

Boundary spanners' knowledge sharing for innovation success in turbulent times

Tamara Keszey

Abstract

Purpose – This paper aims to enrich knowledge management theory and practice by investigating how boundary spanners' willingness to share their knowledge contributes to innovation success and by examining the contingent role of market turbulence.

Design/methodology/approach – Cross-sectional survey data were collected from 296 top income Hungarian firms. Structural equation modelling with bootstrap procedures was used to test the hypotheses.

Findings – Boundary spanners' willingness to share their knowledge has a dual effect on innovation success, which is captured by new product development innovativeness and performance. It has a direct effect on both new product development innovativeness and performance, and it has a mediated effect on new product development performance, where new product development innovativeness serves as a mediator. The study's results indicate that these effects are robust and not contingent on the turbulence of the firm's marketplace.

Research limitations/implications – This study's respondents were managers in boundary-spanning positions charged with the task of linking the organisation with its external environment. Owing to their proximity to the external environment, their evaluation of market turbulence may be distorted.

Practical implications – Maintaining the willingness of managers in boundary-spanning positions to share what they know is essential to the continuous creation of superior new product development performance. Hence, firms should develop organisational cultures where employees' knowledge-sharing willingness is presented as an important asset. While turbulent markets may be unpredictable and hostile, firms should not adjust their knowledge management practices.

Originality/value – Building on the research on knowledge sharing, boundary spanning theory and contingency theory, this paper increases the understanding of the salient factors that are often implicitly assumed in mechanisms involved in transforming knowledge into new product performance. This is the first empirical study to focus on boundary spanners' knowledge behaviour and to consider the contingent role of market turbulence in knowledge management.

Keywords New product development, Knowledge sharing, Market turbulence, Contingency theory, Innovation success, Boundary spanning theory

Paper type Research paper



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1. Introduction

An extensive body of literature posits that successful firms thrive because of their ability to effectively manage their innovations (Han *et al.*, 1998; Wang and Wang, 2012; Darroch, 2005). Innovations are often influenced by knowledge management (Wang and Noe, 2010; Bock and Kim, 2002). One knowledge-centred activity, knowledge sharing, is the fundamental means by which employees contribute to knowledge application and innovation (Wang and Noe, 2010). Knowledge sharing among employees allows firms to capitalise on knowledge-based resources; thus, sharing knowledge becomes a fundamental process that firms should constantly pursue to sustain their competitiveness (Cavaliere *et al.*, 2015; Wang and Noe, 2010).

From a knowledge management perspective, some employees may be more critical than others depending on their network positions (Calantone *et al.*, 2003; Haas, 2015). This study

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Received 19 January 2017
Revised 21 August 2017
6 November 2017
Accepted 7 January 2018

focuses on the knowledge-sharing behaviour of managers in boundary-spanning positions. Firm members who are expected to link the organisation with the environment to forge intra- and extra-organisational boundaries are often referred to as boundary spanners (Cross and Parker, 2004). A recent review of the literature, covering more than 100 sources, concludes that boundary spanners play major roles in the transfer and recombination of external knowledge and that more research is needed on the performance outcomes of their knowledge-sharing behaviours (Haas, 2015).

Although knowledge sharing is a central ingredient in establishing competitive advantage, analyst estimates depict a dark picture by suggesting that firms in the Fortune 500 still lose \$31.5 billion annually because of the failure of employees to share their extant knowledge effectively (Myers, 2015). While scholars and practitioners alike require a sound understanding of how knowledge sharing influences innovation outcomes to firms' maximum performance, empirical research on this domain remains rather scarce. A recent global expert survey interviewing more than 200 knowledge management experts worldwide concludes that one major research gap in the knowledge management literature is the lack of empirical evidence addressing the interplay between knowledge management and innovation performance (Heisig *et al.*, 2016). Innovation is a broad concept and has been conceptualised in many different ways in the literature; this study focuses on the new product development (NPD) aspect of innovation.

In dynamically competitive market environments, in particular, knowledge is the firm's most strategically important resource. Barney *et al.* (2011) note that when a firm has the idiosyncratic resources necessary to achieve competitive advantage in a relatively stable market, but the market conditions suddenly change, the value of these resources may erode and are no longer likely to serve as a basis for competitive advantage. In these cases, firms should adapt to the turbulent market conditions and reorganise their resources to retain their competitive advantage (Barney *et al.*, 2011). Having accepted the value of knowledge sharing in innovation and subsequently in maintaining competitive advantage, the question that emerges is how environmental conditions alter the contribution of knowledge sharing.

This article addresses the following research questions:

- RQ1.* How does boundary spanners' knowledge sharing influence NPD performance?
- RQ2.* Is this effect contingent on market turbulence?

The findings from this study offer two key contributions to the extant literature.

Firstly, the current research enriches the knowledge management literature by focusing on boundary spanners' knowledge-sharing behaviour. Overwhelming evidence highlights that boundary spanners are critically important from a knowledge management perspective (Calantone *et al.*, 2003; Haas, 2015; Hult *et al.*, 2017; Wang and Noe, 2010); however, the role of their knowledge sharing in innovation has remained empirically unexplored thus far. Further, empirical evidence regarding the causal effect between boundary spanners' knowledge sharing and innovation performance is broadened. To better understand the way knowledge sharing affects NPD performance, it is essential to model mediators of this relationship. Modelling mediators contributes to identifying and explaining the mechanisms that underlie the relationship between knowledge sharing and innovation via the inclusion of a third hypothetical variable, the mediator (MacKinnon, 2008). Thus, the mediator variable serves to clarify the nature of the relationship between two variables (i.e. knowledge sharing and innovation performance). This is a particularly important contribution as there is a lack of research on the underlying processes of how knowledge sharing contributes to innovation success. Thus, this study provides a more fine-grained understanding of the salient factors that are often implicitly assumed in mechanisms involved in transforming knowledge sharing into new product performance.

Secondly, the identification of market turbulence as an influential environmental factor has culminated in an upsurge of studies examining its contingent role (Qian *et al.*, 2016; Wang *et al.*, 2015; Tsai and Yang, 2013; Hung and Chou, 2013; Santos-Vijande and Álvarez-González, 2007). While market turbulence has received significant interest by management scholars, its contingent role has been described as equivocal, and market turbulence was only selectively confirmed as a moderator. For example, Calantone *et al.* (2003) and Jaworski and Kohli (1993) found no significant moderation in the relationships between market orientation and performance despite previous research arguing for such an effect (Kohli and Jaworski, 1990). Nevertheless, in other cases, market turbulence served as a significant moderator (Tsai and Yang, 2013; Hung and Chou, 2013). These inconclusive results suggest that depending on the dependent variable used, different moderation dynamics can be expected and that future research into the true impact of market turbulence is needed. To the best of our knowledge, this is the first study to investigate the contingent role of market turbulence in the knowledge management – innovation performance relationship. Delineation of contingencies is important as it can identify boundary conditions for when and where theoretical models and claimed relationships apply. Our study provides the first insight into the environmental contingencies that may moderate knowledge sharing's role in NPD outcomes.

The remainder of this paper is organised as follows. Section 2 presents the theoretical background of the study. Then, the conceptual background including the research hypotheses are introduced in Section 3. Next, in Sections 4 and 5, the study's research method and key findings are presented. While Section 6 illustrates a discussion of the study's theoretical contributions, managerial implications, discussions and contributions, Section 7 concludes the paper, laying out limitations and suggestions for future research.

2. Theoretical foundations and research gaps

The research stems from two theoretical grounds: boundary spanning theory and contingency theory. The following subsections briefly introduce these conceptual backgrounds and note the related gaps in the knowledge management literature by providing an overview of the empirical studies related to each theory.

2.1 Boundary spanning theory and research gaps

Boundary spanners are firm members who serve as interfaces between a unit and its environment (Cross and Parker, 2004). The term boundary spanner is a general term, and many conceptualisations co-exist. According to an early definition, boundary spanners are “persons who operate at the periphery or boundary of an organization, performing organizational tasks, relating the organization with elements outside it” (Leifer and Delbecq, 1978). Other conceptualisations of boundary spanners describe them as individuals charged with the task of contacting persons outside their own group (Friedman and Podolny, 1992). Cross and Parker (2004) note that boundary spanners link groups of people who are separated by location, hierarchy or function. In line with the previous definitions, this study follows the conceptualisation of Zhang *et al.* (2015), who claim that “boundary spanning individuals are organisational members who operate at the periphery of an organisation and act as exchange agents between the organisation and its external environment”.

Owing to their interfacing position, boundary spanners play important roles in knowledge management and innovation. They are organisational actors, yet they are closely involved in managing relationships with external partners (Zhang *et al.*, 2015; Ireland and Webb, 2007). Because of their proximity to external partners, boundary spanners are ideally positioned to transfer, select and interpret vital knowledge from the external environment to the firm (Zhang *et al.*, 2015; Ireland and Webb, 2007; Aldrich and Herker, 1977).

External knowledge gathered by boundary spanners, however, means little to firm level success unless it is disseminated within the firm (Arnett and Wittmann, 2014). Knowledge kept within a boundary-spanning individual does not have the potential to contribute to firm-level performance. Boundary-spanning individuals' knowledge will need to be leveraged into firm-level assets before it can influence innovation outcomes.

Extant research has widely discussed and empirically demonstrated the link between knowledge sharing and innovation (Table I). Overwhelming evidence confirms the direct impact of knowledge sharing on innovation performance, NPD speed and quality and technological innovation (Wang and Wang, 2012; Lee et al., 2013; Sáenz et al., 2012;

Table I Empirical research on the innovation-related outcomes of knowledge sharing

Study	How has knowledge sharing (or related concepts) added to the model configuration?	Main findings (related to knowledge sharing and innovation)	Methods Sampling (sample frame and sample selection) Key informants Final sample size Country of investigation
Ferraris et al. (2017)	Knowledge management (knowledge acquisition/knowledge dissemination/knowledge use) Moderator variable	Knowledge management <i>positively moderates</i> the impact of external R&D on innovative performance	Convenience sample of European subsidiaries of multinational companies with headquarters located in Europe Chief Executive Officers 117 firms Not reported
Akhavan and Mahdi Hosseini (2016)	Knowledge sharing processes (knowledge-sharing intention, knowledge collecting and knowledge donating) Mediator/intermediary variable	Knowledge sharing intention's direct effect on team innovation capability is not tested; however, it has a direct effect on knowledge collecting and donating, which in turn has a positive effect on innovation	Not reported No respondent position reported 230 employees Iran
Soto-Acosta et al. (2014)	Web knowledge sharing Mediator/intermediary variable	Web knowledge sharing has a positive impact on innovation	All Spanish small and medium enterprises with at least 14 employees Chief Executive Officers 535 firms Spain
Lee et al. (2013)	Knowledge sharing Independent variable	Knowledge sharing is the strongest predictor for technological innovation	Commercial database of manufacturing firms Senior executives 162 Malaysia
Wang and Wang (2012)	Explicit knowledge sharing Tacit knowledge sharing Independent variable	Explicit knowledge sharing has a positive effect on both innovation speed and quality, while tacit knowledge sharing has a positive effect on innovation quality only	No information on sampling CEO/general manager and senior manager 89 high tech firms China
Sáenz et al. (2012)	Knowledge sharing embedded in management processes Independent variable	Knowledge sharing in management processes has a positive impact on innovation project management	Not reported no respondent position reported 515 firms Spain and Columbia
Andreeva and Kianto (2011)	Knowledge sharing Independent variable	A direct link between knowledge sharing and innovation has not been tested	Convenience sample of firms with more than 50 employees 515 firms Middle and top managers 261 firms (in 3 countries) Finland, Russia, China
Darroch (2005)	Knowledge dissemination Independent variable	Knowledge dissemination has a positive impact on innovation	Official sampling frame, all firms No respondent position reported 443 firms New Zealand

Andreeva and Kianto, 2011; Darroch, 2005). Recently, scholars have also highlighted that knowledge sharing acts as an intermediary factor between firm-level configurations (i.e. structural and relational dimensions, organisational, technology and environmental contexts) and innovation (Akhavan and Mahdi Hosseini, 2016; Soto-Acosta *et al.*, 2014); this suggests that firms need to establish effective knowledge-sharing mechanisms to be able to benefit from organisational configurations in terms of innovation outcomes. Finally, Ferraris *et al.* (2017) note that knowledge dissemination serves as a moderator that enhances the positive impact of external research and development (R&D) on innovative performance.

Despite valuable findings regarding the link between knowledge management and innovation and conclusive empirical evidence on the positive effects of knowledge sharing, to the best of our knowledge, none of the previous studies has investigated how individual boundary spanners' sharing of critical knowledge within organisational boundaries affects innovation results. As seen in Table 1, quantitative empirical studies focusing on the innovation outcomes of knowledge sharing were typically conducted using surveys to uncover individual-level knowledge-sharing patterns (Martinez-Conesa *et al.*, 2017; Scuotto *et al.*, 2017; Li *et al.*, 2015; Lee *et al.*, 2013; Youssef *et al.*, 2017; Andreeva and Kianto, 2011; Chen *et al.*, 2010; Donate and Guadamillas, 2011; Brachos *et al.*, 2007). Some of these studies do not specify the department to which the key informant belongs (Li *et al.*, 2015; Youssef *et al.*, 2017; Chen *et al.*, 2010; Donate and Guadamillas, 2011). Other studies focus on the knowledge-sharing behaviour of non-boundary spanner managers, such as research and development managers (Scuotto *et al.*, 2017). Some empirical studies do not provide detailed information about the position and responsibilities of respondents whose knowledge-sharing behaviour is being investigated, claiming that the respondents are managers, executives, managing directors, etc. (Martinez-Conesa *et al.*, 2017; Sáenz *et al.*, 2012; Andreeva and Kianto, 2011; Leong *et al.*, 2013). Brachos *et al.* (2007) investigate the role of boundary spanners and, in particular, marketing managers' social interactions and perceptions regarding knowledge quality in new product introduction; however, the results and implications are not discussed in light of boundary spanning theory.

2.2 Contingency theory and research gaps

In studies of contingency theory, researchers have long postulated that performance is contingent on the fit between a firm's strategy and the business environment, and it is this congruence, rather than just the strategy itself, that determines business performance (Lawrence and Lorsch, 1969; Gresov, 1989). The contingency perspective dominates research in many of the disciplines that focus on the relationships among strategy, organisational structure, performance and environment. Environmental variables are elements of the business environment that exist outside a firm's control. Among the environmental variables, market turbulence is considered in this research. This study-based on the work by Jaworski and Kohli (1993) – defines market turbulence as the rate of change in the composition of customers and their preferences.

Many of the extant studies examine how market turbulence moderates innovation's effect on a diverse set of dependent variables, with mixed results (Figure 1). For example, Calantone *et al.* (2003) found that market turbulence has no contingent role in the effect of firm innovativeness on NPD speed or the effect of NPD speed-to-market on NPD performance. Tsai and Yang (2013) and Hung and Chou (2013) claim that market turbulence positively moderates the effect of innovativeness, external technology exploitation and exploration on business performance. Wang *et al.* (2015) note that innovation capability's effect on collaboration effectiveness is positively moderated by market turbulence, while Noordhoff (2007) found a negative moderating effect of market turbulence on the relation between market innovation and knowledge transferability.

Figure 1 Overview of empirical research on the moderating role of market turbulence

		DEPENDENT VARIABLES		
		Innovation	Performance	Other related factors
INDEPENDENT VARIABLES	Innovation Knowledge management	N.S. <ul style="list-style-type: none"> ❖ Innovativeness on NPD speed (Calantone <i>et al.</i> 2003) ❖ NPD speed-to-market on NPD performance (Calantone <i>et al.</i> 2003) 	+ <ul style="list-style-type: none"> ❖ Firm innovativeness on business performance (Tsai and Yang 2013) ❖ External technology acquisition on firm performance (Hung and Chou 2013) ❖ External technology exploitation on firm performance (Hung and Chou 2013) 	+ <ul style="list-style-type: none"> ❖ Innovation capability on collaboration effectiveness (Wang <i>et al.</i> 2015) ❖ Market innovation on knowledge transferability (Noordhoff 2007)
	Market orientation and other related variables	+ <ul style="list-style-type: none"> ❖ Top management risk taking on NPD speed (Calantone <i>et al.</i> 2003) ❖ Organizational memory on organizational innovativeness (Hanvanich <i>et al.</i> 2006); N.S. <ul style="list-style-type: none"> ❖ Market orientation on NPD speed (Calantone <i>et al.</i> 2003) ❖ TQM on administrative innovation (Santos-Vijande and Álvarez-González 2007) ❖ TQM on cultural predisposition to innovate (Santos-Vijande and Álvarez-González 2007) 	+ <ul style="list-style-type: none"> ❖ Guanxi on financial performance (Qian <i>et al.</i> 2016) ❖ Guanxi on strategic performance (Qian <i>et al.</i> 2016) N.S. <ul style="list-style-type: none"> ❖ Market orientation on business performance (Jaworski and Kohli 1993) ❖ Market orientation on firm performance (Slater and Narver 1994) ❖ Organizational memory on overall performance (Hanvanich <i>et al.</i> 2006) ❖ Corporate strategic planning on NPD performance (Calantone <i>et al.</i> 2003) 	+ <ul style="list-style-type: none"> ❖ Low absorptive capacity on external knowledge sourcing (Yoo <i>et al.</i> 2015)[†] N.S. <ul style="list-style-type: none"> ❖ Market orientation on corporate strategic planning activities (Calantone <i>et al.</i> 2003) ❖ Top management risk taking on corporate strategic planning activities (Calantone <i>et al.</i> 2003) ❖ Relational capability on collaboration effectiveness (Wang <i>et al.</i> 2015)
RESEARCH GAP				

Note: †positive moderating effect of market turbulence in some sub-samples, while no moderating effect in other sub-sample
Source: Yoo *et al.* (2015)

While there is a large body of research that scrutinises how market turbulence moderates the effects of market orientation (Hanvanich *et al.*, 2006; Calantone *et al.*, 2003; Qian *et al.*, 2016; Slater and Narver, 1994; Jaworski and Kohli, 1993), there is a research gap in extant knowledge management research. As Figure 1 shows, none of the previous studies were looking at the moderating effect of market turbulence on the link between knowledge management and its impact on either innovation or performance outcomes. A review of the empirical research on knowledge management practices concluded that only 2 out of 32 relevant studies considered the impact of contingencies (Inkinen, 2016). Donate and Guadamillas (2011) focus on firm-level contingencies (knowledge oriented leadership and human resources practices), while Soto-Acosta *et al.* (2014) focus on individual-level contingencies (information technology skills).

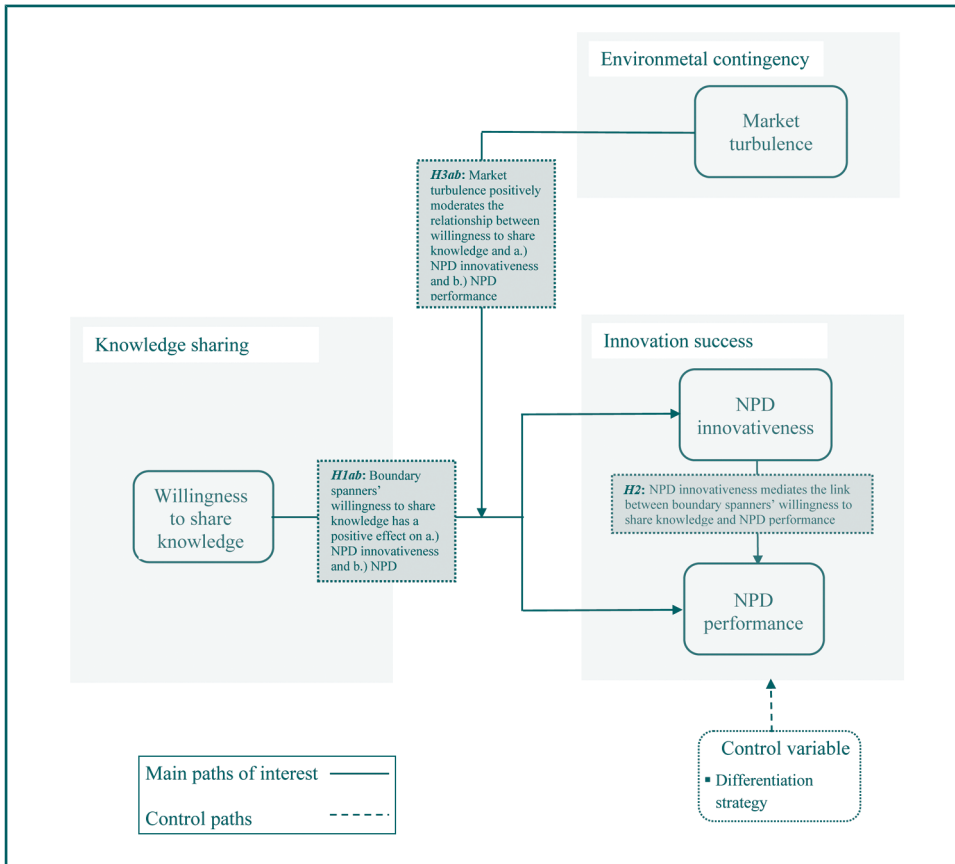
3. Conceptual framework and research hypotheses

The model used in this study (Figure 2) focuses on the effect of boundary spanners willingness to share knowledge on innovation success. The independent variable, willingness to share knowledge, is defined as the individual's tendency to engage in knowledge-sharing behaviour (Bock *et al.*, 2005).

The innovation success metrics that are considered are NPD performance and NPD innovativeness. In line with the extant literature, the term “new product” is used in a broad sense as a “thing” the company provides and sells to customers; hence, product does not necessarily mean physical products, services may also apply and in a similar vein, a new product is not necessarily a technology-intensive innovation (Kuester *et al.*, 2017; Keszey and Biemans, 2016; Calantone *et al.*, 2003).

Firms use a variety of measures to assess a new product's customer-based success (revenues, market share and customer satisfaction), financial success (profit, margin and break-even time) and technical performance success (competitive advantage, innovativeness and quality specifications; Griffin and Page, 1996). In this study, we focus on

Figure 2 Model



NPD performance, which is defined as the extent to which financial objectives were met (Droge *et al.*, 2008; De Luca and Atuahene-Gima, 2007; Olson *et al.*, 1995; Griffin and Page, 1996; Gatignon and Xuereb, 1997). In this respect, NPD performance is a measure of innovation success relative to pre-planned financial expectations.

In line with previous research, we define NPD innovativeness as the extent to which a firm's products are superior in the market compared to competitors' products in terms of novelty, customer response and first-to-market entry (Keszey and Biemans, 2016). Thus, NPD innovativeness is also a metric of innovation success. Unlike NPD performance, which focuses on innovation success relative to internal records (i.e. financial plans), NPD innovativeness focuses on external success criteria, such as product attributes relative to competitive offers available on the marketplace.

3.1 Direct and mediating effects of boundary spanners' knowledge sharing on innovation success

The extant literature on knowledge management suggests two co-existing mechanisms by which boundary spanners may have an impact on innovation success. Firstly, boundary spanners have direct contact with the external marketplace; hence, they are in a position to directly translate external knowledge back to the firm (Zhang *et al.*, 2015; Ireland and Webb, 2007; Aldrich and Herker, 1977; Arnett and Wittmann, 2014). Secondly, owing to boundary spanners' embedded knowledge on the external market, they can contribute to firm-level absorptive capacity by assisting in integrating knowledge from external sources

with other knowledge elements critical for innovation, which are available within the boundaries of the firm (Todorova and Durisin, 2007).

The likelihood of attaining successful innovations has long been associated with sharing and embracing external knowledge from outside the firm (Sofka and Grimpe, 2010; Rosenkopf and Nerkar, 2001; Li-Ying *et al.*, 2014; Chiang and Hung, 2010). External knowledge can be market driven with a sharp focus on customers and competitors (Sofka and Grimpe, 2010). External knowledge about customers, particularly when they are the major source of firms' incomes, allows firms to better pinpoint customer needs and expectations and subsequently boosts the success of new products (Ardito *et al.*, 2015). Acknowledging the critical role of external knowledge in innovation, increasing numbers of companies are finding ways to incorporate knowledge from customers (Cui and Wu, 2016). External knowledge is so pivotal for innovation success that some firms do not merely rely on external knowledge from boundary spanners but co-develop products with customers. For example, Microsoft and SAP invite customer representatives to join in product development as members of the NPD team (Nambisan and Baron, 2009). Boundary spanners' willingness to share their knowledge agrees with the notion of moving critical actors both within and between departments and hierarchical levels; thus, individual-level external knowledge is transformed into an organisational-level asset (Henttonen *et al.*, 2016). External knowledge accessed through boundary spanners allows firms to improve their understanding of customer needs and to create more successful new products.

As an extensive review of 87 articles shows, both the variety and diversity of knowledge elements are necessary in creating innovations that are truly novel (Savino *et al.*, 2017). Thus, successful innovation requires an effective search for and recombination of knowledge elements available both within and beyond organisational boundaries. The recombination of knowledge is a firm-level process that refers to the search for knowledge relevant to innovation and the enhancement of its value by continuously seeking new ways of combining and integrating it with knowledge that is already available within the firm (Kogut and Zander, 1997). Hence, knowledge recombination suggests that external knowledge – often gained and interpreted by boundary spanners – needs to be combined and integrated with other knowledge elements for innovation success. Boundary spanners can advance the knowledge recombination process by translating external knowledge into terms that are meaningful to non-boundary managers and can subsequently be more easily absorbed during the recombination process (Tushman and Katz, 1980; Oldroyd and Morris, 2012):

H1a & H1b. Boundary spanners' willingness to share knowledge has a positive effect on (a) NPD innovativeness and (b) NPD performance.

The literature on innovation emphasises new product advantage compared to competitors as a key determinant of new product financial success (Henard and Szymanski, 2001). Customers are more prone to purchase new products when these products offer novelties that either cannot be found in or superior to competitive offers (Rogers, 2003). Hence, these new products are more likely to be adopted and purchased by customers, and as a result of enhanced marketplace demand, the products become more successful from a financial point of view. Boundary spanners' willingness to share knowledge contributes to NPD innovativeness, which in turn leads to better NPD performance:

H2. NPD innovativeness mediates the link between boundary spanners' willingness to share knowledge and NPD performance.

3.2 Moderating influence of environmental contingency

We propose that market turbulence may moderate the link between willingness to share knowledge and innovation outcomes. Moderating variables are factors that explain the differential effects of knowledge-sharing willingness by providing insight into the conditions

under which it matters most to innovation outcomes. In other words, the effect of knowledge-sharing willingness on innovation outcomes might vary depending on environmental contingencies.

Turbulent markets are characterised by “levels of inter-period change that create dynamic and volatile conditions with sharp discontinuities in demand and growth rates” (Calantone *et al.*, 2003). In turbulent markets, customers’ product preferences change frequently; customers tend to look for new products all the time and have novel product-related needs and desires (Jaworski and Kohli, 1993). These changes continuously erode the value of extant knowledge, as extant knowledge may become quickly inaccurate, outdated and untimely. Further, in turbulent environments, the need for boundary spanners to share relevant knowledge from the marketplace may be even greater.

To survive in a turbulent market environment, firms must become responsive to the changing preferences of current customers and the preferences of new customers (Hanvanich *et al.*, 2006). Under conditions of low market turbulence, changes are not quick or dramatic, and thus, a relatively accurate prediction and subsequent timely response are possible (Droge *et al.*, 2008). However, under frequently changing business environment conditions, the accuracy of predictions decrease, the environment is less predictable and available knowledge about the market becomes rapidly obsolete (Martinez-Conesa *et al.*, 2017). At the same time, there is an increasing need in firms for accurate external knowledge; additionally, the importance of effectively sharing and responding to knowledge and innovation based on marketplace insights that are one step ahead of competition will be the key to success (Song and Parry, 2009; Wang *et al.*, 2015).

Thus, we expect that in turbulent markets, owing to the difficulty of tracking customer needs and desires and the firm’s enhanced need for market knowledge, the positive effect of boundary spanners’ willingness to share their knowledge will be stronger on both NPD innovativeness and NPD performance:

H3a & H3b. Market turbulence positively moderates the relationship between knowledge-sharing willingness and (a) NPD innovativeness and (b) NPD performance.

3.3 Control variable

To assess the impact of knowledge management on innovation, this study controls for differentiation strategy (Porter, 1980) as a control variable for both NPD innovativeness and NPD performance. Differentiation strategy emphasises the exploration of complex customer need structures and the adaptation of products to fit and respond to them (Porter, 1980). Other researchers demonstrate that differentiators can achieve higher levels of customer satisfaction and subsequently business performance (Olson *et al.*, 2005); thus, it is important to account for differentiation strategy as a control for innovativeness.

Although the literature also suggests firm size as a key control variable to exclude rival explanations of NPD success (Engelen *et al.*, 2012), the present study already controls for firm size by focusing on top income-producing firms.

4. Data and method

4.1 Data collection and sample

The data for this study were collected through a mail survey that was sent to all companies in Hungary belonging to the top 10 per cent of firms in terms of sales revenue, as reported in the quarterly business information database of the Hungarian Central Statistical Office. Hungary is especially well suited for a study aiming to uncover the contingent role of environmental turbulence in innovation. Hungary is a former transitional economy that has moved from a communist-style central planning system to a free market system and that

has been a member state of the European Union (EU) since 2004. According to the [European Commission's \(2017\)](#) European Innovation Scoreboard, Hungary, with other member states such as Spain, Portugal, Italy, Slovakia, Poland and the Baltic countries, belongs to the group of moderate innovators. In 2016, Hungary's corporate sales of new-to-market or new-to-firm innovations were higher than 90 per cent of EU average ([European Commission, 2017](#)). Hence, Hungary's patterns of firm-level innovations are not atypical in Europe, while overwhelming evidence suggests that the scale and scope of the environmental turbulence in former transitional economies never seems to abate and remains above average in these economies ([Meyer and Peng, 2015](#)).

In total, 2,500 questionnaires were sent out via mail with the alternative option of completing the questionnaire online. To improve the response rate, follow-up phone calls were made to inquire whether the questionnaire had reached a competent key respondent and to gain information about the causes of non-response. Potential respondents were ensured of the confidentiality of their data, and as an incentive for their co-operation, we offered non-monetary incentives (a managerial summary of the main findings of our previous, related research).

The data collection resulted in 296 usable questionnaires and an effective response rate of 11.8 per cent. Firms in our sample represented a broad range of industries (46.6 per cent business-to-customer – hereafter B2C – firms and 53.4 per cent business-to-business – hereafter B2B – firms). The mean company-specific experience of the respondents' is 12.1 years. The key informants for our study were marketing executives and marketing managers, who are typically top managers or one level below top management, supposedly with decision-making authority. Boundary spanners may hold various positions within a firm. Regarding their departmental positions, the boundary spanner concept is often used to describe marketing personnel and salespersons ([Zhang et al., 2015](#); [Keszey, 2017](#); [Singh, 1998](#); [Lysonski and Johnson, 1983](#); [Calantone et al., 2003](#)). Marketing managers are charged with obtaining critical knowledge about customers, competitors and market developments; interpreting the information; and disseminating it within their organisations. [Table II](#) summarises the profiles of the sample firms.

Analysis of variance did not indicate significant differences between the means of the key constructs or the descriptive statistics (products/services provided, number of employees and ownership structure) of early and late respondents ([Armstrong and Overton, 1977](#)). The

Table II Profiles of respondent firms	
<i>Company characteristic</i>	(%)
<i>Number of employees</i>	
≥1000	9.1
250-999	39.5
50-249	46.3
0-49	5.1
<i>Sector</i>	
Only physical products	31.8
Only services	31.7
Both physical products and services	36.5
<i>Ownership</i>	
Private domestic	47.6
Private foreign	41.6
State-owned	10.8
<i>Major field of operation</i>	
Business-to-customer	46.6
Business-to-business	53.4

most frequent reason for refusal to cooperate – as discovered during the follow-up phone calls – was a lack of time. Therefore, we concluded that non-response errors would not cause a systematic error in the sample, and we pooled the data for subsequent analyses.

4.2 Measures

We used a survey to gather data. The constructs from our framework were measured using seven-point Likert-type multi-item scales. Each scale consisted of at least three items. As all variables were collected at the same time, with the same instrument from the same respondents, the results were controlled and tested for common method bias (CMB; Podsakoff *et al.*, 2003). To control for CMB, predictor and criterion variables were allocated to separate sections of the questionnaire. The existence of CMB was statistically assessed using three different techniques:

1. Harman's single-factor method (Harman, 1976);
2. assessment of the correlation matrix (Bagozzi *et al.*, 1991); and
3. Lindell and Whitney's (2001) method for assessing CMB.

Following Harman's (1976) single factor approach, the results show that no single factor emerged from a factor analysis of all survey items and that no general constructs account for the majority of the covariance among all the constructs. The correlation matrix of the variables included in the conceptual model does not include highly correlated variables ($r > 0.90$) (Bagozzi *et al.*, 1991), suggesting that the data can be pooled using the partial correlation technique (Lindell and Whitney, 2001) with a marker ("Our mailing system is user-friendly", measured on a seven-point Likert-scale) that is theoretically expected to be unrelated to the key constructs of the model. Bivariate correlations among the marker and the other variables, as well as a series of partial correlations, do not indicate significant CMB problems. Given these results, it can be concluded that CMB did not significantly affect the findings from this study.

5. Data analysis and results

5.1 Measurement validation

The validity and properties of the multi-item scales were assessed through a confirmatory factor analysis (CFA) with SPSS 23.0 and AMOS 23.0 for the five reflective constructs of willingness to share knowledge, NPD innovativeness, NPD performance, market turbulence and differentiation strategy. The CFA results indicate a good fit compared to accepted cut-off values: the chi-square/df (χ^2/df) is below 2.5, the comparative fit index (CFI) is above 0.90, the standardised root mean square residual (SRMR) is below 0.08, the root mean square error of approximation (RMSEA) is below 0.08, and the p of close fit (PCLOSE) is above 0.05 (Byrne, 2010). As shown in Appendix, all standardised factor loadings are statistically significant ($p < 0.05$) and, as they are above 0.60, are within an acceptable range (Anderson and Gerbing, 1988). The fit indices for the measurement model are $\chi^2(139) = 250.55$; $\chi^2/df = 1.80$; $p < 0.001$, CFI = 0.97; SRMR = 0.04; RMSEA = 0.05 and PCLOSE = 0.35.

Table III presents the findings from the measurement validation tests.

Composite reliability measures range from 0.78 to 0.95, which is above the 0.70 threshold (Nunnally, 1967), indicating acceptable reliability of the constructs. The average variance extracted values range from 0.52 to 0.83, which are above the conventional benchmark of 0.50 (Bagozzi and Yi, 1988). The outcomes from these tests support the convergent validity of the constructs used. Furthermore, the square of the inter-correlation between two constructs is less than the AVE estimates of the two constructs for all pairs of constructs, which supports discriminant validity (Fornell and Larcker, 1981).

Table III Properties of the measurement scales

Constructs	ME	SD	CR	CA	AVE	1	2	3	4	5
1. Willingness to share knowledge	5.50	1.280	0.93	0.93	0.83	0.91				
2. NPD innovativeness	4.03	1.65	0.95	0.95	0.80	0.23	0.89			
3. NPD performance	4.49	1.46	0.91	0.91	0.73	0.27	0.54	0.85		
4. Market turbulence	4.72	1.20	0.81	0.81	0.52	0.18	0.06	0.05	0.72	
5. Differentiation strategy	5.09	1.55	0.78	0.76	0.55	0.23	0.54	0.33	0.01	0.74

Notes: ME: Mean; SD: Standard Deviation; CR: Composite Reliability; CA: Cronbach's Alpha; AVE: Average Variance Extracted; Value on the diagonal is the square root of the AVE

5.2 Hypothesis testing of direct and mediating effects

We used structural equation modelling (SEM) AMOS 23.0 to test our hypotheses. The fit indices suggest that the model fits the data very well ($\chi^2(141) = 250.87$; $\chi^2/df = 1.77$; $p < 0.001$; RMSEA = 0.051; SRMR = 0.04; NNFI = 0.96; and CFI = 0.97). The results, summarised in Table IV, show that willingness to share knowledge has a direct effect on NPD innovativeness ($b = 0.11$, $p < 0.05$) and NPD performance ($b = 0.17$, $p < 0.01$), providing support for *H1a* & *H1b*. NPD innovativeness is also positively related to NPD performance ($b = 0.48$, $p < 0.001$).

We controlled for one variable, differentiation strategy. Differentiation strategy has a significant effect on NPD innovativeness ($b = 0.51$, $p < 0.001$) and has no significant effect on NPD performance ($b = 0.03$, n.s.).

To test whether NPD innovativeness mediates the relationship between willingness to share knowledge and NPD performance, we followed Zhao *et al.*'s (2010) recommended approach using bootstrapping (based on 500 bootstrap resamples) to investigate the significance of indirect effects. According to this approach, an indirect effect is significant, and mediation is established if the bootstrap confidence interval of an indirect effect does not include zero (Preacher and Hayes, 2008; Zhao *et al.*, 2010). The result of this analysis

Table IV Empirical results: parameter estimates (standardised structural coefficients)

Direct effects	Beta
Willingness to share knowledge → NPD innovativeness ^a (<i>H1a</i>)	0.11*
Willingness to share knowledge → NPD performance ^b (<i>H1b</i>)	0.17**
NPD innovativeness → NPD performance	0.48***
<i>Control paths</i>	
Differentiation strategy → NPD innovativeness	0.51***
Differentiation strategy → NPD performance	0.03
<i>Mediating effects^c</i>	
Willingness to share knowledge → NPD innovativeness → NPD performance	
Total effect	0.23 (0.12/.35) sig
Direct effect	0.17 (0.01/.29) sig
Indirect effect (<i>H2</i>)	0.06 (0.01/.12) sig
<i>Moderating effects</i>	
Willingness to share knowledge × Market turbulence → NPD innovativeness (<i>H3a</i>)	-0.02
Willingness to share knowledge × Market turbulence → NPD performance (<i>H3b</i>)	0.00

Notes: Model fit: $\chi^2(141) = 250.87$; $\chi^2/df = 1.77$; $p < 0.001$; RMSEA = 0.051; SRMR = 0.04; NNFI = 0.96; CFI = 0.97; *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$. ^a R^2 (variance explained) = 0.30; ^b $R^2 = 0.31$; ^cpoint estimates. Lower and upper bootstrapping confidence intervals are in parentheses. Confidence intervals containing zero are interpreted as not significant (n.s.), and confidence intervals not containing 0 are interpreted as significant (sig)

shows that willingness to share information has both significant direct and indirect effects on NPD performance mediated by NPD innovativeness, suggesting partial mediation and providing support for *H2*.

5.3 Hypothesis testing of moderating effects

To test our hypothesised moderating effects, we created interaction terms by the case-wide multiplication of the underlying standardised construct scores for the predictor and moderator variables. Both the moderating latent variable and the interaction terms were then included in AMOS 23.0. Our results in [Table III](#) demonstrate that the moderating effect of market turbulence is insignificant on the link between willingness to share knowledge and NPD innovativeness ($b = 0.02$, n.s.), leading us to reject *H3a*. Similarly, we found that market turbulence does not moderate the effect of willingness to share knowledge on NPD performance ($B = 0.00$, n.s.); thus, *H3b* is also rejected.

6. Discussion and contributions

Our research attempts to enrich the knowledge management and innovation literature by elucidating how managing knowledge can advance innovation as a business outcome and by unravelling the contingent role of market turbulence. More specifically, we aim to answer the following research questions:

RQ1. How does boundary spanners' knowledge sharing influence new product development performance?

RQ2. Is this effect contingent on market turbulence?

Drawing on the boundary spanning theory, contingency theory and empirical data collected from managers, our findings suggest that boundary spanners' knowledge-sharing willingness has a positive direct effect on both NPD innovativeness and NPD performance. Our results indicate that these effects are robust and not contingent on the turbulence of the firm's marketplace. Further, the effect of knowledge-sharing willingness on NPD performance is partially mediated by NPD innovativeness.

6.1 Theoretical implications

By answering these research questions, we aim to make two theoretical contributions to the extant literature.

Firstly, this research carves out and addresses an important gap in the extant literature, as to the best of our knowledge, this is the first empirical study to investigate how boundary spanners' knowledge sharing affects innovation results. This study provides new empirical evidence for the impact of boundary spanners' knowledge-sharing willingness on innovation success in terms of NPD innovativeness and performance. Although it is well known that organisations need to emphasise and more effectively exploit knowledge-based resources that already exist within the organisation, as innovations are often influenced by the organisational knowledge flow and knowledge management, empirical evidence confirming this link is still scarce ([Davenport and Prusak, 1998](#); [Heisig et al., 2016](#)). Our study contributes to advancing knowledge on the effect of knowledge sharing on NPD performance by not only providing important empirical evidence but also suggesting and empirically confirming an underlying mechanism by testing the mediating effect of NPD innovativeness. This is a particularly insightful result that addresses the research gap in empirical investigations on the interplay between KM and innovation performance recently suggested by [Heisig et al. \(2016\)](#) and subsequently contributes to a better understanding of how and through which routes the knowledge-sharing intention of boundary spanners contributes to innovation performance.

Secondly, drawing on contingency theory, this study extends previous work by being the first study to advocate the contingent role of market turbulence in the knowledge-sharing innovation performance link. While scholars of contingency theory suggest that performance is contingent on the relationship, or fit, between an organisation and its external environment (Lawrence and Lorsch, 1969; Gresov, 1989), empirical evidence on the contingent role of market turbulence is contradictory and only seldom confirms the notions of these theoretical grounds. Our findings also indicate that the positive effect of knowledge sharing on NPD performance is stable under different contingencies of market turbulence; thus, willingness to share knowledge has similar effects on NPD performance under different levels of environmental conditions.

6.2 Managerial implications

The findings of this study suggest that the knowledge-sharing willingness of managers in boundary-spanning positions is an important determinant of NPD performance, regardless of market turbulence.

As such, firms should strive to improve boundary spanner managers' (i.e. marketing executives and sales representatives) willingness to share their knowledge to attain higher innovation success. Firms with boundary spanner managers – who are in a unique position to report strategically important market insights and who would increasingly be enthusiastic to share their knowledge – would not only end up with higher NPD performance but would also be more innovative in terms of speed-to-market and superior new product quality compared to competitors, which, in turn, contributes to innovation performance.

This study does not focus on boundary spanners' willingness to share their knowledge in the context of a specific NPD project; rather, the focus is on their engagement to share what they know in general. Thus, firms should not only integrate the knowledge of boundary spanners in NPD projects but also focus on maintaining continuous knowledge sharing. Firms should develop organisational cultures where employees' knowledge-sharing willingness is presented as an important asset and should subsequently implement managerial initiatives and incentives to facilitate and reward knowledge-sharing behaviour.

Findings from this study also show that this link between boundary spanners' willingness to share their knowledge and innovation outcomes is stable over different environmental contingencies. While turbulent markets may be ever changing, unpredictable and hostile, firms should not adjust their knowledge management practices. Market turbulence does not erode but also does not increase the value of boundary spanners' willingness to share their knowledge in developing superior new products. As Day (1990) concludes, "Sooner or later all market arenas lose their luster, as sales growth stagnates, profit margins are squeezed and competition intensifies. Management cannot wait until this has happened to take action". Maintaining boundary spanners' willingness to share what they know is essential to the continuous creation of superior NPD performance. To sum up, the presumption is that firms that manage to maintain their boundary spanners' willingness to share their knowledge are ideally positioned to achieve superior innovation performance under any environmental conditions.

7. Limitations and directions for future research

Our research has several limitations that also present future research opportunities.

Firstly, as with all cross-sectional studies, causality among study variables is not established and remains theoretical. This is especially limiting in the case of market turbulence, where scales measure the actual market turbulence as perceived by the

respondents, the managers in boundary-spanning positions. While studies focusing on the effects of market turbulence often look at the phenomenon in a cross-sectional manner (Hung and Chou, 2013; Wang *et al.*, 2015; Santos-Vijande and Álvarez-González, 2007), longitudinal studies that track the changes of market turbulence could further enhance our understanding of environmental contingencies. For example, it may well be that it is not the actual state of market turbulence that plays a contingent role; rather, it is the pace of change in the market conditions. Firms operating in a relatively stable market may perceive the same level of market turbulence differently than a firm operating in a hostile business environment. While the common practice in studies investigating market turbulence is to measure the actual perceived level of market turbulence, it would also be interesting to add a more objective measure of market turbulence.

Secondly, our respondents are boundary spanners with strong bonds with the marketplace, and their perceptions might be distorted compared to a manager in a non-boundary-spanning position. For example, a marketing manager, who has frequent contacts with the customers (i.e. a boundary spanner), may have different perceptions about the marketplace turbulence than a controlling manager (i.e. a non-boundary spanner), who never meets the end buyers of the firm. As such, obtaining information on market turbulence from multiple respondents would depict a more balanced view of the marketplace's turbulence. In a similar vein, in our questionnaire, we did not differentiate the turbulence level of the different market segments the firm that may be present. This is a limitation and an avenue for research. As turbulence within different market segments in the same market might be different, further studies could investigate the contingent role of market turbulence more precisely by looking at the market-segment turbulence of a firm's individual products instead of focusing on the market turbulence of a whole firm (which may comprise several business units and may have a diverse product portfolio).

In this study, we focus on boundary spanners' willingness to share their knowledge; thus, we do not measure their actual sharing behaviour. While it can be intuitively assumed that managers' willingness to behave in a certain manner highly correlates with their actual behaviour pattern, it would also be interesting to look at this link to understand the potential differences between willingness to share knowledge and actual knowledge sharing on innovation success. It may well be that managers' willingness to share their knowledge reflects the organisational knowledge-sharing culture and has different outcomes on NPD performance than managers' knowledge sharing.

Recent studies highlight the importance of social media in knowledge exchange; however, discussions in this domain remain largely theoretical as there is still a lack of empirical studies supporting these notions (Grant, 2016; Panahi *et al.*, 2013). Although this study was not specifically looking at willingness to share knowledge by means of social media, future research should pay more attention to this domain.

This study focuses on one single mediator, NPD innovativeness. The insights of this study might have been richer if more mediators had been involved. For example, marketing scholars suggest that market orientation increases NPD performance through higher product quality (Paladino, 2008) and greater innovation speed (Carbonell and Escudero, 2010). A recent study by Cui and Wu (2016) places customer involvement between NPD performance and firm-level knowledge management practices. As understanding the process of how knowledge sharing and, more broadly, knowledge management contributes to NPD outcomes is a significant gap and a top research priority in knowledge management (Heisig *et al.*, 2016), it is important to investigate the role of multiple mediators to better understand the underlying mechanisms of value creation.

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Appendix

Table A1 Measurement constructs

Construct and definition (measures inspired by or based on)	Items (factor loadings in parentheses)
<p><i>Willingness to share knowledge</i>: individual's tendency to engage in tacit knowledge sharing behaviour (Holste and Fields, 2010) (reflective)</p>	<p>(1 = fully disagree, 7 = fully agree) If requested to do so, I would allow my colleague to spend significant time observing and collaborating with me for him/her to better understand and learn from my work (0.88) I would willingly share with my colleague rules of thumb, tricks of the trade and other insights into the work of my office and that of the organisation that I have learned (0.98) I would willingly share my new ideas with my colleague (0.87)</p>
<p><i>NPD innovativeness</i>: the extent to which a firm's products are superior in the market compared to competitors' products in terms of novelty, customer response and first-to-market entry (Keszey and Biemans, 2016) (reflective)</p>	<p>(1 = fully disagree, 7 = fully agree) We enter first-to-market with our product innovations (0.88) We have more product innovations than our competitors (0.91) Our NPDs were more successful than our competitors' (0.89) Our NPDs were more novel and innovative compared to our competitors' (0.89) The market response to our NPDs were more positive than to our competitors' (0.89)</p>
<p><i>NPD financial performance</i>: the extent to which NPD financial objectives were met (De Luca and Atuahene-Gima, 2007) (reflective)</p>	<p>(1 = fully disagree, 7 = fully agree) NPD sales goals relative to stated objectives (0.87) NPD return on investment related to stated objectives (0.67) NPD return on assets related to stated objectives (0.94) NPD profitability relative to stated objectives (0.89)</p>
<p><i>Market turbulence</i>: the rate of change in the composition of customers and their preferences. (Jaworski and Kohli, 1993) (reflective)</p>	<p>(1 = fully disagree, 7 = fully agree) In our kind of business, customers' product preferences change quite a bit over time (0.71) Our customers tend to look for new products all the time (0.76) We are witnessing demand for our products and services from customers who never bought them before (0.71) New customers tend to have product related needs that are different from those of our existing customers (0.71)</p>
<p><i>Differentiation strategy</i>: the extent to which a company's market positioning focuses on providing superior product value to the customer. (Homburg et al., 1999) (reflective)</p>	<p>(1 = fully disagree, 7 = fully agree) Our firm/business unit emphasises competitive advantage through superior products (0.80) Our firm/business unit emphasises building up a premium product or brand image (0.76) Our firm/business unit emphasises new product development (0.65)</p>
<p>Notes: Model fit: $\chi^2 = 250.55$, $df = 139$; $\chi^2/df = 1.80$; $p = 0.000$; AGFI = 0.89, GFI = 0.92, NFI = 0.94, IFI = 0.97, CFI = 0.97, RMSEA = 0.05, PCLOSE = 0.35. All loadings are significant at the $p < 0.001$ level</p>	

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