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Employee involvement in ideation and healthcare service innovation quality

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ABSTRACT

This study hypothesizes and empirically tests the influence of involvement of (1) frontline employees and (2) top managers in ideation process on healthcare service innovation quality. Based on data from 168 service innovation projects in Dutch healthcare organizations, the empirical results indicate that frontline employee involvement and top management involvement in, respectively, idea generation and idea application both improve the quality of healthcare service innovation. We find that the positive effect of frontline employee involvement is stronger under the condition of higher service innovativeness. In the direct relationship of top management involvement and healthcare service innovation quality, our data do not show such a moderating effect. The key and general managerial implication of the findings is that healthcare organizations are inspired to involve frontline employees in the idea generation processes and involve top managers in the idea application processes of service innovation projects, in order to improve innovation quality.

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Service innovation; innovation quality; frontline employee involvement; top management involvement; service innovativeness

Introduction

Healthcare significantly affects the quality of life and well-being of individuals and collectives (Berry & Bendapudi, 2007; Ostrom, Parasuraman, Bowen, Patrício, & Voss, 2015). Treatments in healthcare are frequently characterized by a high level of quality control to prevent accidents or other negative consequences for users/patients. Coping with quality pressure, user/patient needs and technological evolution, the healthcare sector is active in service innovation, continuously introducing new/improved healthcare services and procedures (Djellal & Gallouj, 2005; Melton & Hartline, 2010).

Extant research on innovation in healthcare has involved different innovation topics, such as medical innovation (Djellal & Gallouj, 2005), new product development (NPD) (Salge, Farchi, Barrett, & Dopson, 2013), supply chain innovation (Sang, DonHee, & Marc, 2011) and innovation logics (Miller & French, 2016). This study focuses on *service*

innovation in healthcare, and views it as any change that affects one or more terms of one or more healthcare service characteristics (Gallouj & Weinstein, 1997).

Service innovation is regarded as a collaborative effort that calls for the involvement of multiple employees as driving forces (Melton & Hartline, 2013; Vermeulen, De Jong, & O'Shaughnessy, 2005). Despite the unanimous awareness that employee involvement contributes to innovation performance, it is still relatively under-researched how this influence differs between various employee groups, under different circumstances, and in the healthcare setting. With some exceptions (e.g. Melton & Hartline, 2013), past research of employee involvement in innovation processes has concentrated on a single employee group (e.g. Engen & Magnusson, 2015; Kleinschmidt, de Brentani, & Salomo, 2007; Ordanini & Parasuraman, 2011). This study responds to calls from service researchers for a better understanding of (1) employee issues relevant to service innovation and (2) matters of well-being and healthcare services (Berry & Bendapudi, 2007; Ostrom et al., 2015).

The present study aims to address two related questions: *How does the influence of employee involvement in ideation on healthcare service innovation quality differ* (1) *between various employee groups* and (2) *under varying levels of service innovativeness*? This study contributes to the service innovation literature by theoretically proposing and empirically demonstrating an integrated model, which takes the involvement of two employee groups together as antecedents of service innovation quality. For practitioners, answers to these questions are crucial to optimize the effectiveness of their organizations' internal human resources and capabilities, and improve the quality of their healthcare service innovations.

Numerous matters challenge service management, quality control and quality improvement for healthcare service providers (Berry & Bendapudi, 2007). Service innovation quality, as the intersection of service innovation and quality management, has been paid scant attention to both in theory and practice. Since financial performance is not the primary target for the majority of (not-for-profit) healthcare organizations, we operate *service innovation quality* as a consequence, and define it as the conformance of a service innovation project's operational outcomes to the desired specifications.

This study focuses on two employee groups, i.e. frontline employees and top managers, who are two ends of an organization's human resources. This is partly in line with the study of Melton and Hartline (2013) on multiple employee involvement in service innovation. One of their focal groups is frontline employees. Regarded as the primary contact points in customer/user interactions, and one of the vital organizational resources in service-dominant (S-D) logic, frontline employees serve as a crucial source of idea generation (Ordanini & Parasuraman, 2011; Vargo & Lusch, 2016). They have intimate knowledge of customer/user needs and similar services provided by other organizations (Melton & Hartline, 2013). In addition, top management involvement is considered as an influential force of idea application. Top management involvement represents an important form of organizational commitment to innovation effort, which is relevant for facilitating NPD (Cooper & Kleinschmidt, 1995), as well as service innovation (de Brentani & Ragot, 1996).

Although the literature has recognized the contributions of frontline employees and top managers to innovation performance separately, few studies have included both of them in a conceptual framework, and empirically tested their distinct effects. This study frames the two parties into one conceptual model, and integrates knowledge from the two separate literature streams. Furthermore, it considers both direct effects under

different levels of service innovativeness, proposing that the level of service innovativeness influences the degree of the two parties' contribution to service innovation quality in, respectively, the idea generation and idea application process.

To advance current research in the domain of healthcare service innovation, our objective is twofold: (1) to identify the effects of frontline employee involvement in idea generation and of top management involvement in idea application on service innovation quality in the healthcare sector and (2) to investigate the potential moderating role of service innovativeness in both direct relationships. In order to test our hypotheses, we collected empirical data from 168 respondents who are active in various healthcare service innovation projects in the Dutch healthcare sector.

The remainder of this paper proceeds as follows. In the next section, we discuss the theoretical background, and develop the conceptual framework and hypotheses. The method crafted for hypotheses testing composes the third section. The fourth section describes the statistical analysis and empirical results. Finally, we present the discussion with theoretical and practical implications, as well as related opportunities for further research in the fifth section.

Theoretical framework and hypotheses development

Adapted from Carbonell, Rodriguez-Escudero, and Pujari (2009), *service innovation quality* in this study describes the conformance of service innovation outcomes to the preset performance specifications. The concept of service innovation quality is similar to what others have labeled as innovation effectiveness (Froehle, Roth, Chase, & Voss, 2000) and conformance quality (Jayaram & Narasimhan, 2007). Due to the intangible characteristics of services and various categories of service innovation, we do not limit service innovation quality to the quality of a finally offered service. It also incorporates the conformance of other parts that are associated with the whole innovation process (e.g. changes of the service delivery approach, or the introduction of a new technology into services).

The innovation process, i.e. the introduction, exploitation and use of new and/or renewed products and services (Bessant & Tidd, 2007), is highly dependent on the input and processing of information in the form of new ideas (Salomo, Weise, & Gemunden, 2007). The basis of many service innovations is often formed by completely new ideas or ideas that are new-to-the-organization (Engen & Magnusson, 2015; Salge et al., 2013). The initial activities of idea generation and the subsequent activities of idea application are both important consecutive activities in the ideation process that enables service innovation. In this context, idea generation is seen as the information gathering process that enables the discovery of service innovation opportunities (Reid & de Brentani, 2004), and idea application is seen as the use of this information to actually develop the related service innovations (Cooper & Kleinschmidt, 1995).

Focusing on this innovation process, existing research suggests that antecedents of innovation quality in services include characteristics of the socio-political context, of the organization, of the adopting user, and of the innovation *per se*, such as legislation and regulations, resources and complexity (Adams, Tranfield, & Denyer, 2013; Fleuren, Paulussen, Van Dommelen, & Van Buuren, 2014; Fleuren, Wiefferink, & Paulussen, 2004). This present study considers the relationship of employee involvement and service innovation quality, in the context of healthcare, in which service innovation quality can also be influenced by these antecedents.

Employee involvement in service innovation represents the extent to which an organization's employees are involved in the process of a service innovation. Previous studies have connected frontline employees and top managers to innovation outcomes (e.g. Kleinschmidt et al., 2007; Ordanini & Parasuraman, 2011). Studies on frontline employee involvement in innovations are primarily situated in the field of service innovation or new service development. They have indicated the relationship of frontline employee involvement with innovation outcomes, such as innovation success (de Brentani, 2001; Martin & Horne, 1995), and innovation volume and radicalness (Ordanini & Parasuraman, 2011), but not with innovation quality. Research of top management involvement in innovations has covered the domains of service innovation and NPD. These results are related to various innovation outcomes, including our focal innovation quality (Felekoglu & Moultrie, 2014). Despite the intensive attention paid to their separate effects in the literature, there is a dearth of empirical research combining them into an integrated framework to consider the distinctions of their effects under different conditions, and specifically focusing on service innovativeness in healthcare.

Frontline employee involvement and healthcare service innovation quality

Frontline employees are employees of service organizations who have regular contacts with customers/users (Melton & Hartline, 2010). In a healthcare context, frontline employees include receptionists, nurses, doctors and therapists (Bowers, 1989). The study of frontline employee involvement is thought to hold a promising area of service innovation research (Ostrom et al., 2015; Page & Schirr, 2008).

Based on S-D logic, Ordanini and Parasuraman (2011) propose a conceptual framework of service innovation, and empirically verify the effects of frontline employee involvement on the outcomes of organizations' service innovation programs. Prior research has also found that frontline employee involvement improves new service development outcomes (de Brentani, 2001; Martin & Horne, 1995). For instance, Melton and Hartline (2010, 2013) verify its effect on service marketability, which is one aspect of these outcomes. Our study extends extant work by exploring the relationship between frontline employee involvement in the process of idea generation and service innovation quality, and examines this relationship in the healthcare sector and at the individual project level instead of the more aggregate organizational or program level.

Knowledgeable frontline employees are a vital source of innovative ideas and user-generated feedback (Atuahene-Gima, 1996; Engen & Magnusson, 2015). They can record customers'/users' problems, and accordingly put forward new service ideas or novel, unique and special solutions (Edgett & Parkinson, 1994). Their involvement in generating and screening ideas improves the likelihood of acceptance by customers/users and the quality of innovation outcomes (Melton & Hartline, 2010). Their involvement in developing ideas and establishing goals and priorities can prevent process-efficiency considerations from superseding customer/user needs (Ordanini & Parasuraman, 2011).

Medical specialists' extensive and professional knowledge frequently characterizes healthcare organizations, which has effects on innovation processes. The healthcare sector is full of end-user interactions, where frontline employees are often the primary contact point for users/patients in the whole service delivery process (Jamal & Adelowore, 2008). The final set of healthcare service characteristics differs between users/patients, and

strongly depends on the competences of frontline employees, as well as their interactions with users/patients (Windrum & García-Goñi, 2008). Due to the co-creation characteristics of healthcare services, the knowledge and insights of frontline employees into the delivery process are crucial for the ideation process of service innovation. Prior research that has examined this linkage between frontline employee involvement in idea generation and service innovation quality, and specifically in the healthcare sector is scarce (e.g. Melton & Hartline, 2010, 2013). This study explores this relationship and proposes the following hypothesis in the context of healthcare.

H1. Frontline employee involvement in the generation of innovative ideas positively affects service innovation quality in healthcare.

Top management involvement and healthcare service innovation quality

In the literature, the concept of top management is consistent with the notions of senior management (Felekoglu & Moultrie, 2014) and upper management (Bonner, Ruekert, & Walker, 2002). Top managers frequently play a role of project reviewers to make key decisions about the generated innovative ideas, and ensure that the realization of these ideas in the innovation project fits with their organization's strategy (de Brentani & Kleinschmidt, 2004). By providing a vision to guide an innovation project, top management involvement is helpful in solving design conflicts and keeping the project on the right track (Swink, 2000). Top managers champion innovative ideas and innovation efforts during critical phases to overcome obstacles and to support and promote innovation (Kleinschmidt et al., 2007). As representatives of the organization and its reputation, top managers also personally interact with key strategic users (de Brentani, 2001; de Brentani & Ragot, 1996).

Empirical research on the relationship of top management involvement and innovation quality has produced different results (Felekoglu & Moultrie, 2014), e.g. a positive (Swink, 2000), inverted U-shaped (Unger, Kock, Gemünden, & Jonas, 2012), or inconclusive relationship (Gomes, de Weerd-Nederhof, Pearson, & Fisscher, 2001). As the above findings were derived from the field of NPD, further investigation with respect to the relationship in a service context is needed. This study specifically investigates the influence of top management involvement in idea application on service innovation quality in the healthcare sector.

We predict that top management involvement in championing and applying the ideas that are generated in a healthcare service innovation project is positively related to service innovation quality. According to the literature, the involvement of top managers increases the motivation of project team members and helps to overcome organizational resistance to ideas that can ignite change (Swink, 2000). Top management involvement creates an entrepreneurial and team-oriented climate wherein ideas can develop and grow (de Brentani, 2001), and members of innovation project teams are likely to pay more attention to details of problems to be solved and ideas that contribute to a solution (Swink, 2000). Based on the above theoretical points of departure, in the research setting of healthcare, we put forward the second hypothesis.

H2. Top management involvement in the application of innovative ideas positively affects service innovation quality in healthcare.

The moderating effect of service innovativeness

Service innovativeness refers to the uniqueness or novelty of a service innovation to the market or user groups (Calantone, Chan, & Cui, 2006). We use this general definition and further specify healthcare service innovation as our research setting. In our study, the concept of *service innovativeness* emphasizes the degree of *novelty* of a service innovation, while *service innovation quality* is conceptualized as the *conformance* of a service innovation to specifications.

Suggesting that service innovativeness is related to employee involvement in ideation, we concern it as a potential moderator in the focal direct relationships. Service innovativeness offers organizations great opportunities of entry, growth and expansion in new areas (Danneels & Kleinschmidt, 2001). Evaluating service innovativeness helps to identify innovation challenges and uncertainties, which are potential determinants of innovation success and failure (Loch, Solt, & Bailey, 2008). A higher degree of service innovativeness is accompanied with a higher level of uncertainty as well as limited access to information (Salomo et al., 2007). In order to reduce the uncertainty, more and different information is needed. In this logic, we expect that the required degree of employee involvement in the ideation process of service innovation depends on the need for information, which in turn relies on service innovativeness.

Given their frequent interactions with, and extensive knowledge of users/patients, the role of frontline employees is considered more crucial in radical healthcare service innovations. Their involvement makes the benefits of unique and totally new innovations easier to be perceived, understood and adopted by users/patients (Melton & Hartline, 2010). Olson, Walker, and Ruekert (1995) indicate that cross-functional teams are more likely to improve the effectiveness of the process of developing more radical products. Since innovation teams consist of specialists from different functions, we infer that deeper involvement of frontline employees in idea generation produces better innovation quality in radical innovation projects than in incremental ones. Therefore, in the healthcare setting, we hypothesize a positive moderating role of service innovativeness on the relationship between frontline employee involvement in idea generation and service innovation quality.

H3. A positive effect of frontline employee involvement in the generation of innovative ideas on healthcare service innovation quality is stronger at high levels of service innovativeness.

The NPD literature concerns the visible value of top management involvement, particularly in innovations with high uncertainty and risk (Unger et al., 2012). For the success of radical service innovations, which have a weaker fit with the organization's established resources and capabilities, more and new information is required. It is more important for top managers to encourage new or different views, ideas and solutions, and be involved as visionaries and mentors in the process of idea application (de Brentani, 2001). Swink (2000) expects that technological innovativeness moderates the link between top management involvement and design quality in NPD, but does not gain empirical results that support this expectation. We propose and examine a positive moderating effect of service innovativeness on the relationship between top management involvement in idea application and service innovation quality in the healthcare context.

H4. A positive effect of top management involvement in the application of innovative ideas on healthcare service innovation quality is stronger at high levels of service innovativeness.

The relationships associated with these hypotheses are shown in the research framework (Figure 1).

Three control variables, i.e. project complexity, user context turbulence and technological turbulence, are included for service innovation quality. These three covariates are related to broad uncertainties in service innovation projects. Although these variables are applied as antecedents of innovation in studies by Akenroye (2012) and Fleuren et al. (2004), this study integrates these in its research approach as control variables. We control for the impacts of project complexity, user context turbulence and technological turbulence on healthcare service innovation quality to emphasize the direct effect of employee involvement. Project complexity indicates uncertainties within the innovating organization. User context turbulence and technological turbulence indicate environmental uncertainties and complexity (Calantone, Garcia, & Droge, 2003).

Method

Sample and response

Our empirical setting is the Dutch healthcare sector. The unit of analysis is a healthcare service innovation that is realized in a project. This study employs a key informant approach to collect empirical data. We drew a list of organizations operating in the Dutch healthcare sector from the REACH (Review and Analysis of Companies in Holland) directory. These healthcare organizations include hospitals, medical centers, clinics and medical group practices. Leaders who are in the position of managers (e.g. owner, chairman, director and head of department) or specialists who are involved in innovation or R&D activities (e.g. project leader and scientist) are targeted as potential respondents. Employees who meet these criteria for inclusion are likely to have responsibility for, and/or extensive knowledge of service innovation activities in their organizations.

We carried out an online questionnaire survey to 1598 key informants. A two-round pretest and an online pilot test confirmed the appropriateness of the questionnaire. We

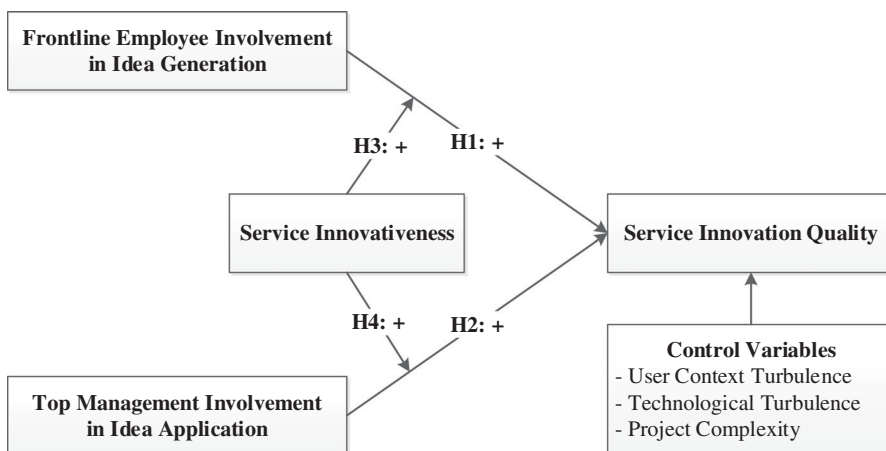


Figure 1. Proposed conceptual framework.

sent out two reminders to the non-respondents. After three e-mailing rounds, we collected a total of 168 usable questionnaires, representing a response rate of 10.5%. The service innovation projects in which the respondents are active cover a broad spectrum of healthcare service innovations, ranging from new-to-the-market services (e.g. apps with medical instructions for patients), new or modified service lines (e.g. websites or long-time telephone services of medical consultation), new delivery processes (e.g. e-health platforms and modules), incremental service improvements (e.g. increased intensity of rehabilitation), repositioning of existing services (e.g. redesign of the mission and ambition), to cost-reducing innovations (e.g. introduction of lean management). [Tables 1](#) and [2](#) show the projects' composition and respondents' demographic characteristics, respectively.

On a five-point scale, the mean of the key informants' knowledgeability is 4.48, and the mean of their involvement degree is 4.42. Considering the respondent's role in the innovation project, 44% is project leader, 33% is supervisor and 19% is member of the project team. Only 4% (7 respondents) is not involved in the project, and has a relatively low average knowledgeability of 2.71, which is still above the middle value of 2.5. The composition of the projects and characteristics of the respondents verify the appropriateness of these samples and key informants.

As a traditional approach for assessing common method bias, Harman's single-factor test suggests no serious problems (Podsakoff & Organ, 1986). To test for nonresponse bias, we compared the answers from the early and late respondents (Armstrong & Overton, 1977). A series of Mann–Whitney U-tests reveals no significant differences between the two subgroups ($p < .05$).

Measures

We employed reflective measurement models for all the latent variables. Measurement items of the constructs are mostly based on existing scales that have shown reliability and validity in previous studies. Unless noted otherwise, five-point Likert-style scales were used (1 = 'strongly disagree' to 5 = 'strongly agree'). [Table 3](#) gives a measurement summary with all items, and their sources and loadings.

Service innovation quality

Given the different types of service innovation projects and diverse characteristics of services, absolute measures of service innovation quality introduce a lack of comparability

Table 1. Projects' composition.

Project category			Project duration			Project team size ^a		
Category	<i>n</i>	%	Month	<i>n</i>	%	Range	<i>n</i>	%
New-to-the-market service	47	28.0	≤1	6	3.6	1–4	70	41.7
New service line	16	9.5	2–6	21	12.5	5–9	60	35.7
Addition to existing service line	18	10.7	7–12	37	22.0	10–14	16	9.5
New delivery process	6	3.6	13–18	30	17.9	15–19	5	3.0
Improvements/Revisions to existing service	48	28.6	19–24	31	18.5	20–24	2	1.2
Service repositioning	7	4.2	≥25	43	25.6	≥25	15	8.9
Cost reduction	7	4.2						
Other	19	11.3						
Total	168	100	Total	168	100	Total	168	100

^aNumber of employees in the project team.

Table 2. Respondents' demographic characteristics.

Gender			Age			Education			Work experience		
Category	<i>n</i>	%	Year	<i>n</i>	%	Category	<i>n</i>	%	Year	<i>n</i>	%
Male	100	59.5	26–35	26	15.5	High school or less	2	1.2	1–2	10	6.0
Female	68	40.5	36–45	38	22.6	Some college	4	2.4	3–5	41	24.4
			46–55	58	34.5	Bachelor's degree	30	17.9	6–10	37	22.0
			≥56	46	27.4	Master's degree	71	42.3	11–15	28	16.7
						Doctoral degree	57	33.9	16–20	15	8.9
						Other	4	2.4	≥21	37	22.0
Total	168	100	Total	168	100	Total	168	100	Total	168	100

among innovation categories. We used a relative measure of three items for service innovation quality, to compare the quality of focal innovation with the quality of preset performance specifications, as well as the quality of similar past innovations completed respectively by the innovating organization and other organizations (Kessler & Bierly, 2002; Lin, Huang, & Chiang, 2012). The three items are: 'Quality of the innovation was better than that of the preset performance specifications' (SIQ1); 'Quality of the innovation was better than that of our similar completed innovations' (SIQ2) and 'Quality of the innovation was better than that of similar innovations completed by other organizations' (SIQ3).

Frontline employee involvement and top management involvement

A scale of three items adopted from Ordanini and Parasuraman (2011) and a scale of five items from de Brentani and Kleinschmidt (2004) and Kleinschmidt et al. (2007) are used to measure frontline employee involvement and top management involvement in, respectively, idea generation and idea application. Respondents are asked to indicate their degree of agreement with the scale statements about the involvement of two employee groups in various activities of the innovation project. For frontline employees, their involved activities of idea generation include 'generating and screening ideas' (FEI1), 'establishing goals priorities' (FEI2) and 'represent(ing) in the innovation project team and other strategic activities' (FEI3). For top managers, their involved activities of idea application include 'reviewing the innovation project' (TMI1), 'vision(ing) and/or champion(ing) of the innovation project' (TMI2), 'enhancing reputation of organization and the innovation project' (TMI3), 'encouraging key strategic users to adopt the innovation project' (TMI4) and 'day-to-day activities of the innovation project' (TMI5).

Service innovativeness

A three-item scale for market innovativeness is adapted to measure service innovativeness, specifically the degrees to which the service innovation offered new user value (SI1), created a new service category (SI2) and changed the way that the user context functions (SI3) (Schultz, Salomo, & Talke, 2013).

Control variables

We measured user context turbulence (UCT1, UCT2, UCT3 and UCT4) and technological turbulence (TT1, TT2, TT3 and TT4) through a four-item scale for each (Candi, van den Ende, & Gemser, 2013; Danneels & Sethi, 2011; Dayan & Di Benedetto, 2011). Three indicators are included for project complexity (PC1, PC2 and PC3).

Table 3. Items for construct measurement.^a

Construct (Source)	Measure of construct	OL	HCL
Service innovation quality (Kessler & Bierly, 2002; Lin et al., 2012)	Quality of the innovation was better than that of		
	SIQ1. ... the preset performance specifications	0.83****	0.34
	SIQ2. ... our similar completed innovations	0.85****	0.21
	SIQ3. ... similar innovations completed by other organizations	0.83****	0.29
Frontline employee involvement (Ordanini & Parasuraman, 2011)	FEI1. Frontline employees were actively involved in generating and screening ideas for the innovation project	0.86****	0.24
	FEI2. Frontline employees were actively involved in establishing goals and priorities for the innovation project	0.89****	0.26
	FEI3. Frontline employees were adequately represented in the innovation project team and other strategic activities	0.87****	0.20
Top management involvement (de Brentani & Kleinschmidt, 2004; Kleinschmidt et al., 2007)	TMI1. Top managers played a central role in review of the innovation project	0.81****	0.30
	TMI2. Top managers were visionaries and/or champions of the innovation project	0.86****	0.18
	TMI3. Top managers enhanced reputation of our organization and the innovation project	0.92****	0.38
	TMI4. Top managers encouraged key strategic users to adopt the innovation project	0.84****	0.29
	TMI5. Top management was active in the day-to-day activities of the innovation project	0.73****	0.12
Service innovativeness (Schultz et al., 2013)	SI1. The innovation offered new user value not offered before by any other services	0.76****	0.29
	SI2. The innovation created a totally new service category	0.78****	0.32
	SI3. The innovation changed the way our user context functions	0.74****	0.31
User context turbulence (Danneels & Sethi, 2011; Dayan & Di Benedetto, 2011)	UCT1. Users' demands and preferences changed quite a bit over time	0.69****	0.22
	UCT2. Users tended to look for new services all the time	0.70****	0.15
	UCT3. We witnessed demands for our services from users who were never served by us before	0.78****	0.42
	UCT4. New users tended to have service-related needs that were different from those of our existing users	0.80****	0.36
Technological turbulence (Candi et al., 2013; Danneels & Sethi, 2011)	TT1. The technology in our industry changed rapidly	0.94****	0.23
	TT2. Technological changes provided big opportunities in our industry	0.92****	0.18
	TT3. A large number of innovative ideas have been made possible through technological breakthroughs in our industry	0.88****	0.17
	TT4. Technological developments in our industry were rather minor ^{bc}		
Project complexity (self-developed)	PC1. The innovation project is complex	0.91****	0.26
	PC2. Project duration ^d	0.69****	0.15
	PC3. Project team size ^{be}		

Note: All items were scored on a five-point Likert-style scale (1 = 'strongly disagree' to 5 = 'strongly agree') unless indicated otherwise.

^aOL: outer loadings, HCL: highest cross-loadings.

^bItem deleted.

^cReverse coded.

^dSix-point rating scale: 1 = ≤ 1 month, 2 = 2–6 months, 3 = 7–12 months, 4 = 13–18 months, 5 = 19–24 months and 6 = ≥25 months.

^eSix-point rating scale: 1 = 1–4 employees, 2 = 5–9 employees, 3 = 10–14 employees, 4 = 15–19 employees, 5 = 20–24 employees and 6 = ≥25 employees.

*****p* < .001; two-tailed.

Measurement properties

We applied SmartPLS 3 to obtain partial least squares structural equation models (PLS-SEMs) for both the measurement and the structural models. Two items (TT4 and PC3) were deleted after comprehensive consideration of their outer loading

(OL), composite reliability (CR) and the average variance extracted (AVE) (Hair, Ringle, & Sarstedt, 2011).

For all constructs, their CRs reach values above the required threshold of 0.7, suggesting a satisfactory internal consistency reliability (Hair, Hult, Ringle, & Sarstedt, 2017). OLS of most indicators are above the rigorous cut-off value of 0.708 for indicator reliability (Hair et al., 2017). All AVEs exceed the recommended threshold of 0.5 for convergent validity (Fornell & Larcker, 1981). We inspected discriminant validity in three ways: the Fornell–Larcker criterion, assessment of the cross-loadings and the Heterotrait–Monotrait (HTMT) approach (Fornell & Larcker, 1981; Hair et al., 2011; Henseler, Ringle, & Sarstedt, 2015). Overall, almost all measures meet or exceed the recommended values, indicating an adequate level of reliability and validity. These related indexes can be found in Tables 3 and 4.

Results

Direct effects

We investigated the direct effects of the conceptual model without accounting for the hypothesized moderating effects. All variance inflation factors are less than 1.04, which are well below the cut-off point of 5, so we perceive no severe collinearity problems (Hair et al., 2017).

The coefficient of determination (R^2) and Stone-Geisser's Q^2 are examined to assess the model's predictive accuracy and relevance. A blindfolding procedure is used to obtain the Q^2 values. The R^2 and Q^2 values of service innovation quality are 0.249 and 0.144, respectively.

We employed a bootstrapping procedure (5000 samples; 168 cases; no sign changes) to test the statistical significance of path coefficients. Table 5 shows the results of direct and moderating effect models. It reveals that frontline employee involvement in idea generation (H1, $\beta = 0.17$, $p < .01$, $f^2 = 0.04$) and top management involvement in idea application (H2, $\beta = 0.15$, $p < .05$, $f^2 = 0.03$) have positive effects on service innovation quality (see Table 6). Both direct effects are verified with a significant path coefficient and f^2 effect size.

Moderating effects

In order to test for the moderating effects in the conceptual model, we used the two-stage approach to develop interaction terms (Hair et al., 2017). Compared with their respective

Table 4. CR, AVE, square root of AVE, correlations and HTMT ratios of the constructs.^a

Construct	CR	AVE	1	2	3	4	5	6	7
1. Service innovation quality	0.88	0.70	(0.84)	0.30	0.28	0.44	0.35	0.22	0.40
2. Frontline employee involvement	0.90	0.76	0.26	(0.87)	0.18	0.19	0.10	0.14	0.28
3. Top management involvement	0.92	0.70	0.29	0.17	(0.84)	0.32	0.22	0.11	0.30
4. Service innovativeness	0.81	0.58	0.33	0.13	0.24	(0.76)	0.50	0.22	0.31
5. User context turbulence	0.83	0.55	0.28	0.02	0.18	0.37	(0.74)	0.17	0.16
6. Technological turbulence	0.94	0.83	0.20	0.11	0.10	0.19	0.15	(0.91)	0.08
7. Project complexity	0.78	0.65	0.26	0.18	0.20	0.18	0.06	0.07	(0.80)

Note: The square roots of AVE values are shown on the diagonal (between parentheses). Correlations and HTMT ratios are reported in the lower and upper half of the matrix, respectively.

^aCR: composite reliability, AVE: average variance extracted, HTMT: Heterotrait–Monotrait.

Table 5. Results of two effect models.^a

Path	Direct effect model		Moderating effect model	
	Path coefficient	t-value	Path coefficient	t-value
Frontline employee involvement → SIQ	0.17	3.03***	0.15	2.47**
Top management involvement → SIQ	0.15	2.47**	0.17	2.41**
Service innovativeness → SIQ	0.17	2.65***	0.18	2.72***
User context turbulence → SIQ	0.16	2.23**	0.13	1.64
Technological turbulence → SIQ	0.10	1.54	0.11	1.68*
Project complexity → SIQ	0.16	2.55**	0.14	2.25**
Frontline employee involvement × service innovativeness → SIQ	–	–	0.11	1.68*
Top management involvement × service innovativeness → SIQ	–	–	–0.05	0.78

^aSIQ: service innovation quality.*** $p < .01$, ** $p < .05$, * $p < .1$; two-tailed.

values in the direct effects model, the R^2 and Q^2 values of service innovation quality in the moderating effects model increase to 0.262 and 0.151, respectively.

The results in Table 6 show that service innovativeness positively moderates the relationship between frontline employee involvement in idea generation and service innovation quality (H3, $\beta = 0.11$, $p < .1$, $f^2 = 0.014$). Although this moderating effect is verified with a marginally significant path coefficient, its f^2 effect size exceeds the medium effect value of 0.01 for interaction terms (Hair et al., 2017; Kenny, 2015). No evidence supports the moderating effect of service innovativeness on the relationship of top management involvement in idea application and service innovation quality (H4).

Robustness checks

To identify potential problems related to observed heterogeneity, PLS-SEM multigroup analysis (PLS-MGA) is conducted (Hair et al., 2017). By comparing path coefficients across subgroups of early and late response, and small and big project team, respectively, a series of PLS-MGAs suggests that there is no significant difference in paths and no serious heterogeneity between respective subgroups. Also, the conclusion of no serious heterogeneity between early and late response provides additional evidence for the absence of nonresponse bias.

To identify potential problems related to unobserved heterogeneity, finite mixture partial least squares (FIMIX-PLS) is used (Sarstedt, Becker, Ringle, & Schwaiger, 2011). The results indicate that one-segment solution is most appropriate. It suggests that unobserved heterogeneity is not a serious problem in this study, and the former PLS-SEM results are not distorted by unobserved heterogeneity.

Table 6. Results of hypotheses testing.^a

Path	Path coefficient (t-value)	f^2 effect size	Hypothesis supported?
Frontline employee involvement → SIQ	0.17 (3.03)***	0.038	H1 – Yes
Top management involvement → SIQ	0.15 (2.47)**	0.025	H2 – Yes
Frontline employee involvement × service innovativeness → SIQ	0.11 (1.68)*	0.014	H3 – Yes
Top management involvement × service innovativeness → SIQ	–0.05 (0.78)	0.003	H4 – No

^aSIQ: service innovation quality.*** $p < .01$, ** $p < .05$, * $p < .1$; two-tailed.

Discussion and conclusion

Analysis of findings

The empirical study confirms the hypothesized positive effect of frontline employee involvement in idea generation on healthcare service innovation quality. The majority of research on the relationship between frontline employee involvement and service innovation performance focuses on other aspects of innovation outcomes, such as innovation success, volume and radicalness (de Brentani, 2001; Martin & Horne, 1995; Ordanini & Parasuraman, 2011). Melton and Hartline (2010, 2013) uncover the positive effect of frontline employee involvement on service marketability, based on data from a variety of service sectors, including healthcare. The quality of service experience is one facet of service marketability examined by their research, and an aspect of service innovation quality concerned in our study. Hence, the revealed relationship of frontline employee involvement in idea generation with service innovation quality is in line with its relationship with service marketability as concluded by Melton and Hartline (2010, 2013). Our study suggests that frontline employees improve healthcare service innovation quality through (1) being involved in generating and screening ideas to identify user/patient needs (Engen & Magnusson, 2015), (2) establishing goals and priorities to emphasize user/patient needs (Ordanini & Parasuraman, 2011) and (3) being participants in the innovation project team and other strategic activities to realize user/patient needs (de Brentani & Ragot, 1996). From our empirical data, numerous Dutch healthcare service innovations involved frontline employees in the idea generation processes of innovation projects, such as exploration of the principles of lean management, development of new therapy modules and implementation of websites for medical consultation.

This study also empirically supports our hypothesis that top management involvement in idea application has a positive effect on healthcare service innovation quality. In a manufacturing context, previous empirical research on the relationship of top management involvement and innovation quality of NPD has resulted in sort-like conclusions (Felekoglu & Moultrie, 2014). Among these, a positive relationship is reported in most cases (e.g. Swink, 2000; Unger et al., 2012). Unger et al. (2012) identify an inverted U-shaped relationship at a project portfolio level compared to our single project level, but claim that the quantity of available resources positively influences the success of a single project. Our study's results are in line with findings from previous research in NPD contexts. Similarly, our study suggests that top managers improve the innovation quality in healthcare service innovation projects through (1) reviewing the innovation project (de Brentani & Kleinschmidt, 2004), (2) being visionaries or champions (Kleinschmidt et al., 2007; Swink, 2000), (3) enhancing reputation of the organization and project (de Brentani & Ragot, 1996), (4) encouraging key strategic users' adoption (de Brentani, 2001) and (5) being active in the day-to-day activities (de Brentani & Kleinschmidt, 2004). A large number of Dutch healthcare service innovations in our data, which involved top managers in the idea application processes of innovation projects, include implementation of the principles of lean management, development of a client administration system and application of advanced remote technologies.

The empirical evidence reveals that the influence of frontline employee involvement in idea generation on healthcare service innovation quality is stronger under the condition

of higher service innovativeness. Olson et al. (1995) suggest that cross-functional teams are more likely to improve the effectiveness of innovation processes when developing radical innovation products, compared with developing incremental ones. This present research's result in healthcare service innovation is consistent with the conclusion of Olson et al. (1995) in NPD of tangible goods, as frontline specialists are frequently involved in innovation teams. When frontline employees' innovative ideas are considered to be implemented in a radical innovation project, it is likely that they will show an increased motivation, willingness and persistence to find ways to realize the idea. To date, previous service innovation research has not yet explored the moderating effect of service innovativeness in the direct relationship with frontline employee involvement in idea generation and innovation quality. In the field of healthcare, this study shows that service innovativeness positively moderates this direct relationship. Due to high uncertainty and risk associated with radical healthcare service innovations, it largely depends on frontline employees' knowledge and efforts to overcome users'/patients' perception and adoption barriers to the new ideas and the radical innovations that can come from these ideas (Melton & Hartline, 2010).

However, the study shows no empirical support for the moderating role of service innovativeness on the relationship between top management involvement in idea application and healthcare service innovation quality. Likewise, Swink (2000) finds that technological innovativeness has no moderating effect on the relationship of top management involvement and design quality in NPD. One potential explanation for our finding is that the high uncertainty and risk, as well as the heavy quality pressures, challenge innovating healthcare organizations' decision making in striving for radical service innovations. Despite the relevance of top management involvement in healthcare service innovations, these challenges may partly overshadow top managers' support for new but also sometimes perceived as risky ideas in highly innovative projects, and induce some interference with their assessments and decisions in the innovation processes (Swink, 2000). Hence, top management involvement in idea application does not tend to have a significantly stronger impact on innovation quality in more radical healthcare service innovation projects, compared with in less innovative ones.

Theoretical and managerial implications

This study amplifies the existing understandings in the domain of healthcare service innovation threefold. Firstly, it highlights the relevance of both frontline employee involvement and top management involvement in, respectively, idea generation and idea application in healthcare service innovation projects. Secondly, it identifies the stronger effect of frontline employee involvement in idea generation on innovation quality under higher service innovativeness. Thirdly, it indicates that the influence of top management involvement in idea application on innovation quality is not adjusted by the degree of service innovativeness.

This study sheds new light on the topic of employee involvement in healthcare service innovation. Previous research has referred to the involvement of frontline employees in idea generation and of top managers in idea application as key factors of innovation success separately. This study is the first empirical research (1) that integrates these two parts of employee involvement in ideation into one model, to examine their contributions to healthcare service innovation simultaneously and (2) that provides a more explicit view

of the different degrees to which the two determinants influence healthcare service innovation quality, under different levels of service innovativeness. This study's framework represents an inaugural attempt at developing a basis for understanding the relationship between the involvement of two employee groups in the ideation process and in realizing service innovation quality.

This research's findings contribute to several literature streams, particularly in healthcare services. First, although frontline employee involvement and top management involvement in ideation have emerged as drivers of service innovation performance in previous studies, this study is the first to specifically address the influence of involving both employee groups in ideation on healthcare service innovation quality, under varying levels of service innovativeness. Second, as discussions about the relationship of employee involvement in ideation and innovation quality originated from and have been examined in manufacturing contexts, we shift this focus from the field of NPD to service innovation. Third, the results deepen our understanding of whether service innovativeness is a moderator in the two direct relationships, through revealing that our conclusions about its role in these two relationships in service innovation are consistent with findings from previous research in NPD settings.

We glean several insights for the management practice in healthcare service innovations from our findings. While service innovations are often generated as a result of employee collaboration, this study suggests that healthcare organizations should align their human resources with the degree of innovativeness in specific service innovation projects for improved results. Healthcare organizations may benefit most from applying the finding that both types of employee involvement (frontline employee involvement and top management involvement in, respectively, idea generation and idea application) should be implemented simultaneously and in an integrated fashion to achieve the highest service innovation quality.

Healthcare organizations should involve frontline experts in strategic innovation activities of idea generation (de Brentani & Ragot, 1996). This implies that a bottom-up approach to service innovations can be an effective way to go in a healthcare context. Healthcare organizations could increase their emphasis on acknowledging their frontline employees' innovative ideas, knowledge and contributions. Furthermore, taking the different levels of service innovativeness into consideration, when developing a radical healthcare service innovation project, healthcare organizations could give more attention to valuing and deeply involving frontline experts. Their involvement in idea generation can help to reduce the high level of risk and uncertainty in radical innovation processes (Atuahene-Gima, 1996). Failing to consider the moderating role of service innovativeness, healthcare organizations may not benefit fully from the involvement of frontline employees in ideation processes of healthcare service innovations.

This study also encourages top managers of healthcare organizations to act as reviewers, visionaries and champions of innovative idea application in healthcare service innovations. Healthcare organizations would benefit from involving top managers in any (incremental or radical) healthcare service innovation. To offer support from the top, top managers of healthcare organizations could not solely participate in radical service innovations and ignore the less innovative ones. They could be aware of the concept that their commitment and involvement is essential for assuring the quality of any healthcare service innovation, even the quality of incremental one. Meanwhile, it is neither

possible nor desirable for top managers to control the innovation process of every healthcare service innovation. This study's evidence can inspire them to reasonably coordinate their involvement, and not to overemphasize their commitment in radical ones, while overlooking the incremental ones.

Limitations and directions for future research

Next to its merits, this study also has its limitations. First, this research draws its sample from healthcare organizations in the Netherlands. The data limits the validity of our findings to the Dutch healthcare context. Future research could study the same relationships in a broader context, for example in other countries, and could also test the hypotheses in other service sectors.

A second limitation is that we draw conclusions from a relatively small sample size of 168 respondents. Although testing results indicate that nonresponse bias is not a serious problem in this study, and PLS-SEM can deal with this relatively small sample size (Wetzels, Odekerken-Schröder, & van Oppen, 2009), the limitation inevitably exists. Further research could test our hypotheses with a complementary and larger sample.

Furthermore, this research uses a single key informant approach for data collection. It may result in the possibility of common method bias, even though we have made considerable efforts (both procedure and statistical remedies) to alleviate this issue (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). This limitation could be avoided to a large extent via a longitudinal empirical design with multiple informants.

Moreover, the proposed model in this study only focuses on two employee groups' involvement and their respective direct effects. Their interaction effect may also be relevant in the context of healthcare, and could be further tested whether it is synergetic and/or across different levels of service innovativeness. This study primarily investigates frontline employee involvement and top management involvement in, respectively, the idea generation and idea application process in the innovation project, not the experience with the implemented innovation after the project is ended. Conducting a detailed study that focuses on the contributions of employee involvement to the applied ideas at the post-project stage could be a fruitful direction of further research.

Also, this study's dataset is short of information to separate the responses from frontline employees, top managers and others. This mix may introduce uncontrolled variance, even though the results of robustness checks reveal that unobserved heterogeneity is not a serious problem in this study. The identification of respondents could be helpful for more accurate findings in the future research.

Future analysis could also include other additional facets of stakeholder involvement in ideation to expand the model in this research, such as the involvement of a cross-functional project team (e.g. Melton & Hartline, 2013), or of customers/users. Besides, related coordination mechanisms could be considered to deeply explore their roles within the link between employee involvement and service innovation quality. All these supplements can account for the variance not explained by this research's model.

Summary and conclusion

This study aims to explore two related questions in the domain of employee involvement in healthcare service innovation: *How does the influence of employee involvement in*

ideation on healthcare service innovation quality differ (1) between various employee groups and (2) under varying levels of service innovativeness? It focuses on two ends of an organization's human resources, namely *frontline employees* and *top managers*. In the literature, there are extensive concerns about their separate effects, but studies that combine their involvement in service innovation simultaneously are scarce. This research integrates frontline employee involvement and top management involvement in ideation process of a healthcare service innovation into a conceptual framework. Specifically, it investigates their effects on healthcare service innovation quality, and further explores the role of service innovativeness as a moderator in both direct relationships.

This empirical study, covering data from 168 service innovation projects in the Dutch healthcare sector, supports the hypothesized positive effect of both frontline employee involvement and top management involvement in, respectively, idea generation and idea application on healthcare service innovation quality. Moreover, it verifies that service innovativeness positively moderates the effect of frontline employee involvement in idea generation, but plays no moderating role in the effect of top management involvement in idea application.

This study furthers the understanding of employee involvement in healthcare service innovation, by identifying the relevance of frontline employee involvement in idea generation and top management involvement in idea application for healthcare service innovation quality, as well as the potential adjustment functions of service innovativeness. The results encourage healthcare organizations to involve frontline employees and top managers in the ideation processes of service innovations, in order to improve service innovation quality. Healthcare organizations are implied to involve frontline employees in generating ideas in varying service innovation projects, particularly in highly innovative ones. Top managers are inspired to participate in the processes of idea application in various healthcare service innovation projects, even in less innovative ones.

Disclosure statement

No potential conflict of interest was reported by the authors.

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