Q plot (Switzerland) and Shapiro-Wilk test ($p > 0.05$, Singapore). There was homogeneity of variances, as assessed by Levene's test of homogeneity of variances ($p = 0.950$). There were, in average, no statistically differences between SMEs from the two countries, $F(1, 86) = 0.16$, $p = 0.899$.

Findings on differences between the design properties of PMS between Singaporean and Swiss SMEs are summarized in Table 25. Only the breadth of measurement systems was different in a statistically significant way ($p < 0.05$) between companies of both countries: Singaporean SMEs used, in average, broader measurement systems compared to their Swiss peers.

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[52]Observations 75 and 77 due to significant lower average formalization scores, i.e., larger than 1.5 box lengths.

Table 25 – Overview of differences between countries: PMS properties

	N(0,Ϭ)		Homogeneity of variance[3]		Significantly different[4]		Mean (SD)	
	CH	SIN					CH	SIN
ALS	✔[1]	✔[2]	✘	$p = 0.039$	✘	$F(1, 60.141) = 2.145$, $p = 0.148$	n/a	n/a
BAL	✔[1]	✔[2]	✘	$p = 0.032$	✔	$F(1, 61.869) = 11.727$ $p = 0.001$	4.49 (1.43)	5.43 (1.01)
FOR	✔[2]	✔[2]	✔	$p = 0.950$	✘	$F(1, 86) = 0.16$ $p = 0.899$	n/a	n/a

1) As assessed by Q-Q plot

2) As assessed by Shapiro-Wilk test ($p > 0.05$)

3) Levene's Test of Homogeneity of Variance

4) Tested with ANOVA significance if homogeneity of variance is given, otherwise Welch's robustness test

6.2.3 Summary of supporting evidence for propositions

Table 26 summarizes the results based on the theoretical predictions that draw on national culture literature and the observed differences between SMEs in Singapore and Switzerland. Supporting evidence for all propositions on the use of measures (P_1, P_4) is found as well as for the propositions that link assertiveness as well as uncertainty avoidance with the breadth of measurement systems (P_5, P_6). Please note that the analysis allows only for identifying evidence that substantiates propositions rather than for testing hypotheses. This is because of the absence of variances in the cultural dimensions for SMEs in the two countries.

Table 26 – Research propositions testing results

No.		Proposition	Culture[1]		Str. Perf. Management		Support
			CH	SIN	CH	SIN	
Use of measures							
1	+	The more a society values individualism, the greater the use of measures for target setting and firm performance evaluation.	4.0^3	5.6^3	5.9 / 5.5	5.3 / 4.8	✔
4	+	The more a society values assertiveness, the greater the use of measures for incentive setting.	3.2	4.4	4.3	5.5	✔
Measure properties							
2	+	The more a society values individualism, the broader the performance measurement systems.	4.0^3	5.6^3	4.5	5.4	✘
3	+	The more a society values individualism, the greater the degree of formalization of performance measurement systems.	4.0^3	5.6^3	*n.s.*	*n.s.*	✘
5	+	The more a society values assertiveness, the broader the performance measurement systems.	3.2	4.4	4.5	5.4	✔
6	+	The higher a society's uncertainty avoidance, the broader the performance measurement systems.	3.2	4.2	4.5	5.4	✔
7	–	The lower a society's power distance, the broader the PMS.	2.4	3.0	4.5	5.4	✘

Note: +/– refers to a positive/negative hypothesized effect

    n.s. no significant differences found

1) Values refer to the cultural dimension mentioned in the respective proposition

2) Values refer to the managerial practices or PMS design properties mentioned in the respective proposition

3) Refers to degree of collectivism

6.3 Excursus: Descriptive characteristics of Strategic Performance Management in Swiss and Singaporean SMEs

The following section provides the interested reader with descriptive and in-depth insights about the actual practice of Strategic Performance Management in SMEs in both countries. At first, findings on the use of measures in the interviewed Singaporean and Swiss SMEs are presented in this section. Then, details on PMS properties are provided. Small and medium-sized enterprises are delineated throughout these analyses because major differences exist.

Use of measures (1/3): Overview

Three major insights are found from the analysis on aggregate level as depicted in Figure 27:

(1) use of measures for target setting and performance evaluation is higher in Swiss SMEs,

(2) use of measures for incentive setting is higher in Singaporean SMEs, and

(3) medium-sized firms rely more on measures in their managerial processes than small firms.

Presented values refer to the seven point Likert scale used with 1 being "*strongly disagree*", 4 equals "*neither agree nor disagree*", and 7 being "*strongly agree*".

Swiss SMEs use, in average, performance measures more for the managerial processes target setting and performance evaluation than their Singaporean counterparts. This finding is consistent for small and medium-sized firms. Swiss SMEs use measures mostly for target setting with average scores of 5.5 for small firms (5.9 for medium-sized firms) and 4.8 (5.7) for performance evaluation.[53] Both values are higher than the ones in Singaporean SMEs which equal 4.9 (5.6) and 4.2 (5.1) respectively.

Singaporean SMEs clearly outperform Swiss SMEs in the use of measures for setting incentives. Again, this finding applies to small and medium-sized firms. Particularly, Singaporean firms interviewed tend to use measures more often for incentive schemes with an average value of 5.4 (5.4). In sharp contrast, Swiss SMEs rely less on measures in this managerial process, with value of 4.1 (4.5). In addition, measures are used the least in Swiss SMEs for incentive setting compared to the other managerial processes.

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[53]Consistency check with chapter 6.2.1: This excursus includes all observed firms, whereas chapter 6.2.1 observes a sample free of outliers.

Figure 27 – Descriptive characteristics of the use of measures in SMEs
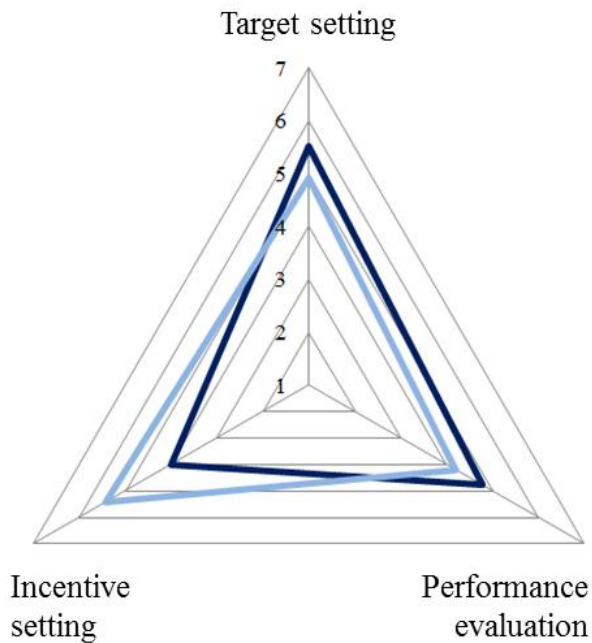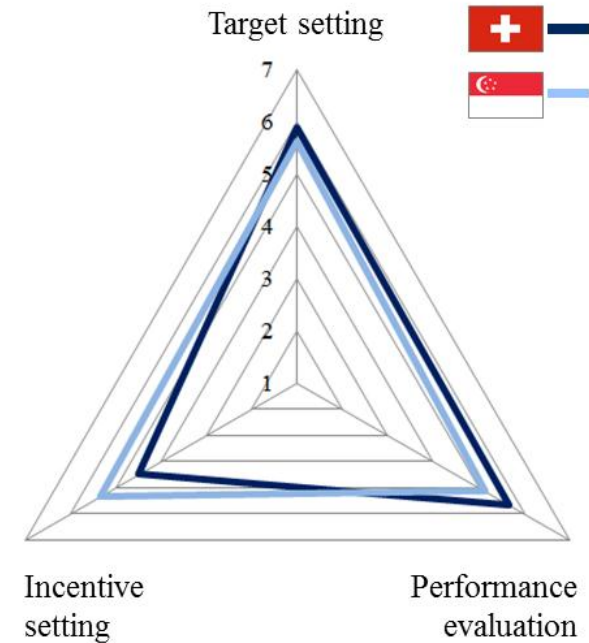
1) Higher score indicates greater use of performance measures

Medium-sized firms in both countries use measures more often in their managerial processes compared to small firms. This is consistent with theory which suggests a greater use of measures with increasing firm size. One exception builds the incentive setting in Singaporean firms, where – on a relatively high level – small firms embed measures in their systems as often as medium-sized firms (both 5.4).

Use of measures (2/3): Small enterprises

Next, differences on an indicator level are analyzed. As depicted in Figure 28, Swiss small enterprises rely more on their budgets by using measures to set financial targets. In addition, they make higher use of measures in their communication of performance goals and to a lower extent to all employees compared to their Singaporean counterparts.

The evaluation of firm performance appears to be facilitated more by the use of measures in Swiss SMEs. In particular, the management teams use measures more often to analyze discrepancies between achieved versus planned production output and the achievement of long-term company goals. The evaluation on shopfloor level using measures is similar in both countries. Managerial involvement in weekly production meetings is common.

Figure 28 – In-depth analysis of use of measures in small enterprises

Likert scale 1-7, average

	Use of measures for…	σ_{CH}	σ_{SIN}
TAR1	Budgeting/financial target setting	1.55	1.71
TAR2	Short-term production planning	1.74	1.54
	Communication of performance goals to		
TAR3	management team	1.09	1.30
TAR4	employees of all company levels	1.30	1.85
EVA1	Variance analyses of planned production output	1.83	1.81
	Evaluation of target achievement for		
EVA2	long-term company goals	1.50	1.87
EVA3	weekly/monthly production output	1.75	1.62
INC1	Evaluating employee performance	1.45	1.13
INC2	Non-financial rewarding employee performance[1]	1.39	2.05
INC3	Determining compensation practices	1.59	0.90
INC4	Applying sanctions[2]	1.22	1.60

1) e.g., dinner with leadership team, weekend trip

2) e.g., internal relocation, notice, layoff

Singaporean small enterprises outperform the Swiss ones in terms of use of measures for incentive setting, especially for evaluation of employee performance. Overall, the respective values for Swiss firms are lower than for Singaporean ones. This indicates that employee performance is less often tied to quantitative criteria such as production volume or firm performance and that financial incentives are less common.

Besides the use of measures for evaluating employee performance, Singaporean small enterprises use measures more to determine compensation. As a consequence, it seems that Singaporean small firms incentivize their employees mostly by financial means which requires an objective and traceable assessment of an employee's performance. Notably, Singaporean SMEs also tie sanctions such as internal relocation, notice or even layoff more often to the achievement of metrics-based targets. This is particularly interesting because of the oppressive labor market in Singapore and the associated challenges in hiring qualified manufacturing staff. Practices of actively renewing permanent staff by layoff of employees that do not meet their targets are in general rather low in small firms and particularly less common in Swiss enterprises.

Use of measures (3/3): Medium-sized enterprises

Though the tendency of outcomes is similar for small enterprises, three major differences exist for medium-sized firms (Figure 29). Firstly, the use of measures in medium-sized firms is higher than for small firms. As stated earlier, medium-sized firms leverage measures more often to cope with increasing organizational complexity and to align the interests of employees. Secondly, firms in Singapore show significantly higher values than their smaller peers. A possible explanation could be the limited domestic market. As a consequence, firms that expand their businesses need to internationalize. These firms start competing internationally with players in and from other markets. Consequently, these firms need to react to the increased competition which might translate to a tighter cost management, increasing quality standards or ensuring quality across multiple production sites. Thirdly and contrary to the changes described above, the indicator "*applying sanctions*" remains on a very low level for medium-sized Singaporean enterprises. A possible explanation could be the tight Singaporean labor market. Facing challenges in recruiting qualified and experienced staff, managers could be simply less willing to sanction their employees.

Figure 29 – In-depth analysis of use of measures in medium-sized enterprises

	Use of measures for…	σ_{CH}	σ_{SIN}			
TAR1	Budgeting/financial target setting	0.65	1.42			
TAR2	Short-term production planning	1.93	1.21			
	Communication of performance goals to					
TAR3	management team	0.84	0.81			
TAR4	employees of all company levels	1.42	1.72			
EVA1	Variance analyses of planned production output	1.50	2.06			
	Evaluation of target achievement for					
EVA2	long-term company goals	1.00	1.50			
EVA3	weekly/monthly production output	1.84	1.42			
INC1	Evaluating employee performance	1.82	0.78			
INC2	Non-financial rewarding employee performance[1]	1.70	1.09			
INC3	Determining compensation practices	1.37	0.90			
INC4	Applying sanctions[2]	1.50	1.42			

1) e.g., training, promotion

2) e.g., internal relocation, notice, layoff

Measure properties (1/3): Overview

Three insights emerge when analyzing SME managers' responses with regards to the properties of the PMSs used on an aggregate level (Figure 30):

(1) small firms tend to have few measures which mostly do not fulfill the requirements of PMS as recommended in literature,

(2) compared to Singaporean firms, small Swiss companies tend to have more formal systems, and

(3) compared to Swiss firms, Singaporean medium-sized companies tend to have broader measurement systems.

Figure 30 – Descriptive characteristics of measure properties in SMEs
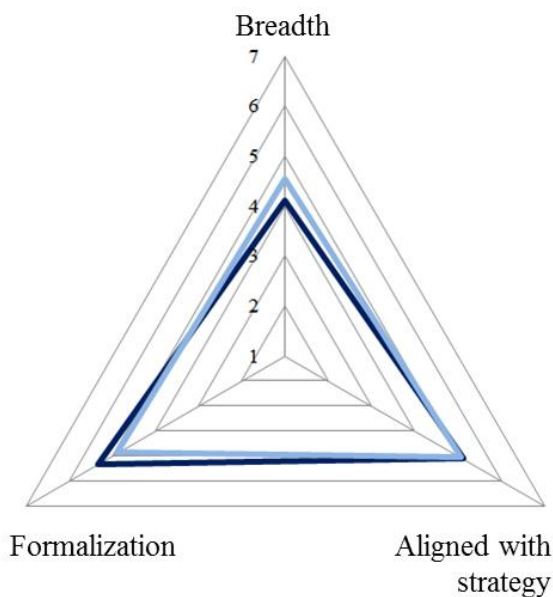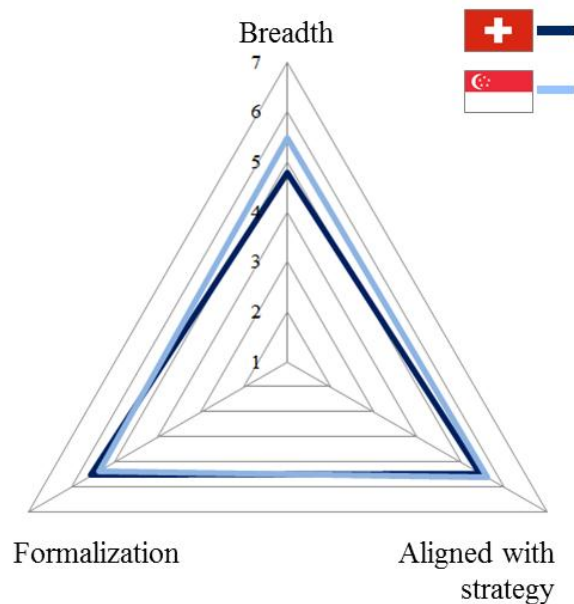
1) Higher score indicates greater use of performance measures

Measurement systems in small firms tend to, on average, show lower levels of the three PMS characteristics breadth, alignment of measures with strategy, and formalization. The respective average scores were on aggregate level for companies in Singapore (Switzerland) for alignment of measures with firm strategy 5.1 (5.1), breadth 4.6 (4.1), and 4.9 (5.4) for the degree of formalization. It is reasonable to consider these values as very low, taking into consideration that a four on the Likert scale equals "*neither agree nor disagree*". This finding is not surprising, given that small SMEs tend to focus on a single measure or a few measures only (Sousa *et al.*, 2006).

Small Swiss companies have, in average, more formal systems than their Singaporean counterparts. This is remarkable because these differences diminish with increasing firm size. The respective average scores for small Swiss firms (medium-sized firms) was 5.4 (5.5) and 4.9 (5.4) for small Singaporean firms. This indicates that whereas Swiss firms start off with relatively high degree of formalization, Singaporean ones tend to formalize their systems as they grow.

According to the information provided by SME managers, Singaporean medium-sized companies clearly outperform their Swiss counterparts with regards to the breadth of measurement system. Singaporean firms show on average a score of 5.5, and Swiss firms 4.8. A potential explanation lies in the use of measures for incentive setting which is significantly higher in Singaporean than in Swiss firms. The need to ensure that the work of individuals or teams is assessed comprehensively is likely to affect the scope of measurement. For example, financial measures alone are not sufficient to assess efficiency and effectiveness of an employee's work in the development team. More likely, specific measures would relate to the quality of work. Therefore, non-financial aspects would complement the financial dimensions in the measurement system.

Measure properties (2/3): Small enterprises

Next, I analyze differences on the indicator level. As depicted in Figure 31 for small companies, major differences exist between both countries with regards to the levels of breadth and formalization. On relatively low levels for both, small Swiss enterprises tend to use fewer measures. In particular, measures used appear to cover less an internal and external view. The answers provided by Swiss SME managers indicate that their PMS are, in average, more formal than the ones in Singaporean SMEs. This applies especially to the accountability for single measures and to formal documentation. Notably, these measures are then used less often for formally communicating them to all the employees, e.g., by using dashboards. No major differences can be seen with regards to alignment of measures with strategy, where both countries show similar values.

Figure 31 – In-depth analysis of measure properties in small enterprises
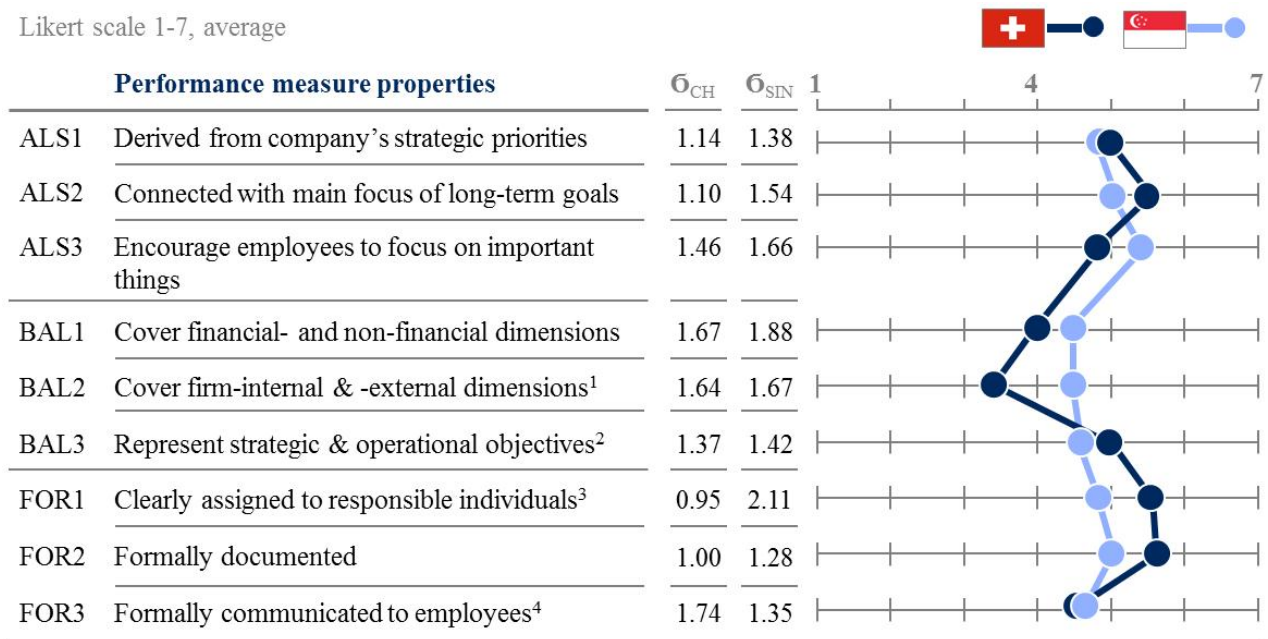
Likert scale 1-7, average

	Performance measure properties	σ_{CH}	σ_{SIN}
ALS1	Derived from company's strategic priorities	1.14	1.38
ALS2	Connected with main focus of long-term goals	1.10	1.54
ALS3	Encourage employees to focus on important things	1.46	1.66
BAL1	Cover financial- and non-financial dimensions	1.67	1.88
BAL2	Cover firm-internal & -external dimensions[1]	1.64	1.67
BAL3	Represent strategic & operational objectives[2]	1.37	1.42
FOR1	Clearly assigned to responsible individuals[3]	0.95	2.11
FOR2	Formally documented	1.00	1.28
FOR3	Formally communicated to employees[4]	1.74	1.35

1) e.g., internal process efficiency vs. customer satisfaction

2) e.g., profitability vs. production lead time

3) i.e., who is responsible for acting on each performance measure

4) e.g., using dashboards, graphs

Measure properties (3/3): Medium-sized enterprises

In line with findings for the use of measures, PMS properties increase for medium-sized firms compared to small enterprises. SMEs from both countries show similar and relatively high values for the degree of alignment of measures with firm strategy (Figure 32).

Singaporean medium-sized firms tend to have broader PMSs with a higher focus on both financial- and non-financial as well as internal and external dimensions. Interestingly, the measures used tend to cover less strategic and operational objectives and therefore are more one-dimensional. This is contrary to Swiss medium-sized firms, where SME managers rated the breadth of the PMS in general lower, but the degree to which strategic and operational goals are represented higher. Notably, the levels of formalization increase significantly for Singaporean medium-sized SMEs compared to their small counterparts. Contrary, Swiss medium-sized firms feature similarly high values as small firms from Singapore.

Figure 32 – In-depth analysis of measure properties in medium-sized enterprises

Likert scale 1-7, average

	Performance measure properties	σ_{CH}	σ_{SIN}	1 ... 4 ... 7
ALS1	Derived from company's strategic priorities	1.46	1.09	
ALS2	Connected with main focus of long-term goals	0.97	1.09	
ALS3	Encourage employees to focus on important things	1.54	1.21	
BAL1	Cover financial- and non-financial dimensions	1.74	1.75	
BAL2	Cover firm-internal & -external dimensions[1]	1.54	1.39	
BAL3	Represent strategic & operational objectives[2]	1.29	0.73	
FOR1	Clearly assigned to responsible individuals[3]	1.16	1.36	
FOR2	Formally documented	1.35	1.56	
FOR3	Formally communicated to employees[4]	1.87	1.71	

1) e.g., internal process efficiency vs. customer satisfaction

2) e.g., profitability vs. production lead time

3) i.e., who is responsible for acting on each performance measure

4) e.g., using dashboards, graphs

In summary, several differences between SMEs in both countries exist. With regards to the use of measures, Swiss SMEs tend to use measures more often for target setting and performance evaluation. Singaporean SMEs show high values for the use of measures for incentive setting. With regards to measure properties, Singaporean medium-sized firms tend to have broader measurement systems and Swiss enterprises have more formal systems. In addition, medium-sized enterprises rely, in average, more on measures and show a more sophisticated measurement system, yet on a relatively low level.

7 Managerial implications

The results of this empirical study suggest that the use of measures and broader measurement systems are beneficial for SMEs. In this chapter the attention turns to SME practitioners. Section 7.1 translates the academic findings into actionable recommendations for SME managers. In a larger sense, the subsequent two sections then elaborate on the challenges of Singaporean and Swiss SMEs, provide strategic recommendations, and finally recommendations for the implementation of a measurement system. These last two sections draw on the qualitative findings from the 90 interviews conducted.

7.1 Managerial implications in the narrow sense

Some of the interviewed SME managers considered the use of measures as a waste of resources. In addition, they asserted that an SME only needs to know customer requirements and to have the right employees to transfer these requirements into matching products and services. This may hold true for SMEs with unique products and services which allow for commanding a price premium, i.e., a price percentage higher than the price of comparable products in the market. Their need to monitor revenue, cost drivers, and the market environment may be lower (Ries, 2011, pp.264-265). Contrary, this research suggests that it is useful for SMEs to use measures in managerial processes to achieve higher strategic alignment of employees. This perspective is in line with the extant measure-use centric view in literature for large companies, yet contains several nuances. So what should SME owner-managers and managing directors do?

Firstly, companies should recognize that the recommendation on whether to use measures or not depends on firm size. This research suggests that a critical firm size of 45-55 employees exists beyond which the use of measures becomes increasingly important. This quantitative finding is consistent with the impression of an owner-manager of a medium-sized precision parts manufacturer:

> "*I believe that there is a critical size of around 40 employees. We have about 110 employees and [are] getting to a point where informal ways are getting difficult. I promote small firms to make good use of being small rather than small firms trying to imitate big firms. Small firms that try to work in the same way as large firms die beautifully. Surviving in a mess is better than dying beautifully.*"

Regardless of firm size the use of measures is found to increase the strategic alignment of employees. In other words, even in small firms, the use of measures helps to increase employees' understanding and awareness about firm strategy and to align activities. However, the mediated effect of the use of measures on firm performance becomes significant only for firms beyond a critical size of 45-55 employees (section 5.2).

In addition, the use of measures for small firms is likely to be more challenging for two reasons. The financial performance of small firms often depends relatively more on exogenous factors because their product portfolio and customer base tend to be less diversified (Ries, 2011, p.265). For example, an SME with a strong niche orientation may excel in innovativeness and quality. However, the loss of a customer affects a small firm's performance relatively more given its smaller customer base. As a consequence, the use of measures in small enterprises can be less useful and even be demotivating for employees that do not achieve their targets despite performing well. The latter is especially the case when individual rewards are tied entirely to company performance measures that are determined mainly by exogenous factors. Furthermore, the costs to implement and to maintain a measurement system are relatively higher compared to large firms. As a result the efforts associated with the use of measures are likely to outweigh the associated benefits.

Secondly, managers should recognize the importance of the choice of appropriate measures. This requires answering three essential questions: (1) what to measure?, (2) what can be measured?, and (3) how to measure it efficiently? Several of the interviewed SME managers have experienced major benefits from the use of measures. For example, the managing director of a medium-sized SME producing precision metal forging parts noted:

> *"We see a clear benefit by using our measurement system: transparency. It helps to get the strategy across to employees. Furthermore, the entire management team has now transparency on what is going on in the company."*

Other SME managing directors experienced benefits in terms of fact-based decision-making, more information about market trends by transparency on sales of different product lines, constantly reminding of defined targets, and a positive marketing effect in negotiations with large companies.

Benefits depend on the choice of appropriate metrics. As measures help to align employees, they should be derived from, or at least be in line with firm strategy. What to

measure therefore depends on the strategy of an SME as described in detail in section 7.3. In addition, SMEs with less standardized processes are likely to have more challenges in capturing process-related measures. However, not everything that should be measured can be measured. As pointed out by the managing director of a small manufacturer of electronic engines:

> *"Some topics are hard to measure, e.g., the efficiency of our sales team. We aim for a processing time from customer request to submission of our offer that is less than four days. Currently we mostly perform it in one day. However, if we take only this variable into account, we would neglect other important elements such as customer reclamations, clarifying inquiries for our offers. […] If we would try to capture everything, then I would need additional two employees that work only on this."*

As such, when identifying appropriate metrics SMEs need to not only consider what can be measured but also how it can be measured with justifiable efforts. Several SME managers emphasized that high effort to maintain a measurement system can reduce an SME's innovativeness and flexibility. This is especially the case when despite this high effort data-driven reports are not read or not understood (Ries, 2011, p.258). That said, many relevant measures are often gathered already by single departments or teams and are kept within these organizational sub-units. Next to identifying appropriate measures, measurement itself should require the least resources possible. As a rule of thumb, 80% of relevant measures should be generated by the SME's IT system. Most of the interviewed SME managers that had implemented a companywide IT system such as an Enterprise Resource Planning (ERP) system stated a share of around 80% of measures that were automatically generated. These SMEs had IT-solutions that fit the needs of SMEs. To conclude, the choice of measures therefore is also a trade-off between feasibility and effort. An IT system allows real-time queries, facilitates the measurement process, and helps to gather relevant information despite employee resource constraints. In turn, not everything that can be measured should be measured.

Thirdly, the recommendation for a broader measurement system does not necessarily require SMEs to implement a Balanced Scorecard-type of measurement. An analysis of PMS-design specific characteristics suggests that broader measurement systems enhance the effect of use of measures on strategic alignment of employees. Breadth of PMS reflects the scope of information that is focused on. Unlike in large firms, there is less need for SMEs to focus on depth as well (Garengo *et al.*, 2005, p.34). But how many

metrics should an SME focus on? All SMEs are recommended to focus on a small set of four to five fundamental measures such as liquidity, order intake, sales visits of new and existing customers, value added per employee, and employee cost. This is important to increase awareness on businesses' fundamental necessities and value drivers. Most of these measures are leading financial indicators that allow SME managers to react early to changes before they hit the bottom-line of their profit and loss statement. However, SMEs tend to focus primarily on ex-post measures such as revenue (see Figure 19).

In addition to these fundamental measures, this study suggests that SMEs should focus also on at least one to two specific metrics that reflect key success factors of their business. As depicted in Figure 33 this recommendation applies to firms with less than 45-55 employees and to firms with frequently changing processes. Examples for specific measures are scrap costs or on-time delivery.

Figure 33 – Recommendations for use of measures in SMEs
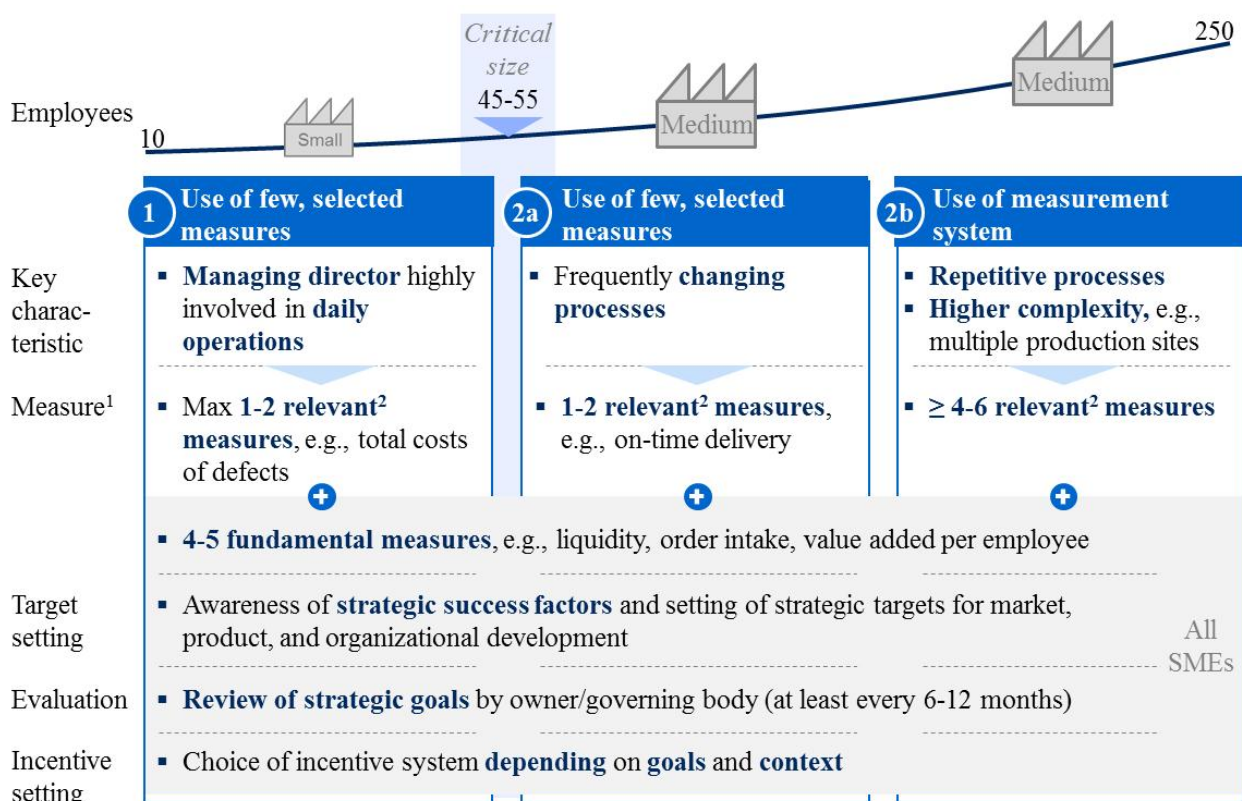
1) on MD-level

2) derived from an SME's strategic success factors, e.g., reflecting flexibility, time-to-market, innovativeness

The need for monitoring is higher in firms that have more standardized and repetitive processes or higher product and organizational complexity (Möller, Hülle, & Kahle,

2011). Therefore, they should have, for example, an additional four to six measures that reflect the underlying success factors. Notably, 11% of interviewed Swiss SMEs revealed that they used a comprehensive measurement cockpit with 20 or more measures and saw major benefits in doing so. All these companies had IT systems that supported in gathering relevant information.

Next, measures facilitate implementation of strategy but are no ends in themselves. To implement strategy into organizational reality strategic initiatives are required in the first place. Each initiative needs someone who is accountable for it. Measures help to assess the effect and/or realization of these initiatives. Therefore, the responsible person also needs to be accountable for the respective measures. To increase awareness about important topics and share information about current company performance, relevant measures should be shared with employees at all levels. A suitable and simple form of visualization helps to achieve that employees understand the meaning of measures. As the managing director of a medium-sized manufacturer of control sensors emphasized,

> "[…] some employees on the shopfloor level have difficulties in understanding, others don't want to understand the strategic goals. They show only little interest and prefer to focus on their immediate activities".

Consequently, the management team is recommended to aim for an increase of awareness by communicating relevant topics and by adapting the communication to the respective skill-level of employees. For example, an SME owner-manager mentioned that he provides in the two-monthly town hall meeting exactly the same explanation for the most important measures. In another SME, the production manager shows photos of their products in use at their customers' sites and explains why a certain production step is particularly important to achieve the strategic goal product quality. By this, employees can better see the linkages between their contribution and strategic company goals. In sum, the use of measures is a first step to increase the strategic alignment of employees. This step needs to be complemented by concrete actions and efforts from SME managers to ensure that employees understand firm strategy and the associated measures which requires investing in time for communication.

Lastly, managers should recognize the importance of adapting the use of measures and design of PMS to both the organizational and national culture. The owner plays the central role in many SMEs. Her leadership and management style affect the organization (Garengo *et al.*, 2005) and, vice versa, the organization tries to align with the owner's interests, regardless of the ownership structure (Volery & Khadjavi, 2009). The use of

measures and the design of a measurement system therefore also need to reflect the philosophy and requirements of the owner. For example, the managing director of a medium-sized manufacturer of stamping presses emphasized that

> *"[…] in our company no one actually knows how much profit we make per year. This is a deliberate decision made by the owner."*

In addition, the use of measures also needs to address cultural characteristics. What works well in one culture might not work in another. For example, this study has shown that employees in Singapore are more often incentivized by tying individual performance to the reward system. Contrary, many Swiss interviewees stated that employees in Swiss SMEs wish a decent wage level but find fulfillment rather by other topics such as personal development, enabling creativity, and job enrichment. As a result, one third of Swiss SMEs in this study do not link individual or firm performance to compensation.

In summary, SME managers should recognize that the use of measures enhances strategic alignment of employees but it requires careful consideration of (1) what and how to measure, (2) the associated efforts to gather, process, and analyze information, (3) required breadth of PMS, and (4) the organizational and cultural context. Lastly, (5) measures alone are not sufficient for strategy implementation but complement other pillars such as concrete initiatives with responsible employees and an adequate communication to employees.

With these implications in mind, managerial recommendations in the wider sense are discussed in the next sections. They provide concrete recommendations on what SME managers can do to implement findings of this study into organizational reality.

7.2 Strategic recommendations for Swiss and Singaporean SMEs

Managing directors of manufacturing SMEs in Switzerland and Singapore emphasized the challenging business environment they were operating in. In the following and based on the 90 interviews, I suggest a classification of SMEs into three archetypes. Next, I detail the effect of business environment on each archetype of SME and elaborate on the associated challenges. Lastly, findings are blended into strategic recommendations for Swiss and Singaporean manufacturing SMEs.

Swiss manufacturing SMEs

In Switzerland, SMEs struggle from the rise of the Swiss franc which has appreciated by more than 30% compared to the Euro since 2007. A few of the interviewed SMEs

hedged against currency fluctuation for example by sourcing primarily from foreign countries such as Germany. As a result, Swiss exports became increasingly expensive which in turn reduced competitiveness of Swiss products abroad. Given the average export ratio of 48% for all manufacturing SMEs (section 4.1.1) Swiss SMEs in general experienced challenges on the pricing and ultimately demand side. At the same time labor costs are high which put pressure on the cost structure. For example, the hourly compensation costs in Switzerland were USD 57.8 in 2012. This was more than 2.3-times higher than the ones in Singapore (USD 24.8, U.S. Department of Labor, 2013).

Despite these structural disadvantages, Swiss manufacturing SMEs performed well. One reason for this is that most of the interviewed Swiss SMEs had a clear strategic positioning in their niches. 82% of the interviewed managing directors of Swiss SMEs mentioned that they produced premium products and services. In the words of an owner-manager of a Swiss medium-sized manufacturer of controlling instruments:

> *"The infrastructure in Switzerland allows for producing the best products in the market. For this, you also need a clear strategic direction and the aspiration to produce 'premium 200%'."*

As *niche excellence* players they have specialized in their niches, aim for technological leadership, and focus on innovation and premium quality.

Further 15% of interviewees somewhat agreed to this view. Commonly these market players have a dual strategy by focusing on high quality but also accepting lower quality orders to achieve high utilization of their machines *(opportunity trailing)*. Others are *concentration pressed*, i.e., serve with old assets and little innovation primarily the domestic market. 3% of interviewed SMEs had no clear strategic focus on quality. To address cost challenges, their strategic focus lies almost exclusively on productivity.

On the financial result side, 59% of Swiss SMEs expressed that they clearly obtained a price premium for their products. Another 23% somewhat agreed to this view and only 9% of SMEs did not achieve a price premium. Figure 34 illustrates the strategic positioning of the three archetypes of SMEs that focus on product rather than cost differentiation and indicates the number of each type of players interviewed.

Figure 34 – Strategic positioning of Swiss and Singaporean manufacturing SMEs

Note: This figure does not show companies that focus on a cost-leadership strategy. Please also note the relatively small sample size, especially in Singapore.

To build capabilities that allowed for producing premium most SMEs aimed for technological leadership and anchor this aspiration in their strategic goals. This view was emphasized several times across interviews. Consider the strategic orientation of the owner-manager of a small company that manufactures precision parts:

> *"...we focus every day on good work and make use of the latest technologies. Our clear focus on our core competencies helps us to be special and unique. Acquisition of new customers is a good indicator for how things are going. When we fall behind in technology, potential new customers won't buy our products. As a result, we would have to reduce our price and end up in a race to the bottom: competing on price and ultimately [gaining] no profit to reinvest in the latest technology."*

The ability of Swiss SMEs to invent and produce premium products has evolved over many years. Most of the interviewed managing directors emphasized that their strategic focus was predominantly on the enhancement of existing or development of new product niches through technological leadership and innovation. Similar with technological leadership, high innovativeness often doesn't happen by chance but is a result of

strategic planning and internal mechanisms. For example, a Swiss medium-sized manufacturer of safety equipment defined the strategic goal that 8% of the annual revenue need to spring from products that have been implemented in the last three years. As a result, Swiss SMEs often developed their markets by innovative products. For example, a medium-sized manufacturer was the first to introduce electronic controls and hydraulic gears for precision machinery in its market.

However, potential for improvement exists. Only 27% of the interviewed SMEs had a dedicated strategy for their major business units or departments. This is particularly important for medium-sized enterprises because they tend to have a broader product portfolio and are often serving different geographic markets (Ries, 2011, pp.264-265). In only 32% of SMEs was the achievement of strategic goals evaluated systematically, i.e., review of strategic goals and achievements in detail by the managing director and the governing board/owner(s). This reflects the risk that market and product developments may happen rather randomly. Most of those 32% SMEs with a systematic review assessed the status of achievement of strategic goals and initiatives every three to six months.

In sum, Swiss SMEs often have positioned themselves as *niche excellence* players. Their primary focus way forward should be on enhancing their technological leadership and innovativeness. Dedicated sub-strategies for major departments, innovation accounting, and a systematic review of achievement of strategic goals contribute to this focus as sub-strategies increase the awareness of the strategic positioning of each product (line) and on detailed market trends. In addition, they should consider increasing employees' awareness and understanding of firm strategy. Based on the interviews, the following recommendations help to transfer these strategic goals into organizational reality:

- Develop dedicated strategies for business segments and/or departments instead of only for the entire company
- Derive up to four main goals per business unit and/or department
- Develop 5-10 year roadmap for new product as well as technology developments which also helps to prioritize projects
- Delineate strategy clearly in
    - Re-engineering to optimize existing products and product technology on an ongoing basis
    - Innovation and development of new products

- Cooperate closely with research institutes for innovation and form strategic partnerships with companies with complementary products and engineering/manufacturing associations

- Communicate key elements of strategy to all employees every 6-12 months, use concrete examples to avoid misunderstandings, and use informal get-togethers such as company off-sites to repeat strategy and to clarify further questions.

In addition, many interviewees noted that they were operating in a difficult market environment, emphasizing that buyers from abroad often focused more on price when purchasing. Given this difficult market environment and the structural disadvantages many Swiss SMEs should continue to focus on implementation of continuous improvement programs that aim to improve their cost structure (see section 7.3).

Singaporean manufacturing SMEs

Several of the interviewed managing directors and owner-managers of Singapore-based SMEs were optimistic for the local industry, but only if they are able to improve on key strategic dimensions: (1) strategic positioning and planning, (2) strategic alignment of employees, and (3) productivity. In the following, current challenges and recommendations for SMEs along these three strategic dimensions are provided.

Singaporean manufacturing SMEs (1/3): Strategic positioning and planning

The same three archetypes were found for Singaporean manufacturing SMEs: *Concentration pressed, opportunity trailing*, and *niche excellence* players. In contrast to Swiss SMEs and as depicted in Figure 34 the majority of companies are *opportunity trailing* and *concentration pressed*. Few can be classified as *niche excellence* players. Several managing directors criticized that Singaporean SMEs often lacked a clear strategic positioning. Consider the impression of the owner-manager of a medium-sized SME with highly specialized niche products for the aviation industry:

> *"Most SMEs in Singapore don't follow Michael Porter's recommendation: if you want to be successful, you need to have a clear strategic positioning."*

Several manufacturing sub-sectors in Singapore such as electronics are stagnating or even shrinking. As the domestic market is comparably small, SMEs have experienced downward pressure on their margins. To increase utilization of their machines, *concentration pressed* SMEs tended to accept orders of any kind which leaves them with

little industry or product specification. To escape the downward pressure, many SMEs have turned to product quality (58% of interviewed SMEs). Most of them were *opportunity trailing* SMEs that pursued a dual strategy: high quality-low volume (complex systems) and lower quality-high volume products (volume operations model). High quality products generated premiums and the lower quality-high volume products ensured higher utilization of machines and employees. However, this approach carries two risks. Firstly, an opportunistic intake of orders can result in a loss of focus on defined strategic goals. For example, a customer order with a significant need for customization of the expiring product C can result in a loss of focus on products A and B which are central in the firm's strategy. Notably, financial goals may be achieved by opportunistic behavior, but the firm is unlikely to progress (quickly) in the direction of its long-term strategic roadmap. Secondly, optimizing the production system for high utilization of single machines often leads to inefficient end-to-end processes and costly in-process inventory levels (Ries, 2011, pp.184-188). In addition, batch sizes tend to increase which reduces flexibility (pp.197-198).

Next, Singaporean SMEs that are *concentration pressed* or *opportunity trailing* tended to fall short on strategic planning. 78% of interviewed SMEs focused in their (strategic) planning on maximum one year. As the owner-manager of a *niche excellence* SME pointed out:

> *"Planning is critical to best make use of a system and utilize it. [....] My impression is that 90% of local SMEs only plan for 1-2 years at best. This limits them as they focus only on today."*

Several managing directors claimed the dynamic environment to cause long-term strategic planning to be useless. For example, product cycles in electronics last less than six months. An expansion of products and services to other countries is often challenging for *concentration pressed* or *opportunity trailing* SMEs. Compared to local players in nearby Asian markets, these Singaporean SMEs tend to have higher costs. And for serving high quality segments internationally, they often still struggle in achieving highest quality levels or at least fall short on innovation and technology levels. That said, smaller firms can benefit from strategic planning by focusing on product developments which ultimately positively affects firm performance (Song, Im, van der Bij, & Song, 2011). In addition to a focus on innovation, diversification in terms of more prospering local industries such as oil and gas, aviation, or medical devices can reduce the dependency on local sun-setting industries.

In contrast, *niche excellence* SMEs based in Singapore have achieved a clear strategic positioning and focused on innovative and premium products. 14% of interviewed SMEs have their strategic focus on premium quality and innovation. Their focus on foreign markets exposed them to global competition which required specialization of their product and service offerings. All interviewees of *niche excellence* SMEs mentioned that they were following a strategic roadmap. It typically covered 10 years and outlined development steps in terms of technology and product innovation. Finally, Singaporean *niche excellence* players achieved superior financial and market performance despite challenging developments with regards to costs and domestic demand.

However, only 22% of interviewed SMEs reviewed their strategic goals systematically. Those that did, did so primarily on an annual basis. Consequently, most managing directors did not systematically gather feedback on whether strategic goals were met. As a consequence, company development may happen in a less planned manner. In the words of a *concentration pressed* manufacturer of precision parts:

> *"We are like a ship on the ocean. I set the direction but the final port I cannot tell. The focus is more to do every day small steps passionate and excellent. Then the results will come."*

Singaporean manufacturing SMEs (2/3): Strategic alignment of employees

Besides the lack of strategic planning and positioning, the majority of SMEs reported low levels of strategic alignment of their employees. More precisely, only 46% agreed that their employees are, in average, aware of the strategic direction of the company. 18% even considered their employees to be unable to derive operational goals from strategic goals. As the managing director of a small *concentration pressed* SME pointed out:

> *"Most of the workers are just happy to have a job and, frankly spoken, do the job to earn money. Our lower-paid workers change in average every 2 years. We do not really focus on them, e.g., in terms of training, etc."*

This statement also indicates the low focus on long-term development of employee skills. In addition, it shows that employees in Singaporean SMEs seem to be highly motivated by monetary incentives. As a result, 71% (6%) of interviewed SMEs had a monetary incentive scheme that tied bonus to individual (company) performance. The

average bonus for shopfloor employees was 5-18% of the annual salary.[54] The remaining 24% of companies used non-monetary incentives such as overseas training or invitations for dinner with the leadership team.[55]

To increase awareness and understanding of strategy, managing directors could focus more on managerial processes and systems, e.g., clearly define firm strategy, communicate strategy and targets as well as use measurement systems in an interactive way. For example, in a Singapore-based medium-sized manufacturer of springs the foremen rather than the department managers presented in the monthly target meeting the department's performance using key measures concerning financials, quality, and productivity. Through this, the managing director ensured full understanding of and commitment to the strategic goals. At the same time she had the chance to train the foremen.

Singaporean manufacturing SMEs (3/3): Productivity

In recent years, Singaporean SMEs have focused on productivity to improve their cost structure. Rising input factor costs are particularly challenging for *concentration pressed* SMEs. In Singapore, unit business costs in the manufacturing industry have increased in total by 7.4% from 2005-2012 (Singapore Ministry of Trade and Industry, 2010, 2012). As depicted in Figure 35, strong increases in service costs (+17.1%) such as charges for warehousing services, transportation and rental and to a lower extent increase in governmental rates and fees (+10.0%) were dampened by a reduction of unit labor costs (-7.4%).

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[54]Excludes 13th month salary and salary increases for the consecutive year.
[55]In comparison, only 26% (37%) of the interviewed Swiss SMEs tied bonus to individual (company) performance with an average bonus range for shopfloor employees of 2-8% of the annual salary. In 37% of SMEs, employees were rewarded by non-monetary means.

Figure 35 – Unit business costs in manufacturing industry, 2007-2012p

Percent, indexed at 2005
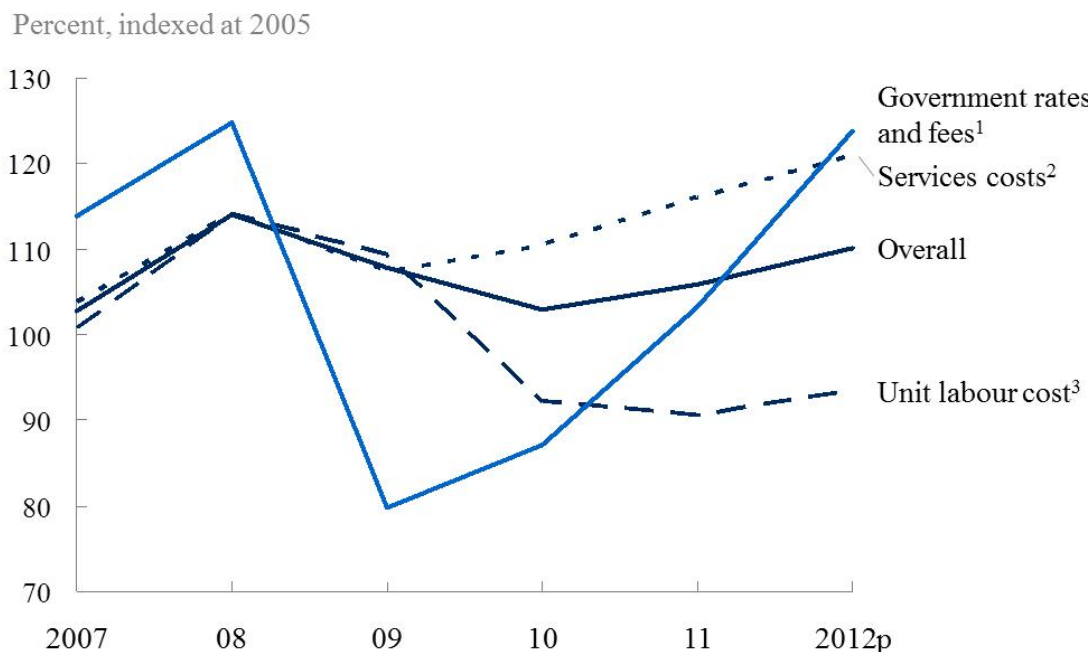
1) Includes import and export duties, property and tax, other taxes and fees, e.g., road tax, business registration tax

2) Includes charges for utility, warehousing services, rental for industrial premises, financial services, transport, wholesale and retail, IT, professional services

3) Includes remuneration, skills development fund contributions, foreign workers levy collection

Source: Data from Singapore Ministry of Trade and Industry (2010, 2012)

Higher labor productivity led in the same period to an increase of value added per hour worked in this industry by +27.7%. This efficiency increase reflects the industry's and government's efforts to improve productivity, e.g., by the Productivity and Innovation Credit Scheme (PIC). However, evidence for most Singaporean industries exists that productivity increases in the past were mainly driven by technology improvements rather than workforce efficiency (Lee, 2013). In the words of a managing director of a medium-sized manufacturer of precision parts:

> *"[…] we need to work on productivity. The government PIC has helped us to buffer some investments but ultimately it's about people. People productivity, multitasking is essential. Not all companies can automate. I think that many SMEs need to get a lot of help to get lean. It needs to start with the top leader, who needs to believe in this. Then, people need to have a mindset for continuous improvement and the leadership team needs keep on preaching and selling a lean mindset."*

In line with this view, the value added per worker remained almost flat between 2007 and 2012 (+4.0% or CAGR 0.8%) as shown in Figure 36.

Figure 36 – Remuneration and value added per worker in the manufacturing industry, 2007-2012p
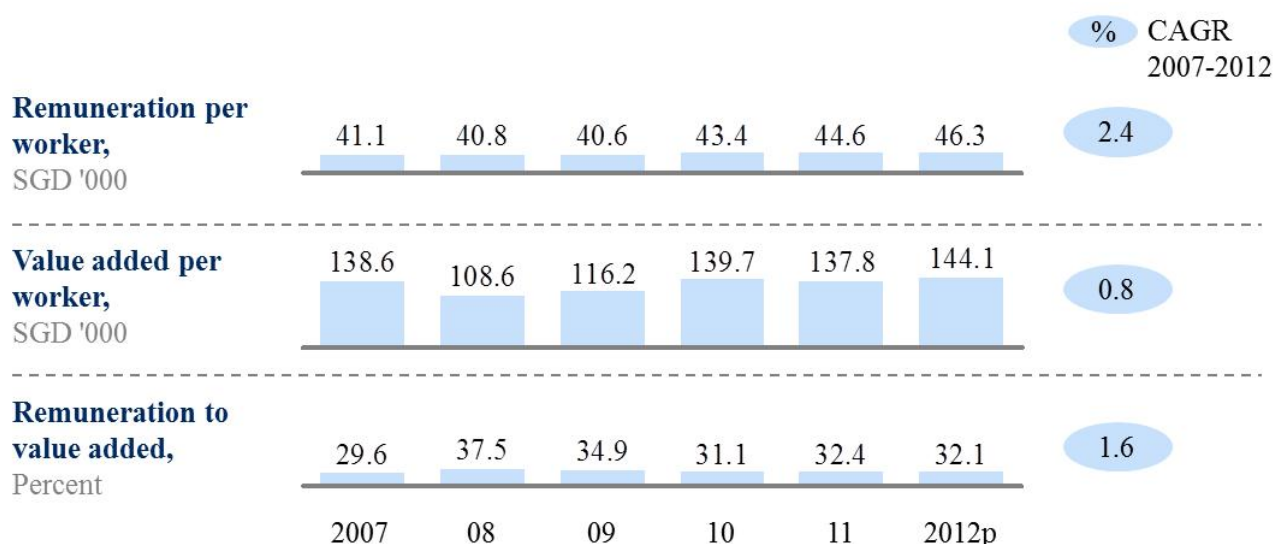
Source: Data from Singapore Ministry of Trade and Industry (2012),
Singapore Ministry of Manpower (2012)

As a consequence, further improvement potential exists. In the words of an owner-manager of a medium-sized SME:

> *"When I look to the technology leaders, I can still see so much space to improve. This makes me optimistic that we can still improve."*

Looking forward, SMEs see major cost challenges in factors beyond their control, i.e., cost of materials, salary hikes and rent increases (DP Information Group, 2012a). This is particularly challenging because SMEs pale in levels of value added per worker compared to large enterprises (Chew & Chew, 2008; DP Information Group, 2012a). In this light, some *concentration pressed* and *opportunity trailing* SMEs consider relocation

to lower cost countries such as Malaysia or China. However, SME managing directors need to be aware of total cost of production which might be higher than initially estimated. Consider the experience of a Singapore-based medium-sized manufacturer of precision injection molds:

> *"I think that relocation is wrong. Focus should be on improving productivity here [in Singapore] and grow. Often firms relocate because they see labor cost advantages. However, they do not properly calculate total costs. Besides, there is often political instability. I am convinced that companies can sustain here. Even in high-cost countries such as Germany or Switzerland companies do perfectly. Every country has a certain kind of formula for success."*

SMEs that plan to serve the respective foreign market need to bear in mind that often not only input factor costs but also product prices in the foreign market are lower. Therefore, potential cost savings do not necessarily translate into higher margins.

In sum, SMEs based in Singapore operate in a challenging market environment with rapidly increasing costs for input factors. SMEs face different challenges depending on their strategic positioning in the market. Improvement potential for sustainable operations in Singapore exists according to SME leaders and when considering the development of value added per worker over the last years. Strategic recommendations for *niche excellence* players focus mainly on enhancing their innovativeness and product specialization. Therefore, recommendations are similar to the ones for Swiss SMEs. *Concentration pressed* and *opportunity trailing* SMEs are recommended to focus their strategic endeavors on three main areas: (1) strategic positioning and planning, (2) strategic alignment of employees, and (3) productivity. In the following and based on this field study, several interesting practices are provided:

- One week offsite strategy workshop with the owner and the management team to clearly define a 5-10 year strategic roadmap and to avoid distraction by day-to-day business
- Explicit focus on product development, research and development, e.g., investment of 10% of revenue in research and development
- Definition of up to 4-6 key measures for each business unit/department to increase strategic focus and to avoid „*cockpit-mentality*"

- Communication of strategy to all employees (every 6-12 months), including key elements, opportunities and risks, importance of major projects, concrete examples, and clarification of questions
- Systematic review of implementation status of strategic initiatives and of achievement of strategic goals, e.g., half-yearly
- Avoid opportunistic intake of orders that are not in line with the firm's strategy.

7.3 Recommendations for implementation of measurement systems

Regardless of country, implementation and use of measurement systems is particularly challenging for SMEs given their firm characteristics (see chapter 2). This study finds supporting evidence for the use of measures in SMEs. Broader measurement systems reinforce this effect. Notably, 11% of SMEs in Switzerland and Singapore have implemented a comprehensive measurement system. All of these firms were medium-sized enterprises with an average of 131 (160) employees in Switzerland (Singapore). The concern that measurement systems may be less suitable for businesses that offered primarily project work appears untenable because 29% (66%) of SMEs with comprehensive measurement systems offer project-based products or services. managing directors in this field study had opposing views on the use of measures in managerial processes. Proponents mentioned the following four benefits:

- Transparency on recent business development and operations
- Higher awareness of market trends and information on a potential mismatch with firm strategy, e.g., development of product-mix
- Constant reminding of targets set on all hierarchical levels
- Positive marketing effect when dealing with large companies.

Contrary, other managing directors argued that in SMEs there are several circumstances when the use of measures is not beneficial. They suggested that measures should not be used in the following three circumstances:

- High effort to gather, process, and analyze data which impedes innovativeness
- Small enterprises with high dependency on highly volatile exogenous factors which are beyond the SME's control
- Low need for cost management, e.g., due to high margins or lack of competition.

If the owner-manager or managing director decides to use measures or even adopt a comprehensive measurement system, then three steps are suggested based on qualitative findings: (1) establish a sound basis, (2) define relevant measures, and (3) continuous

improvement. The starting point is contingent on the maturity of the firm as depicted in the lower part of Figure 37.

Figure 37 – Three-step approach for implementation and use of measurement system
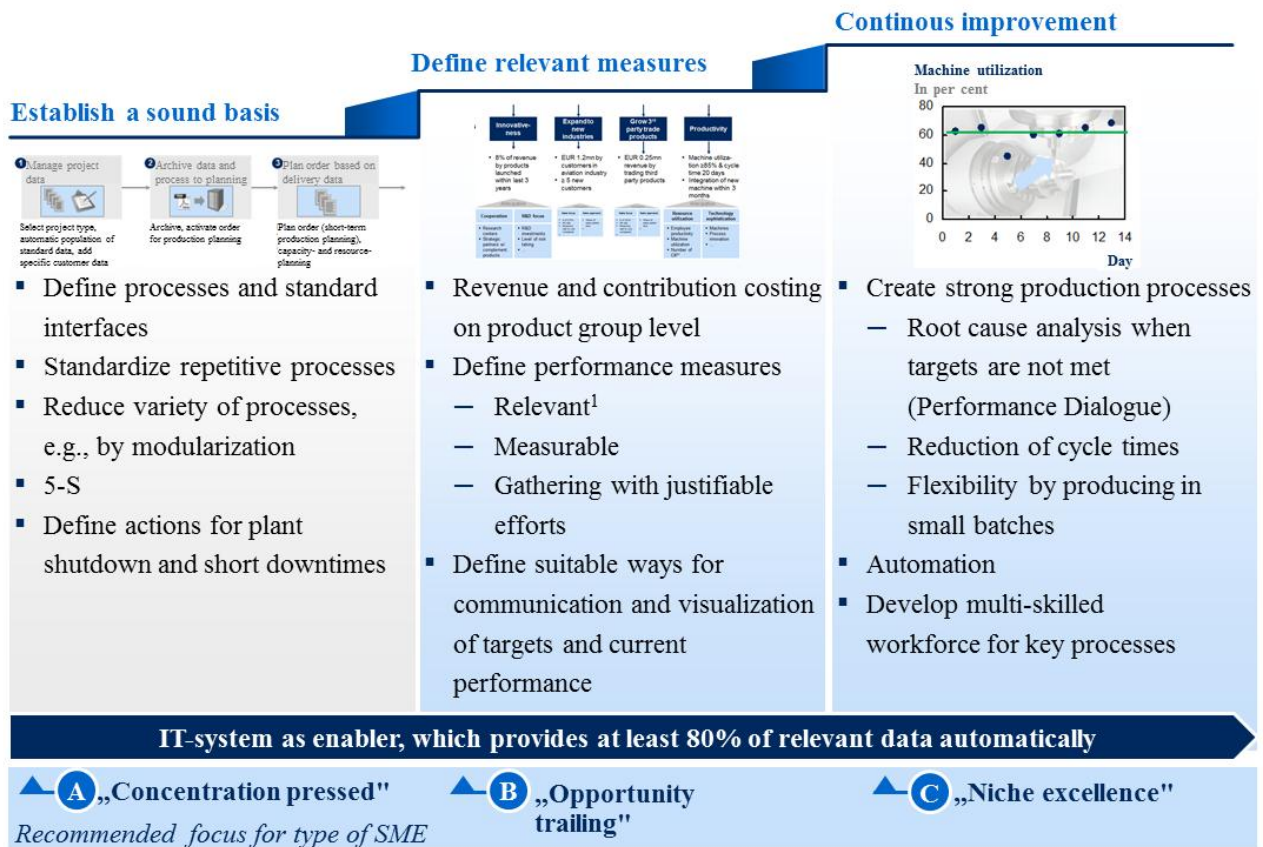
1) Derived from an SME's strategic success factors and for key processes

Establish a sound basis

In the first step, the SME needs to establish a sound basis to stabilize its operations system and reduce volatility. This requires identifying and defining core processes that are essential for the business and have an influence on the SME's major success factors such as time-to-market, innovativeness, and flexibility. For example, core processes in job preparation and engineering are order intake, production planning and production. Clearly defined processes and interfaces are important because they help to synchronize operational steps within and across departments, and are the basis for reduction of non-value adding activities, and ultimately meaningful automation. Based on these processes the SME can apply basic principles of the lean production philosophy such as flow principle for end-to-end processes, pull systems, or Six-Sigma (e.g., Womack & Jones, 1996).

Successfully establishing a sound basis requires consideration of an SME's specific characteristics such as resource constraints and importance of personal relationships. Consider the approach of an owner-manager of a Swiss medium-sized manufacturer of precision tools:

> *"A top-down consulting approach doesn't work for us. We define a small project for single employees or teams. The first pilots of our Six-Sigma approach generated only small savings around CHF 10.000 per year. It is important that the employee can see his success. Achievements are then made public within the company and celebrated to reward the employee and to support the change management process."*

Next, it is recommended to standardize repetitive processes to ensure that they are conducted in the same way which facilitates learning and quality improvements. For example, a precision tool maker standardizes its tooling system to organize production sequence, to align interfaces for tools and work pieces, and to support flexible manufacturing processes. Then, the tool maker separates the set-up (support activity) from the working process (value adding activity) which helps to reduce set-up times and ultimately cycle time. Standardization is essential for measurement because without standardization process characteristics such as cycle and tact times cannot be measured in a consistent way. However, standardization needs to be done in a way that still allows flexibility, a key success factor for many SMEs. This can be achieved for example by production in small batch sizes (e.g., Reinertsen, 2009) and modularization of products (e.g., Mohamad, Hickethier, Hovestadt, & Gehbauer, 2013). As a consequence, the variety of differing processes is reduced but flexibility to customize products remains. The reduction in process variety builds the basis for standardization. Consider the experience of the owner-manager of a Swiss small manufacturer of textile machinery:

> *"We try to use standardized parts as part of our basic modules. These basic modules are used in all products. This allows us to standardize our processes."*

Lastly, house-keeping is the basis for value adding activities. Several frameworks such as 5-S (sort, straight, shine, standardize, and sustain) exist (Womack & Jones, 1996, p.348). This helps SMEs to increase transparency on their operations, and therefore to identify and to eliminate non-value adding activities. Establishing a sound basis appears particularly relevant for *concentration pressed* Singaporean SMEs because it is a

necessary requirement for high quality. With regards to tidiness, the owner-manager of a medium-sized Singaporean manufacturer of precision parts has observed:

> *"There's no Chinese word for housekeeping and we are really bad in this. As an example, I was so impressed to see an employee in a Swiss firm took off his shoes, climb up his machine, and start cleaning until it [was] super clean."*

Define relevant measures

All SMEs are advised to monitor and to manage fundamental financial measures such as liquidity or leading indicators such as order intake. Ideally, these metrics are on product group, department or team level to increase transparency on drivers for change in revenue and contribution costing. SMEs should also derive further measures that reflect the key success factors of their business.

Measures need to be relevant, measurable, and can be gathered with justifiable efforts. Relevant refers to a measure being causally linked with firm strategy. For example, an SME has defined the strategic goal to become technology leader for clamping tools and to diversify its industry footprint. At the same time the SME aims for 10% growth in revenue at a profit margin of at least 15% (Figure 38).

The owner-manager has decided to focus on sales growth and therefore has defined the following four success factors: focus on innovation, expand business to aviation industry, grow third party trade products, and increase productivity of internal processes. For each of these four success factors, the owner-manager has defined targets.

As depicted in the figure, not all targets need to be quantified. The firm's success factor to increase value add of internal processes is reflected by two targets. The first one, embed know-how in processes, intentionally defined qualitatively as concrete measurement, may be less meaningful. For instance, it might take fewer efforts to transfer know-how from one expert to the price-product feature determination process than for another expert to the tool fitting process. Therefore, defining measurable metrics is advisable but may not always be meaningful. In addition, cases exist when measurement is in theory possible but requires significant efforts. That said, gathering of data with justifiable efforts is particularly important for SMEs given their resource constraints (see chapter 2). In the absence of a supporting IT system and to reduce measurement efforts, an SME may for example consider to gather and to analyze data on a quarterly basis only.

Figure 38 – Example for definition of relevant measures
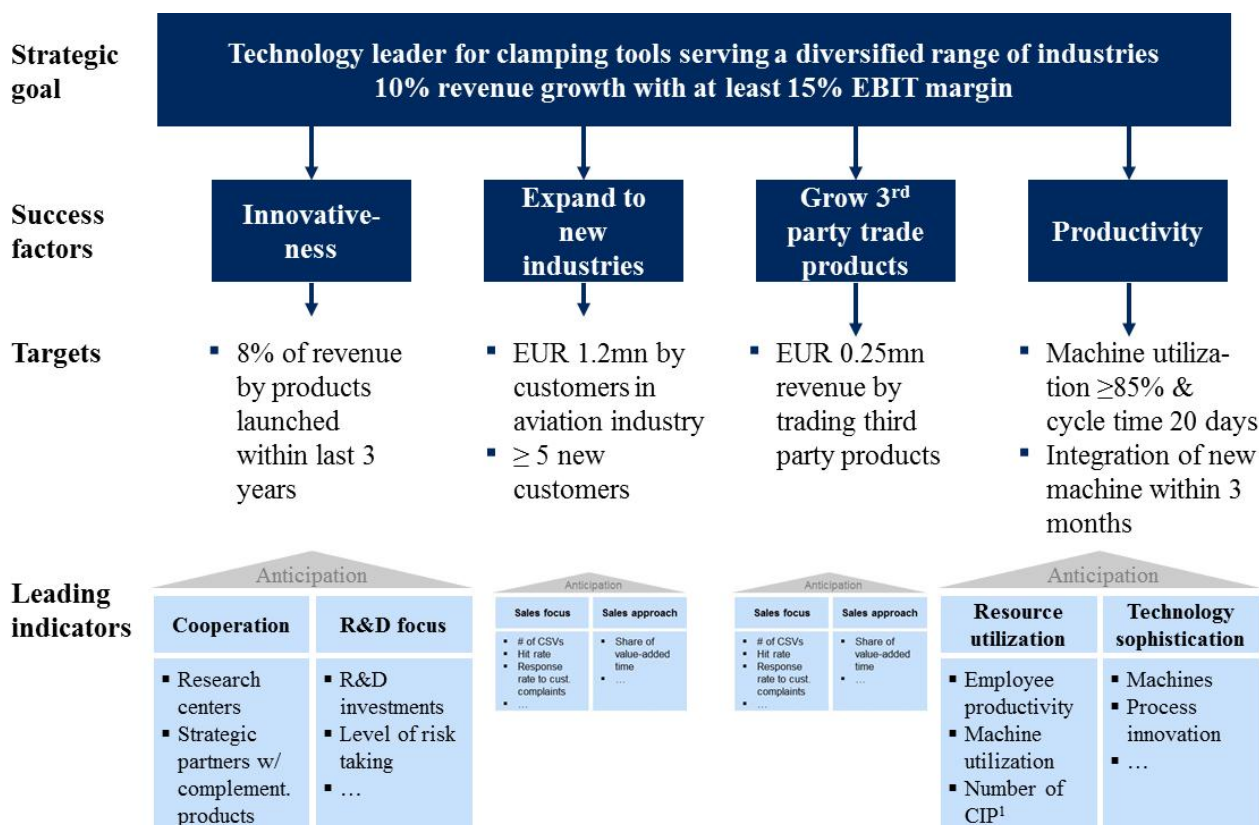
1) Continuous improvement program suggestions

For each target and measure, the SME should consider leading indicators as well. To react to volatility in demand and operations, the notion of leading indicators is important because it takes foresight to launch counteractions to become effective in time. However, many SMEs focus exclusively on lagging measures such as sales (see Figure 19). If, for example, an SME starts to increase sales visits only after noticing that sales has gone down, it is likely that counter initiatives become effective too late. In contrast, a focus on leading success factors such as number of customer visits or hit rates allows the SME to predict future changes of sales and to adjust its efforts accordingly.

Lastly, key measures that are relevant to departments, teams, and employees need to be communicated in a meaningful way. Yigitbasioglu and Velcu (2011) summarize findings in literature on the design of dashboards for performance management. The authors conclude that the design needs to reflect the purpose and the dashboard users' tasks, expertise, and cognitive capabilities when deciding on a presentation format (pp.51-53). Based on the circumstances, managers can then detail functional (e.g., graphs vs. tables, aggregation level, automated alerts) and visual features (e.g., single page, use of grid lines) (p.47). For example, visualization of trend curves for machine utilization can be

operationalized by showing targets, historical and actual as-is performance to facilitate understanding and awareness of performance and remind employees on a day-to-day basis about strategic goals.

Continuous improvement

The last step focuses on integrating the measurement system into daily processes and supports continuous improvement. This requires a systematic and regular review of performance and root cause analysis when targets are not met. For example, weekly cross-functional "*Performance Dialogue*" meetings with shopfloor employees together with the production manager and/or managing director facilitate the discussion of causes ("*5 Why's*"; see Ries, 2011, pp.229-232) and solving of problems to ensure that mistakes made will not occur in future any more. As a result, non-value adding activities are eliminated over time and support activities are reduced (Womack & Jones, 1996, p.176). This positively affects cycle times and overall productivity. For example, setup times for CNC machines can be optimized by introducing presetting cells in which tools and frames are measured and fitted. This clear separation of set-up and working process reduces a machine's idle time which in turn, increases productivity. Consider the experience of an owner-manager of a medium-sized manufacturer of precision parts:

> *"We use offline loading: we place the parts or materials to be processed in the precision fixture while the machine is working. Once the current batch is finished, we can immediately load the fixture into the machine and the next batch can start almost immediately. This frees up manpower to work on two or more machines simultaneously."*

This quote also indicates that an employee's ability to work on several machines is especially important in SMEs. This is because know-how is often in the heads of employees rather than in processes. A multi-skilled workforce is likely to increase the number of workers that have know-how on the same machine and production step. This reduces the dependency on individual experts which becomes particularly relevant in case they are absent or leave the company. In addition, and as noted in the part on strategic planning, planning is critical to best make use of assets and allow for automation.

Lastly, standardization and the creation of strong production processes set the basis for automation. Automation may conflict with flexibility, but even when batch sizes are small some of the interviewed SMEs have found ways to automate and to increase their productivity.

Figure 39 summarizes the examples provided above. It illustrates well the three-step approach to implement and to use a measurement system for a contract manufacturer of precision parts that pursues the strategic goal of increasing productivity.

Figure 39 – Example for contract manufacturer for precision parts with strategic goal productivity increase
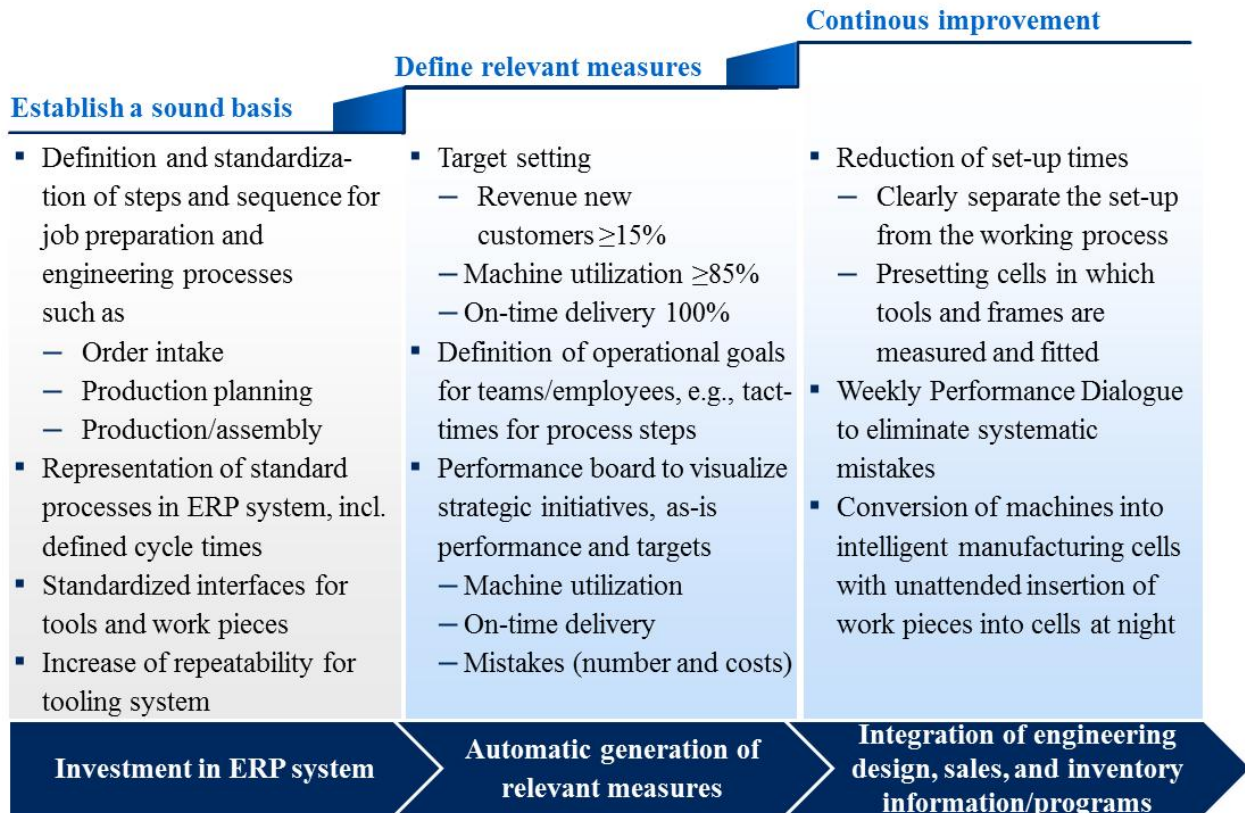
In conclusion, if applied correctly, SMEs can by the use of relevant measures enhance their abilities to sense opportunities and to eliminate waste in their processes. The first builds the basis to seize strategic opportunities and the latter frees up resources for value adding activities such as research and development. As a result, external trends and internal shortcomings become more visible and should be approached with honesty and the intention of learning, not with recrimination and blame. This contributes towards building organizations that focus on sustainable value creation. In contrast, valuable employee time in an SME is wasted if extensive measurement turns into an end in itself.

8   Conclusion and research directions

This last chapter serves to recall the study's goals and to summarize findings. Finally, the limitations of this research are highlighted which build the starting point for the suggested avenues for further research.

8.1   Summary of findings

This study offers insights to performance management research by investigating the effects of Strategic Performance Management in SMEs. Strategic Performance Management refers to "*formal and informal mechanisms, processes, systems and networks used by organizations for conveying the key objectives and goals elicited by management, for assisting the strategic process and ongoing management through analysis, planning, measurement, control, rewarding, and broadly managing performance, and for supporting and facilitating organizational learning and change*" (Ferreira & Otley, 2009, p.264). In this study, the concept is divided in two components for detailed analyses: the use of measures and the design of PMS. Its goal is to analyze the effects of both components on strategic alignment of employees and SME performance and therefore addresses the need to investigate:

What is the effect of Strategic Performance Management on SME performance?

By this, it provides empirical validation for the mounting research on Strategic Performance Management in SMEs that this management approach is beneficial in smaller firms (e.g., Sousa & Aspinwall, 2010, Wiesner *et al.*, 2007). The research draws on 90 interviews in which owner-managers and managing directors of Swiss and Singaporean manufacturing SMEs filled in a questionnaire.

Results provide supporting evidence for the use of measures in SMEs. The use of measures refers to the extent to which an organization uses metrics in the key managerial processes target setting, evaluation of company performance, and setting of incentives for employees. For example, setting clear financial and quality targets on product level for the entire firm and breaking them down to department and team level is considered as higher use of measures in target setting. The use of measures is found to be positively associated with strategic alignment of employees. Results were robust and not sensitive to changes in the constructs or the measurement instrument.

In addition, a positive and indirect effect on firm performance exists. This effect, however, depends on firm size. Findings suggest that a critical firm size of around 45-55

employees exists above which the use of measures has a highly significant effect on strategic alignment of employees. In addition, the use of measures is in this case directly and positively associated with firm performance. A possible explanation for this is that with larger firm size strategic and organizational complexity increases and with it the difficulty and required efforts to strategically align employees. This is important because it implies that SMEs should not be treated as a homogenous group but rather be delineated in small *and* medium-sized enterprises when analyzing performance management related topics. That said, this study also contributes to mounting literature that suggests that the effect of Strategic Performance Management on firm performance is indirect via people's behavior (e.g., Burney & Widener, 2007; Ittner, Larcker, & Meyer, 2003) and organizational capabilities (e.g., Chenhall, 2005; Hall, 2008).

Results indicate different effects for various PMS design properties, suggesting research should consider SME-specific characteristics more when recommending suitable PMS designs. This study's approach to model design properties of the measurement system as an interaction effect allows for identifying the associated marginal effects. It finds supporting evidence for the breadth of a measurement system. Broader measurement systems positively moderate the underlying association between use of measures and strategic alignment of employees. Findings are on a 90% confidence level, the significance of the marginal effect depends on the extent to which an SME uses measures, and are less robust. Therefore, an unconfined recommendation for comprehensive PMS such as the Balanced Scorecard seems less appropriate for SMEs. In contrast to previous research in large organizations (e.g., Bisbe & Malgueño, 2012; Hall, 2008), this research finds no statistically significant effects for the PMS properties alignment of measures with firm strategy and the required level of formalization.

Next, this study contributes to the performance management literature by providing an operationalization of Ferreira and Otley's (2009) Strategic Performance Management framework. The chosen measurement approach proves constructs to be of high reliability and validity. However, findings are sensitive to changes in the measurement instrument. This emphasizes the importance for further research to design constructs and measurement instruments in line with literature. That said, the model fit was moderate for the sub-model with the endogenous construct strategic alignment of employees. The full model which includes the second endogenous construct firm performance, showed limited predictability. This is not surprising because firm performance is influenced by several variables that were not included in the research model, e.g., environmental factors, quality of and access to resources. As this research focuses only on the inner

dimensions of Ferreira and Otley's (2009) framework, I hope that the suggested operationalization approach encourages researchers to continue their investigations into how the firm context influences Strategic Performance Management.

This research also addresses national culture and emphasizes the importance of considering this contextual factor in further research. Surprisingly little research exists in this important sub-field (e.g., Keleş & Aycan, 2011; Rubienska & Bovaird, 1999). To provide avenues for further research, this study develops propositions based on empirical findings for the use of measures and design of measurement systems in Singaporean and Swiss SMEs. Findings suggest that Swiss organizations use measures significantly more for target setting and performance evaluation. In contrast, Singaporean enterprises tend to emphasize incentive setting and adopt broader measurement systems. This is important because research on performance management is ethnocentric Western-focused but findings indicate that differences in the use of measures and in the design of measurement systems across cultures exist.

Finally, this study provides detailed insights for practitioners and interested researchers on the use of measures and design of measurement systems. Descriptive characteristics are presented along eleven indicators for the use of measures and nine indicators for the design of PMS, consistently delineated in small and medium-sized firms as differences in practices exist. For example, medium-sized enterprises tend to rely, in average, more on measures than their small counterparts. Compared to Swiss firms, Singaporean medium-sized companies tend to have broader measurement systems. In addition, this research also provides managerial recommendations and concrete examples based on the qualitative part of the 90 interviews. The focus lies on when to use measures and how to design a strategic measurement system. In addition, this study reveals the different strategic positioning of SMEs in Switzerland and Singapore, elaborates on associated challenges that each archetype currently faces, and suggests a three-step approach for implementing sustainable performance management-processes.

8.2 Limitations and further research

This study's primary intention is to investigate whether Strategic Performance Management has a positive effect on strategic alignment of employees and firm performance in manufacturing SMEs. With regards to national culture, my intention is not to offer a quantitative assessment of the relationships between cultural dimensions and Strategic Performance Management. Instead, this study's secondary goal is to develop propositions for associations between the concepts under study. In the following,

I suggest various avenues for further research and tie these suggestions to potential limitations of this research.

Firstly, various industries should be empirically examined. This research focuses on the manufacturing industry. This limits the potential to generalize findings across industries. The identified effects may differ across industries. In particular, service firms rely heavily on employees as well as on consistent service levels. Differences in management practices exist between service and manufacturing enterprises with regards to planning and budgeting, incentive systems, and PMS (Lääts, Haldma, & Möller, 2011, pp.363-365). Differences can also be found within the service industry. For example, firms in the business consulting industry often have adopted mature measurement systems. Project teams and team members receive frequent and detailed quantitative and qualified feedback along several measures that have been identified as crucial for a project's success (e.g., customer feedback regarding a project's perceived impact) and the employee's development (e.g., analytical and communication skills). Contrary, restaurants, for instance, could benefit from more mature measurement systems (Heikkilä & Saranpää, 2006, pp.24-38). Thus, service industries offer a rich context to examine the outcomes and conditions of Strategic Performance Management empirically.

Secondly, the relatively small sample size of 90 valid observations puts a caveat to the findings. Operationalization of general rules of thumbs to arrive at meaningful generalizations such as a sample size of 10% of the total population is challenging. In Switzerland for example, this recommendation would translate in a minimum sample size of about 7,500 manufacturing SMEs.[56] This sample size appears unrealistic. This is because the relatively low interest of SMEs to participate in (online) surveys (e.g., Garengo *et al.*, 2005, p.28) and the limited access to specific (financial) information on firm-level set oppressive boundaries for research in the context of SMEs.

Thirdly, an important avenue for further research is the empirical examination of alternative dependent variables. This study focuses on strategic alignment of employees and financial performance of the firm. SME managers emphasized the importance of flexibility, innovativeness, and time to market for their businesses which qualify for promising alternative dependent variables. For example and in line with practitioners' view, previous research in SMEs found organizational factors such as innovation strategy

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[56]High-level estimate based on 39.361 small and medium-sized SMEs in Switzerland in 2008 (Schweizer Bundesamt für Statistik, 2010) and on the assumption that share of 19% value add to overall economy for manufacturing (Schweizer Bundesamt für Statistik, 2014a) equals the distribution of SMEs across industries.

and project management as important to commercialize innovation (Do, Mazzarol, Volery, & Roboud, 2014). Other researchers suggest that a more measure-driven management of innovation (innovation accounting) results in both higher efficiency and effectiveness (Möller *et al.*, 2011). As such, it is important to understand the effects of Strategic Performance Management on alternative outcomes as mentioned above.

In addition, key informant reliability is a potential limitation of this study because financial performance was quantified based on the perception of the interviewee given the limited availability of financial information of SMEs. A single source provided information on both dependent and independent variables, with potential downsides on correlation values between variables (Podsakoff *et al.*, 2003, p.879). That said, biased perceptions or overconfidence was not an issue in this study, as validated by additional ten secondary interviews. However, further research should aim to analyze the use of measures and PMSs in SMEs using more objective measurement approaches and extend the scope towards alternative performance measures such as innovativeness, flexibility, and time to market.

Fifthly, elements capturing the conditions under which PMSs are used should be considered. The variables in scope of this study are based on Ferreira and Otley's (2009) comprehensive framework for Strategic Performance Management. Given the degrees of freedom in this study, my scope of analysis is restricted to variables from the inner core of this framework. Therefore, important contextual dimensions are subject for further investigations. For example, this study does not analyze how a PMS is actually used within the organization, i.e., in an interactive or control way (e.g., Bisbe & Otley, 2004; Henri, 2006a). This seems important in the context of SMEs because of two reasons. First, the relatively higher importance of each employee due to resource constraints and the close relationship between owner and employees are likely to reinforce the effects for each type of use observed in large companies. Second, the way a PMS is used affects organizational capabilities and learning (Bisbe & Otley, 2004; Henri, 2006a). These effects are likely to have a major impact on an SME's competitiveness. Based on the introduced framework the following topics look promising for further empirical research: interactive vs. control use, organizational structure, dynamic PMSs, information flows and networks, and strength and coherence.

Next, the costs of implementation, for using measures and for maintaining PMSs matter. While this study provides empirical justification for SMEs to use measures and broader measurement systems in their managerial processes, findings do not imply that this should be done without careful assessment of costs for implementing and maintaining

these systems. Further research could add value by better understanding the total effect of Strategic Performance Management on SME's competitive advantage by considering not only the outcomes but also the associated efforts.

Finally, research that empirically tests the effects of national culture on Strategic Performance Management would offer valuable insights on contextual factors. This study lays out avenues for further research in this interesting sub-field by developing propositions. Statistically different practices in the use of measures and with regards to breadth of measurement systems are identified in this study. For example, Singaporean SMEs link incentives more to individual performance compared to their Swiss counterparts. This suggests that Strategic Performance Management is applied differently in different environments. However, the approach chosen is limited to two countries only which does not allow for quantitative testing of predicted associations. The academic and practical value to be gained from further research in this area would be tremendous given the rising importance of economies in the East and, in contrast, the predominantly-Western focused research in the field of performance management.

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Appendix

Appendix 1 - Overview of focal constructs

	Definition	Variation	Example	Source
Strategic Performance Management	"Formal and informal mechanisms, processes, systems and networks used by organizations for conveying the key objectives and goals elicited by management, for assisting the strategic process and ongoing management through analysis, planning measurement, control, rewarding, and broadly managing performance, and for supporting and facilitating organizational learning and change"	n/a	Company that bases decision-making on and uses a comprehensive measurement system for setting of strategic targets, performance review, and setting employee incentives	Ferreira & Otley (2009, p.264)
Strategic alignment of employees	Extent to which "organizations align their [employee] actions in pursuit of their strategic objectives"	Continuous from zero to high	Employees are fully aware of the firm strategy and can translate it into operational activities in their day-to-day work	Franco-Santos, Lucianetti, & Bourne (2012, p.95)
Firm performance	Perceived financial performance of an organization as indicated by profitability growth and revenue growth	Continuous	Above industry average financial performance over last three years	n/a
Use of measures	Extent to which an organization uses measures in the three key managerial processes: target setting, performance evaluation, and setting employee incentives. A measure is a metric or indicator that allows for quantifying the performance of a focal construct.	Continuous from zero to high	Monitoring the efficiency of the back-end sales process, product sales, or asset utilization.	Building on Ferreira & Otley (2009)

	Definition	Variation	Example	Source
Design of measurement system	Properties that describe the scope of the measurement system used with regards to *"financial- and non-financial measures [that] are used to operationalize strategic objectives"* and the way it is used within the organization	n/a	Balance Scorecard with cause-and-effect relations between measures and with firm strategy	Building on Franco-Santos, Lucianetti, & Bourne (2012, p.80) and Kaplan & Norton (1992, 1996a)
Alignment of measures with firm strategy	Degree to which performance measures describe strategy consistently *"by using cause-and-effect relationships"*	Continuous from zero to high	Leading operational measures (e.g. patents) that represent value drivers of the firm (e.g., innovativeness) which ultimately contribute to achievement of firm strategy	Building on Speckbacher, Bischof, & Pfeiffer (2003, pp.365-366) and Kaplan & Norton (2001)
Breadth of measurement system	Degree to which measures cover financial and non-financial aspects of the organization's strategy and to which measures are interlinked with a cause-and-effect relationship	Continuous from zero to high	Leading and lagging performance measures that cover a financial, customer, internal process and organizational learning perspective	Kaplan & Norton (1992, 1996a, 1996b)
Formalization of measurement system	Degree to which activities of employees are governed by process procedures and organizational standards	Continuous from zero to high	Relevant department measures visible on shopfloor level e.g., by graphs visualizing target, and as-is performance	Building on Terziovski (2010, p.893) and Golann (2006, p.370)

Appendix 2 – The Performance Management systems framework
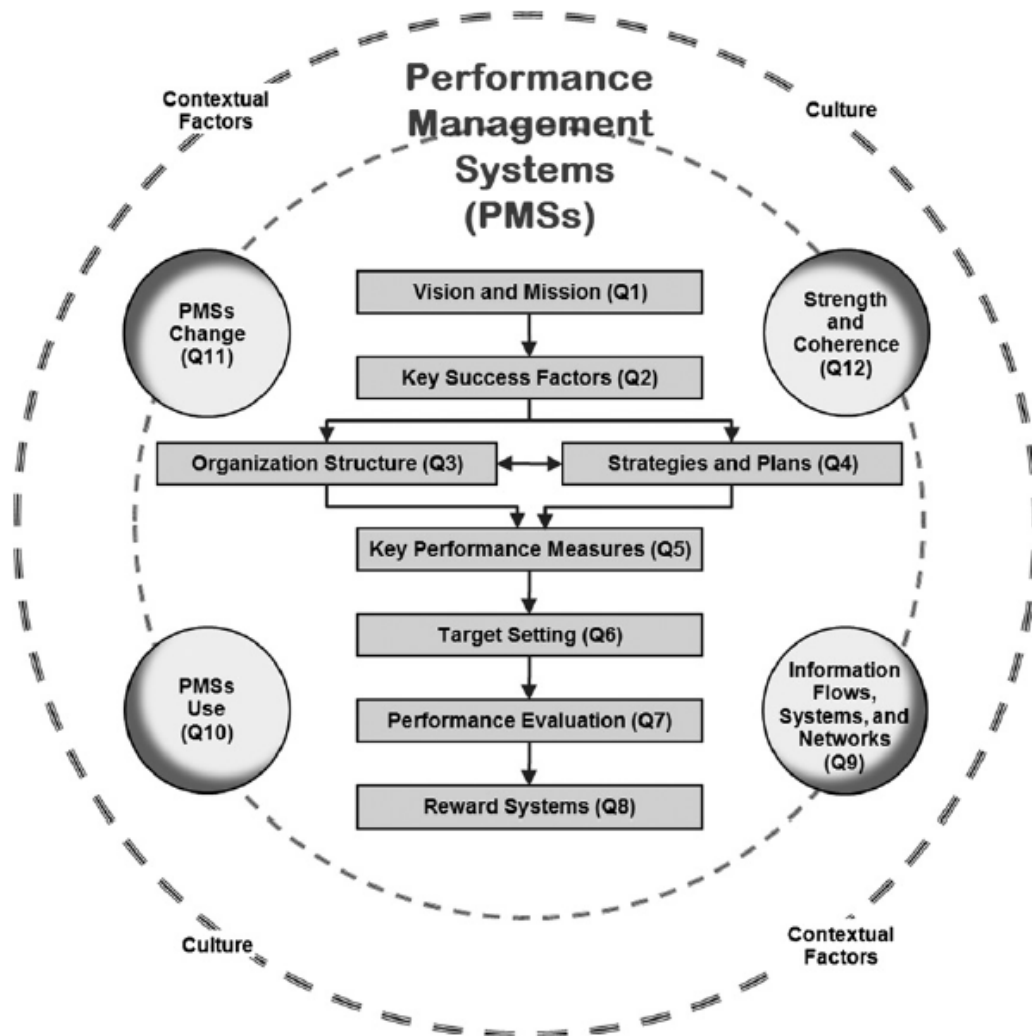
Source: Ferreira and Otley (2009, p.268)

Note:

- Independent variable "*use of measures*" in the baseline model of this study refers to the last three variables "*target setting*", "*performance evaluation*" and "*reward system*"
- Moderating variables refer to Ferreira and Otley's (2009) variable "*key performance measures*". This variable captures the preceding variables and can be described by the PMS properties "*alignment of measures with strategy*", "*breadth of measurement system*", and "*degree of formalization*".

Appendix 3 – Overview of interview partners

No.	Country	Interviewee	Industry classification	Size, in FTE	Size cluster	Mode	Date	Duration, in min
1	CH	Managing director	General manufacturing industries	250	Medium	Phone	23. Aug 2013	60
2[2]	CH	Managing director	PE: Precision tools	30	Small	Phone	28. Aug 2013	100
3	SIN	Owner-manager	General manufacturing industries	8	Small	In person	29. Aug 2013	80
4	SIN	Managing director	PE: Precision parts	240	Medium	In person	6. Sep 2013	60
5	CH	Owner-manager	PE: Precision tools	170	Medium	Phone	10. Sep 2013	50
6	CH	Managing director	PE: Precision tools	65	Medium	Phone	10. Sep 2013	60
7[2]	CH	Owner-manager	General manufacturing industries	15	Small	Phone	12. Sep 2013	50
8	CH	Owner-manager	General manufacturing industries	10	Small	Phone	16. Sep 2013	55
9	SIN	Managing director	PE: Precision parts	100	Medium	In person	17. Sep 2013	55
10	CH	Managing director	General manufacturing industries	70	Medium	Phone	23. Sep 2013	45
11[2]	CH	Owner-manager	General manufacturing industries	140	Medium	Phone	23. Sep 2013	57

12	CH	Owner-manager	Machinery & systems (incl. PE machinery)	20	Small	Phone	24. Sep 2013	48
13	CH	Owner-manager	Machinery & systems (incl. PE machinery)	62	Medium	Phone	23. Sep 2013	53
14	CH	Owner-manager	General manufacturing industries	22	Small	Phone	25. Sep 2013	45
15	CH	Owner-manager	General manufacturing industries	12	Small	Phone	25. Sep 2013	55
16	SIN	Managing director	General manufacturing industries	30	Small	Phone	26. Sep 2013	45
17	CH	Owner-manager	PE: Precision tools	35	Small	Phone	26. Sep 2013	58
18	CH	Managing director	PE: Precision tools	180	Medium	Phone	27. Sep 2013	29
19	CH	Other board member	Machinery & systems (incl. PE machinery)	140	Medium	Phone	30. Sep 2013	74
20	CH	Owner-manager	General manufacturing industries	22	Small	By email	1. Oct 2013	n/a
21	CH	Owner-manager	PE: Precision tools	70	Medium	Phone	1. Oct 2013	30
22	CH	Managing director	PE: Measuring, analyzing and controlling instruments	160	Medium	Phone	7. Oct 2013	47

23	CH	Owner-manager	General manufacturing industries	70	Medium	In person	9. Oct 2013	65
24	CH	Owner-manager	Machinery & systems (incl. PE machinery)	80	Medium	In person	10. Oct 2013	60
25	SIN	Other board member	General manufacturing industries	160	Medium	By email	11. Oct 2013	n/a
26	CH	Managing director	Machinery & systems (incl. PE machinery)	250	Medium	In person	15. Oct 2013	65
27	CH	Managing director	Machinery & systems (incl. PE machinery)	52	Medium	Phone	16. Oct 2013	48
28	CH	Owner-manager	General manufacturing industries	96	Medium	Phone	16. Oct 2013	75
29	CH	Managing director	Machinery & systems (incl. PE machinery)	55	Medium	In person	21. Oct 2013	70
30[2]	CH	Owner-manager	PE: Precision parts	12	Small	Phone	22. Oct 2013	50
31	CH	Other board member	PE: Precision parts	19	Small	Phone	22. Oct 2013	35
32[2]	CH	Other board member	PE: Measuring, analyzing and controlling instruments	57	Medium	Phone	23. Oct 2013	56
33	CH	Managing director	PE: Precision tools	24	Small	Phone	24. Oct 2013	51
34	CH	Owner-manager	Machinery & systems (incl. PE machinery)	15	Small	Phone	25. Oct 2013	66

35	CH	Managing director	General manufacturing industries	170	Medium	Phone	28. Oct 2013	26
36	CH	Owner-manager	Machinery & systems (incl. PE machinery)	45	Small	Phone	29. Oct 2013	60
37[2]	CH	Managing director	PE: Precision parts	130	Medium	Phone	29. Oct 2013	45
38	CH	Managing director	PE: Measuring, analyzing and controlling instruments	11	Small	Phone	31. Oct 2013	45
39	CH	Owner-manager	PE: Measuring, analyzing and controlling instruments	38	Small	Phone	31. Oct 2013	55
40	CH	Managing director	Machinery & systems (incl. PE machinery)	105	Medium	In person	1. Nov 2013	65
41	CH	Owner-manager	PE: Precision tools	40	Small	Phone	4. Nov 2013	60
42[1]	CH	Owner-manager	Machinery & systems (incl. PE machinery)	4	micro	Phone	4. Nov 2013	32
43	CH	Owner-manager	PE: Measuring, analyzing and controlling instruments	10	Small	Phone	4. Nov 2013	52
44	CH	Owner-manager	Other	16	Small	In person	5. Nov 2013	40
45	CH	Owner-manager	Other	200	Medium	In person	6. Nov 2013	40
46[2]	CH	Managing director	PE: Precision tools	45	Small	In person	6. Nov 2013	70

47[2]	CH	Owner-manager	PE: Precision parts	250	Medium	In person	7. Nov 2013	110
48	CH	Owner-manager	PE: Measuring, analyzing and controlling instruments	20	Small	In person	7. Nov 2013	90
49	CH	Owner-manager	PE: Precision tools	65	Medium	In person	11. Nov 2013	40
50	CH	Owner-manager	PE: Precision parts	26	Small	By email	11. Nov 2013	n/a
51	CH	Owner-manager	Machinery & systems (incl. PE machinery)	132	Medium	Phone	12. Nov 2013	42
52	CH	Owner-manager	PE: Precision parts	30	Small	Phone	12. Nov 2013	65
53	CH	Managing director	PE: Precision parts	130	Medium	Phone	13. Nov 2013	55
54	CH	Managing director	PE: Precision tools	165	Medium	Phone	14. Nov 2013	55
55[1]	CH	Owner-manager	General manufacturing industries	6	micro	Phone	14. Nov 2013	37
56	CH	Managing director	Other	130	Medium	Phone	15. Nov 2013	30
57[2]	CH	Owner-manager	Machinery & systems (incl. PE machinery)	20	Small	Phone	15. Nov 2013	60
58	CH	Other board member	General manufacturing industries	250	Medium	In person	18. Nov 2013	80

59	CH	Managing director	PE: Measuring, analyzing and controlling instruments	50	Small	Phone	21. Nov 2013	46
60	CH	Managing director	Machinery & systems (incl. PE machinery)	25	Small	Phone	20. Nov 2013	55
61	CH	Owner-manager	General manufacturing industries	110	Medium	Phone	25. Nov 2013	50
62	CH	Owner-manager	PE: Measuring, analyzing and controlling instruments	100	Medium	In person	3. Dec 2013	50
63	CH	Managing director	Other	60	Medium	Phone	3. Dec 2013	39
64	CH	Managing director	PE: Precision tools	55	Medium	Phone	6. Dec 2013	41
65[2]	CH	Owner-manager	PE: Measuring, analyzing and controlling instruments	45	Small	In person	10. Dec 2013	80
66	CH	Managing director	General manufacturing industries	130	Medium	Phone	10. Dec 2013	63
67	CH	Owner-manager	PE: Precision tools	70	Medium	Phone	19. Dec 2013	52
68[1]	CH	Owner-manager	General manufacturing industries	6	micro	Phone	10. Feb 2014	39
69	SIN	Owner-manager	Machinery & systems (incl. PE machinery)	8	Small	In person	11. Feb 2014	40
70	SIN	Owner-manager	PE: Precision parts	85	Medium	In person	18. Feb 2014	55

71	CH	Managing director	PE: Precision parts	30	Small	Phone	19. Feb 2014	50
72	SIN	Owner-manager	PE: Precision parts	68	Medium	In person	20. Feb 2014	35
73	SIN	Owner-manager	General manufacturing industries	81	Medium	In person	24. Feb 2014	55
74	CH	Managing Director	PE: Precision tools	120	Medium	Phone	25. Feb 2014	45
75	SIN	Managing Director	General manufacturing industries	30	Small	In person	1. Apr 2014	45
76	SIN	Other board member	PE: Precision tools	30	Small	In person	1. Apr 2014	60
77	SIN	Owner-manager	PE: Precision parts	110	Medium	In person	2. Apr 2014	60
78	SIN	Managing director	PE: Precision tools	80	Medium	In person	3. Apr 2014	60
79	SIN	Managing director	PE: Precision tools	165	Medium	In person	10. Apr 2014	50
80	SIN	Owner-manager	PE: Precision parts	24	Small	In person	10. Apr 2014	45
81	SIN	Owner-manager	PE: Precision parts	65	Medium	In person	10. Apr 2014	50
82	SIN	Managing director	PE: Precision parts	215	Medium	In person	16. Apr 2014	45

83	SIN	Managing director	Machinery & systems (incl. PE machinery)	14	Small	In person	16. Apr 2014	40
84[3]	SIN	Managing director	General manufacturing industries	100	Medium	In person	23. Feb 2014	n/a
85[3]	SIN	Managing director	General manufacturing industries	30	Small	In person	04. Feb 2014	n/a
86[3]	SIN	Other board member	General manufacturing industries	40	Small	In person	03. Mar 2014	n/a
87[3]	SIN	Managing director	PE: Precision tools	200	Medium	In person	19. Feb 2014	n/a
88[3]	SIN	Managing director	General manufacturing industries	250	Medium	In person	20. Feb 2014	n/a
89[3]	SIN	Owner-manager	General manufacturing industries	250	Medium	In person	18. Mar 2014	n/a
90[3]	SIN	Other board member	Machinery & systems (incl. PE machinery)	100	Medium	In person	04. Mar 2014	n/a
91[3]	SIN	Managing director	Machinery & systems (incl. PE machinery)	20	Small	In person	12. Feb 2014	n/a
92[3]	SIN	Managing director	General manufacturing industries	130	Medium	In person	19. Feb 2014	n/a
93[3]	SIN	Other board member	General manufacturing industries	30	Small	In person	29. Jan 2014	n/a
94[1]	SIN	Owner-Manager	PE: Precision parts	250	Medium	In person	16. Jan 2014	105

Note: CH = Switzerland; SIN = Singapore; PE = Precision Engineering; FTE = Full time equivalent

1) Removed from sample based on initial selection criteria (e.g., excl. micro firms) or due to incomplete questionnaire
2) In addition, a second questionnaire-based interview was conducted
3) Conducted by second interviewer

Curriculum Vitae
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Academic Development		

03/2013 – 02/2015	**PhD Student**	
	University of St. Gallen/SMU	Switzerland/Singapore
	Performance Management in SMEs	
10/2003 – 05/2009	**Industrial Engineering and Management**	
	Technical University of Darmstadt	Darmstadt, Germany
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12/2008 – 03/2009	**Diploma Thesis**	
	Tongji University,	Shanghai, China
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06/2002	**Abitur**	
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Industry Experiences		

03/2011 – 02/2013	**McKinsey & Company**	
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	Internship, Consultant	Shanghai, China
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Engagement	

Since 09/2013	Guest lecturer Asia Term at Singapore Management University