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The service concept – a missing link in lean for services

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This paper aims to contribute to the empirical literature on lean implementation for services by examining how the relation between lean implementation and operational performance improvement is moderated by the degree of service concept diffusion. The effect of explicit service concept diffusion on the outcome of lean implementation processes is tested by a sample of 153 respondents from Dutch service organizations. By means of hierarchical regression analysis this research shows that lean implementation in service organizations with an explicit and widely disseminated service concept positively affects organizational performance. Additionally, it is found that the moderating influence of service concept diffusion on performance improvement is especially apparent in case of explicit presence and a clearly disseminated service concept or an explicitly absent and unclear service concept. These results are corroborated by the finding that lean implementation in service environments without the moderating influence of service concept diffusion does not result in enhanced organizational performance. Finally, the positive sole effect of a disseminated service concept on organizational performance is empirically corroborated. These findings show the importance of clarity on what is expected of employee- and improvement specialist's involvement in terms of goals, roles, responsibilities and activities with respect to the service concept in service-based organizations. Having such clarity enhances their ability to make a meaningful contribution to improvement initiatives in lean implementations. Thereby, this research is the first to provide empirical evidence for explaining *how* employee involvement in service-based organizations can yield better lean implementation results.

Keywords: lean management; service concept; employee involvement; organizational performance; lean services

1. Introduction

Organizations are increasingly focused on delivering high quality services and products efficiently due to various reasons such as increased competition, price transparency and scarcity of resources. To do so, organizations typically rely on the adoption of methodologies for operational excellence, such as among others lean management (lean) (Womack et al., 1990). Despite many attempts and ongoing academic debate about the definition of lean (Bhamu & Sangwan, 2014), lean is defined here as 'a management philosophy aimed at identifying and eliminating waste in the entire value stream of a product (or service), not only within the organization, but also across the entire supply chain network' (Shah & Ward, 2007). As implied by the definition, lean was originally

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developed in manufacturing environments, and is indeed increasingly being adopted by service organizations (Prashar & Antony, 2018; Sanchez & Blanco, 2014).

Despite anecdotal lean implementation guidance for service sectors (Liker & Morgan, 2006) and success stories from service-based organizations (Delgado et al., 2010; Piercy & Rich, 2009; Staats et al., 2011), the academic literature provides limited empirical guidance for lean implementation processes (Bhamu & Sangwan, 2014). Prior research has provided extensive reviews of critical success factors (CSFs) for lean improvement programs (Netland, 2016). For lean, Sreedharan et al. (2018) listed the ten mostly found CSFs. From these prior enquiries we learn that the involvement and autonomy of employees and improvement specialists (Marin-Garcia & Bonavia, 2015; Scherrer-Rathje et al., 2009) that have a clear understanding of the organizations' strategies (Bortolotti, Boscari, et al., 2015) is of undisputed importance for successful lean implementation. To date it is however unclear *how* clarity of the organizations' strategies enables successful lean implementation for service-based organizations. Hence, to better understand how clear organizational strategic intent relates to successful lean implementation we introduce the moderating role of the service concept (Goldstein et al., 2002).

Although several definitions of the service concept exist (Goldstein et al., 2002), it is defined here as 'a detailed description of what is to be done for the customer (what needs and wishes are to be satisfied) and how this is to be achieved' (Edvardsson & Olsson, 1996). Thereby, the service concept serves as a translation of an organizations' strategic intent into operational and everyday expectations of employees. The service concept concretely describes how a service ought to be produced and delivered, and what the role of service employees and customers are in the service delivery process. Hence, it states what adds and what does not value in the service delivery to meet customer's expectations. Therefore, we argue that explicit diffusion of the service concept in organizations makes involved employees and improvement specialists in lean implementations able to contribute to successful outcomes because they are more aware of what needs to be done for customers (i.e. organizing value-adding activities), and perhaps even more importantly, what should not be done for customers (i.e. eliminating non-value-adding activities). This rationale leads us to the main research question: 'How does the diffusion of an explicit service concept in service-based organizations affect the impact of lean implementation on operational performance.'

The paper contributes to the empirical literature on lean implementation for services by explaining how service concept diffusion, lean implementation and operational performance improvement are related. The moderating effect of explicit service concept diffusion on the outcome of lean implementation processes is tested by a sample of Dutch service-based organizations that have implemented lean for operational excellence purposes. The structure of this paper is as follows. In section 2, existing literature is reviewed and hypotheses are proposed. The research method is discussed in section 3, while the analysis of the data is discussed in section 4. The results, theoretical contributions and future research opportunities are discussed in section 5, while section 6 provides the conclusion and the limitations of our study.

2. Theoretical background and hypotheses

Lean management, originally developed by Toyota as a methodology to improve quality and reduce costs, evolved from a mutually reinforcing set of 'best practices' to create world class operations (Spear & Bowen, 1999). Later it was recognized that 'implementing best practice tools represents at most 20 percent of the effort in lean transformations'

(Mann, 2009, p. 15). The other 80% of the effort has to be spent changing the mindsets and behaviors of leaders and employees, to simultaneously change the social and technical systems in the organization (Shah & Ward, 2007). Consequently, Shah and Ward (2007) identified ten practices or infrastructural capabilities that best defined lean, including involved customers, supplier feedback, developing suppliers, JIT delivery capability, flow production capability, pull control capability, setup reduction capability, controlled processes, productive maintenance and involved employees. It became apparent that particularly the balance between the more technical hard aspects of lean (e.g. flow production, pull control) and the more soft aspects (e.g. customer- and employee involvement, supplier feedback) determines the ultimate success of a lean implementation (Bortolotti, Danese, et al., 2015; Osono et al., 2008).

2.1. *Lean for services and operational performance*

Lean places the delivery of customer value central, just like service management does, and because there is arguably much to improve in various service delivery processes (Gupta et al., 2016), lean is popular in service environments for increasing operational and customer-related performance (Vashishth et al., 2019). Examples of such implementations in services comprises studies of organizations in the digital high-tech service sector that reveal how lean-based implementations are focused on objectives related to cost reduction, improved process efficiency and customer satisfaction, but also employee development and broader implementation of process automations (Lameijer, Pereira, et al., 2021). Additional empirical research shows for instance that financial service organizations deploy lean-based implementations for alike objectives, but in addition also focus on new (digital) process developments as a result of their lean implementations (Lameijer, Antony, et al., 2021).

The relative portion of non-value adding activities in service delivery processes is generally considered larger than that of value adding activities (Gupta et al., 2016), which especially applies to non-profit services (Cudney et al., 2020; Radnor & Johnston, 2013). In service environments, lean is often applied in commodity services with repetitive back office processes where the focus is on standardization and efficiency (Van Assen, 2021). Implementing lean in service environments is a complex management task, even in repetitive service environments where there is already more possibility for standardization (Alsmadi et al., 2012; Suárez-Barraza et al., 2012). Moreover, the introduction of lean in a non-repetitive service environment (i.e. an environment with high demand variability) may even harm operational performance (Bortolotti et al., 2013). Such environments however do not preclude the application of lean practices, but require adaptation in deployment methods (Negrão et al., 2017). Although the lean methodology is originally developed in manufacturing contexts, most of the principles and methods are applicable to service environments (Sunder et al., 2018). Operationalization of lean implementation for services comprises practices such as set-up time reduction (project or job-processing set-up phases), process control mechanisms (performance indicator monitoring and follow-up), establishing flow (organization of processes around similar work packages), installing pull-mechanisms (customer orders that dictate the pace of service operations), employee- and customer involvement (collecting feedback and engaging in constructive improvement procedures) and supplier feedback mechanisms (frequent adjustments based on buyer-supplier interactions) (Shah & Ward, 2007). Lean practices such as just-in-time and maintenance practices are considered to have less relevance for service environments (Alsmadi et al., 2012).

Research to date on the effects of lean implementation in services on proxies for organizational performance is still relatively scarce and fragmented (Hadid, 2019; Hadid & Afshin Mansouri, 2014). Lean implementation in a service environment is however found to instigate leaner service delivery processes, so that the service provider can focus more on the customer and on the delivery of the right customer value; i.e. it means more efficient and more effective processes (Lins et al., 2021), less waste in the value stream of services (higher productivity, shorter lead times) (Swank, 2003), more attention to prevention (particularly higher quality and less errors) instead of correcting and dealing with customer complaints (Crute et al., 2003), and ultimately to achieve more with fewer resources (Lins et al., 2021), hence realizing a higher productivity (Joosten et al., 2009). Based upon the above, we propose the following hypothesis:

Hypothesis 1: Lean implementation in services is positively related to operational performance.

2.2. *Service concept and operational performance*

Past decades have seen much debate on the exact definitions of services as economic value creating observational unit, and accepted definitions of services comprise: 'the application of specialized competences (skills and knowledge), through deeds, processes, and performances for the benefit of another entity or the entity itself (self-service)' (Vargo & Lusch, 2004). The service concept therein is the set of tangible and intangible elements that delineates and makes explicit what constitutes the service offering (Roth & Menor, 2003). It specifies how customer value is delivered; the service concept defines the service delivery process (Clark et al., 2000). The service concept specifications drive design and improvement decisions about the service delivery process (Roth & Menor, 2003). Moreover, process design characteristics, such as the required skills, the level of automation and front-office versus back-office configurations, depend on the design and improvement of the service concept (Ponsignon et al., 2011). Indeed, the service concept acts as a sort of 'service specification' and is closely related to the internal and external marketing concept (Goldstein et al., 2002): it constitutes a guideline for the customer, what the customer can expect precisely, what customers the company does or does not target and what rules must be followed in the service delivery process (Meiren & Burger, 2010). The service concept plays a key role in service design and development as it defines the how and the what of service design, and helps mediate between customer needs and an organization's service intent (Goldstein et al., 2002). It also constitutes what service employees are expected to do and what not to do. The use of the service concept in marketing communications may help to manage both customer and employee expectations and behavior in the service delivery process. Hence, the guidelines set in the service concept provide clarity for both service employees and customers (Van Assen, 2013).

Prior research has provided suggestions about how service concepts in service-based organizations, via focused process design and optimization, can improve firm performance (Ponsignon et al., 2012). Empirical research to date on the effects of service concept definition and diffusion on proxies for organizational performance is however virtually absent. Service concept diffusion entails a service concept that is defined, but more importantly that is extensively communicated and well-known by employees, and we argue that developing, articulating and sharing a (compelling) service concept helps to achieve customer focus, deliver the right value-adding services and thereby ultimately improve operational performance (Radnor & Johnston, 2013). We therefore propose:

Hypothesis 2: The diffusion of the service concept in service organizations is positively related to operational performance.

2.3. *The moderating effect of the service concept on lean implementation outcomes*

A service is an activity or a series of activities that are carried out to realize a solution for a customer where there is at least one interaction moment with the customer (Grönroos, 1990; Van Looy et al., 2003). A difference compared to manufacturing environments is that the customer in the service process is often not only a customer, but may also fulfill the role of (information) supplier and co-producer (Vargo & Lusch, 2004). It is not without reason that Goldstein et al. (2002) argues that 'unlike a product, service components are often not physical entities, but rather are a combination of processes, people skills, and materials that must be appropriately integrated to result in the "designed" service'. It is therefore not surprising that when introducing lean in a service environment, not only the hard, technical side is important, but also the more soft (inter-human) practices are (Costa et al., 2019). The introduction of lean in a service environment should not only be concerned with the improvement or even redesign of the service delivery process, but must concern the redesign and improvement of the entire service package and service encounter including its less tangible components such as the infrastructure and climate of the service environment (Meiren & Burger, 2010): a holistic perspective that is lacking in contemporary lean deployment guidance (Lameijer et al., 2017; Lameijer, Boer, et al., 2021).

Improved operational performance in service environments is driven by the alignment of the service concept with service processes (Kellogg & Nie, 1995; Ponsignon et al., 2012). Thereby, the service concept serves as guidance for the development of service delivery processes, including the roles and tasks of service employees. For instance, principles of the service concept must be incorporated in improved standard process operating procedures (Van Assen, 2013). The introduction of lean means improvement of processes and tasks, and we argue that with an explicit service concept, it is clear to service employees what is demanded from their roles and how service tasks must be performed, controlled and improved. Therefore, we propose:

Hypothesis 3: There is a positive interaction between lean implementation and diffusion of a service concept, such that the more a service concept is disseminated, the stronger the positive effect of lean on the operational performance.

In sum, our conceptual model is illustrated in Figure 1.

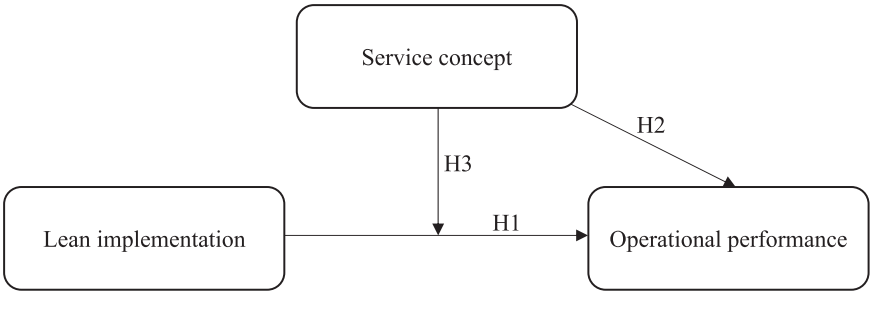

Figure 1. Conceptual model.

3. Research methods

3.1. *Sample*

To enhance research validity we have applied a 'key informant approach', i.e. preference for better informed respondents having specialized knowledge about the phenomena under research, over more but less knowledgeable respondents (Kumar et al., 1993), by inviting 205 Operational Excellence (OE) executive students at a Dutch business school to fill out a web-based survey before attending an advanced OE/ lean related course (which required some basic lean knowledge). Prior to the course, we explicitly informed respondents that it was not mandatory to complete the questionnaire in order to participate successfully. Furthermore, we explicitly remarked that the results were treated anonymously and only used for research. The data collection was performed via a direct link to a questionnaire designed with Survalyzer survey software. The first section contained the introductions of the study and explanations of the measures of interest as well as the corresponding questions; see the Appendix. The last section of the survey aimed to measure participant's characteristics such as function, tenure, sector of employment and business unit and organizational size. Via the direct link the questionnaire could be accessed and completed, after which the answers are automatically recorded in a database.

198 of the 205 participants actually filled-out the survey, of which about 80% of the participants represented a services-based organization (Table 1) which ultimately resulted in 153 fully completed questionnaires regarding the items used for this study. Respondents are predominantly middle managers (67%); 9% had a higher management position and about 24% of the respondents did not have a management position. Respondents had on average 3.7 years' work experience with their current organization ($SD = 3.07$); they also represented organizations or independent organizational units (e.g. government organizations) that employed in average 159.6 FTE ($SD = 293.4$).

The topic under investigation logically demands respondents predominantly from service-based environments, and the strong representation of respondents from services enhances the reliability of our findings for Dutch-alike economies with similarly high percentages of relatively mature service-based organizations.

Table 1. Industry distribution of respondents.

Industry (Standard Industry Classification)	Frequency	Percentage
0100–0999 Agriculture, Forestry and Fishing		
1000–1499 Mining		
1500–1799 Construction		
2000–3999 Manufacturing		
4000–4999 Transportation, Communications, Electric, Gas and Sanitary service	10	6.5
5000–5199 Wholesale Trade	11	7.2
5200–5999 Retail Trade		
6000–6799 Finance, Insurance and Real Estate	22	14.4
7000–8999 Services	76	49.7
9100–9729 Public Administration	34	22.2
9900–9999 Other		
Total	**153**	**100%**

3.2. *Measures*

Despite advancements in developing measurement instruments for measuring lean adoption in services (Malmbrandt & Åhlström, 2013), no validated service-based measurement instruments have become available (Leyer & Moormann, 2014). Therefore, we have adopted the operationalization of Shah and Ward (2007) as a measure for lean implementation. Selection and application of their validated items in environments out of their original manufacturing setting is common practice (e.g. Alsmadi et al., 2012; Lizarelli et al., 2023). To increase the generalizability and applicability of our research, we have excluded maintenance practices, JIT-delivery and supplier development as these practices are less common in service environments (Bowen & Youngdahl, 1998; Van Assen, 2021). The final scale, based on five-point Likert scaled items, includes controlled processes (α = .74), set-up reduction (α = .85), pull control (α = .87), flow (α = .71), involved employees (α = .65), involved customers (α = .63), and supplier feedback (α = .67).

We have measured operational performance (α = .75) using items developed by Inman et al. (2011) that requested respondents to rate their organization's average performance over the last three years with respect to productivity improvement (OP1), quality improvement (OP2), first time right ratio of product and services (OP3) and lead time reduction (OP4), using 5-point Likert scales anchored with 'strongly decreased' and 'strongly increased'.

Finally, we have measured the construct 'service concept diffusion' by three new items (α = .70). For development of the scale the work by Goldstein et al. (2002) provided inspiration as no previously validated scales exist: 'the service concept acts as a guideline for employees on how the service should be made and executed' (SC1), 'the service concept has been extensively communicated with all employees' (SC2) and 'the service-concept is generally known within the organization' (SC3). Specifically, survey respondents are asked to indicate to what extend the service concept is (1) defined, (2) communicated and (3) accepted and understood within their organizations.

We evaluated the unidimensionality, reliability and convergent validity of each scale using confirmatory factor analysis using IBM AMOS 25. Some items were removed from the final scales because they did not meet the requirements of satisfactory convergent validity, (i.e. the estimated parameters between the latent variables and their indicators were less than .50 and/or the mean extracted variances (AVE) were less than .50 (Kline, 2001); see Table A1 in the Appendix). The final first order measurement model fits the data well (Browne & Cudeck, 1992): $\chi^2 = 355.556$, $df = 263$, $p = .000$, CFI = .931, IFI = .934, TLI/NNFI = .915, RMSEA = .048. Table 2 presents the correlation matrix for the

Table 2. Descriptive statistics and correlation matrix with Cronbach's alpha on the diagonal.

$N = 153$	Mean	SD	1	2	3	4	5	6
1. Lean implementation	3.07	.48	(.73)					
2. Service concept	3.29	.75	.61**	(.70)				
3. Size	3.09	.93	.11	.01	–			
4. Tenure	3.73	3.07	−.03	.01	−.20*	–		
5. Management position	.67	.47	.23**	.30**	.11	.07		
6. Operational Performance	3.83	.61	.13	.26**	.02	−.12	.21**	(.70)

**$p < 0.01$ level (2-tailed).
*$p < 0.05$ level (2-tailed).

final constructs with Cronbach's alpha values that exceed .70 meaning that the constructs are all represented by high inter-item homogeneity and consistency (Kline, 2001).

3.3. *Control variables and common method bias*

Size of the organization and tenure of the respondent were used as control variables. Size, for instance, is considered a control variable since smaller organizations typically have fewer resources to implement improvement practices like lean (Cao & Zhang, 2011). Size of the organization or independent organizational unit was measured by the number of employees. This variable was transformed (logarithmic function) for use in the analysis to meet normality assumptions (Yuan et al., 2000). Finally we included the variable management position, where we differentiate between non-management, middle-management and higher management positions. Interdependency among the control variables was found; as expected there is a negative correlation between the size of the organization and respondent tenure (−.20). Because the sample mainly contains young middle-managers, we expected them to change jobs more quickly in larger organizations Furthermore, we notice that the higher the respondents' management position is, the more positive they rate the level of lean implementation, the use of a service concept and the operational performance. Because the correlations do not exceed .30, we expect that this will not cause any problems in the regression analysis and the results of this study.

To minimize the potential for common method bias, given the fact that all measures were obtained from a single source, several procedural methods were applied. First, our sample included predominantly middle managers with significant levels of relevant knowledge, which tends to mitigate single source bias (Mitchell, 1985). Second, we performed Harman's one-factor test to test whether the majority of the variance can be explained by a single factor (Richardson et al., 2009) but given the outcome of 24% this was not the case, which indicates that the risk of common method bias is negligible.

4. Results

To estimate the proposed research model, we performed hierarchical regression analysis in IBM SPSS statistics 25 with 'service concept' moderating the relation between 'lean implementation' and 'operational performance'. Hierarchical regression analysis was selected specifically to assess the predictive power of our variable of interest, 'service concept', over the commonly known and intuitively predictive (control) variables. Moreover, as predictor variables are expected to be correlated, hierarchical regression analysis allows for an assessment of consecutive predictor variables' contributions to the explained dependent variable's variance (Kerlinger, 1986). In the first step ($\Delta F(4.148) = 2.55$, $p < .01$, $R^2 = .07$) we included the control variables 'size', 'tenure', and the dummy variables for middle-management position and non-management position and tested their effects on 'operational performance'. In this step, we only found a significant coefficient for the dummy variable non-management ($\beta = -.31$, $t(148) = -2.31$, $p < .01$). In the second step ($\Delta F(6.146) = 3.67$, $p < .01$, $R^2 = .11$) the variables 'lean implementation' ($\beta = -.06$, $t(146) = -.63$, *n.s.*) and 'service concept' ($\beta = .25$, $t(146) = 3.01$, $p < .01$) were included. In the third step ($\Delta F(7,145) = 12.97$, $p < .01$, $R^2 = .18$) the interaction term 'service concept × lean implementation' ($\beta = .29$, $t(145) = 3.60$, $p < .001$) was included. Hence, 'lean implementation' does not directly impact 'operational performance' according to our sample data, only in interaction with the presence of a service concept; see Table 3.

Table 3. Hierarchical regression modelling results.

Variables	Step 1		Step 2		Step 3	
	β	t	β	t	β	t
Size	−.01	−.10	−.01	−.07	−.01	−.08
Tenure	−.13	−1.43	−.13	−1.50	−.10	−1.30
Middle-management	−.31*	−2.31	−.21	−1.43	−.18	−1.34
Non-management	−.11	−.85	−.07	−1.43	−.01	−.07
Service concept			.25**	2.51	.35**	3.492
Lean			−.06	−.63	−.10	−1.07
Service concept × Lean					.29***	3.60
R^2	.07		.11		.18	
ΔF	2.55		3.67		12.97	

Notes: $N = 153$. ***$p < .001$ level (2-tailed), **$p < .01$ level (2-tailed), *$p < .05$ level (2-tailed). Standardized coefficients are reported.

To evaluate the effect of the use of a service concept as a moderator in the relationship between lean implementation and operational performance, we used the PROCESS-plugin of Hayes (2013) for SPSS to plot the effect (see Figure 2) by testing the simple slopes for respondents with a high level (i.e. one standard deviation above the mean), an average level, and a low level of service concept diffusion to determine the nature of the service concept × lean interaction. Lean was significantly related to operational performance for a low level of service concept diffusion ($\beta = -.42$, $t(147) = -2.66$, $p = .009$) but not for an average or high level of service concept diffusion.

The analysis reveals that lean implementation has a negative effect on operational performance at a low value of the variable service concept (i.e. one standard deviation below

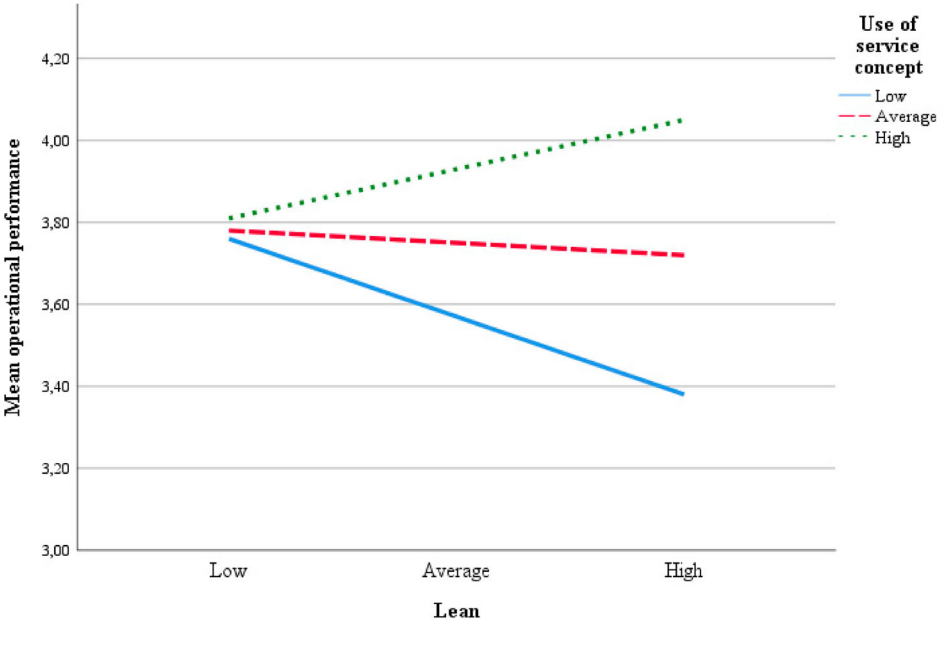

Figure 2. Interaction of 'service concept' and 'lean' on 'operational performance'.

the mean) and no significant effect when the variable service concept has a value of one standard deviation above the mean. To analyze the moderating effect of 'service concept' in more detail we also used the Johnson-Neyman technique as recommended by Preacher et al. (2007), a technique that instead of testing for significance at fixed values of the moderator M (in this case the variable service concept), reverses precisely to determine the values of the moderator M for which the effect of X (i.e. lean) on Y (i.e. operational performance) is significant and for which values this effect is not significant. We used the plugin for SPSS of Hayes (2013) to perform the Johnson-Neyman technique with bootstrapping (i.e. 1000 bootstrap replications) to plot the region of significance where a significant effect of X (i.e. lean) on Y (i.e. operational performance) exists (for various values of the variable service concept). The estimates of the indirect effects and (bias corrected) confidence bands for various values of the variable service concept are plotted in Figure 3.

In fact, Figure 3 shows two significance regions: one significance region exists below the threshold value for the variable service concept of −.61 SD from the mean and a second significance region starts from the second threshold value for the variable service concept of .96 SD from the mean. At both thresholds, lean is just significantly related to operational performance ($b = -.60$, $p = .05$ and $b = .30$, $p = .05$). The more the value of the service concept variable is less than – .61 SD from the mean, the stronger the negative effect of lean on operational performance, and the more the value of the service concept variable is greater than .96 SD from the mean, the stronger the positive effect of lean on operational performance. Note that 22.9% of the respondents have a value of the variable service concept lower than −.61 SD from the mean and only 4.6% of the respondents have a value of the variable service concept greater than .96 SD from the mean. Of interest in this figure is the insight that the strength of the indirect effect of (the use of a) service concept via lean on operational performance increases with the level of service concept; between the thresholds, lean has no significant effect on operational performance.

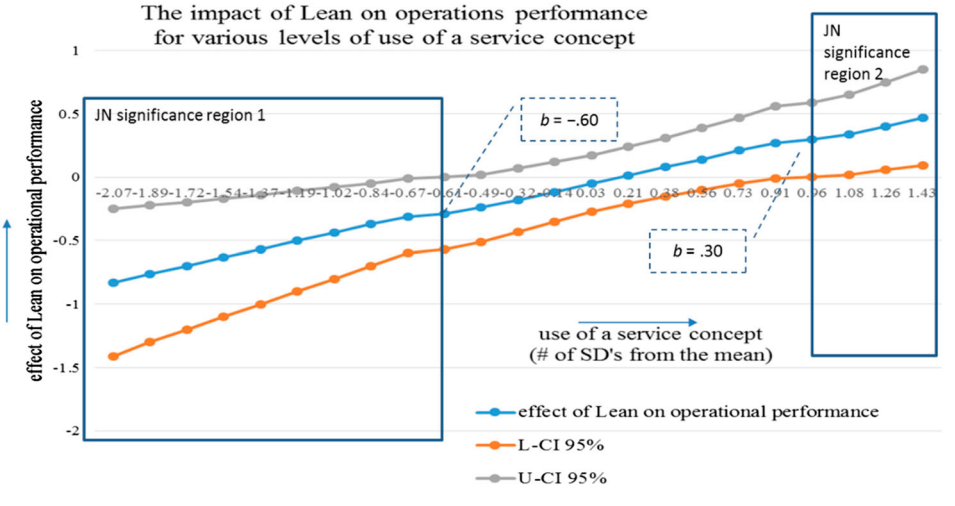

Figure 3. Johnson-Neyman significance regions of the interaction between service concept and lean .

5. Discussion

The purpose of this research is to understand how diffusion of an explicit service concept in service-based organizations enhances the impact of lean implementation on operational performance. Thereby this paper contributes to the understanding of effective lean implementations in service environments.

The first contribution is that lean implementation in service-based organizations with an explicit and widely disseminated service concept positively affects firm performance. In-depth analysis revealed that especially an explicitly present and disseminated service concept or an explicitly unclear and absent service concept seems to either positively or negatively affect operational performance. This implies that clarity on what is expected in terms of goals, roles, responsibilities and activities of employees and improvement specialists in service- based organizations enhances their ability to make a meaningful contribution to process improvement initiatives in lean implementations. The importance of a clear link with strategic objectives (Langabeer et al., 2009) and employee involvement and empowerment (Shah & Ward, 2007) in lean implementations is widely acknowledged. Prior research explored the importance of empowerment (i.e. increased levels of autonomy) (Bayo-Moriones et al., 2008), training (Marin-Garcia & Bonavia, 2015) and communication (i.e. top-down communication about goals, expectations and results) (Cua et al., 2001) in lean implementations. The effect of these factors on organizational performance has been explored for service sectors (Hong et al., 2014) and corroborated for manufacturing environments (Marin-Garcia & Bonavia, 2015). Although these prior findings are not directly confirmed for service sectors by this research, we do provide empirical evidence and a theory for explaining *how* a clear translation of strategic objectives, employee involvement, and clear communication in service-based organizations yields better lean implementation results. Namely, the diffusion of the service concept, the operational blueprint and the guidelines set in the service concept, provides clarity for service employees on what is expected in terms of customer value-adding services and activities and enables active contribution to driving out non-value adding activities and process inefficiencies. Future research should further focus on the *if* and *how* of the relations between *employee involvement*, service concept diffusion and organizational performance in service sectors.

The second contribution is that lean implementation in service environments without clear service concept diffusion does not seem to result in enhanced operational performance. Prior research has provided extensive evidence on the effects of lean on firm- or organizational performance; see Hardcopf et al. (2021) for an overview. Evidence on this relation for service-based organizations however is limited (Hadid, 2019; Hadid & Afshin Mansouri, 2014). Our findings provide both evidence and understanding of preconditions for successful lean implementation in service-based organizations. Namely, the introduction of lean means improvement of processes and tasks and we argue that with an explicit service concept, it is clear to service employees what is demanded from their roles and how service tasks must be performed, controlled and improved. Thereby, the service concept serves as guidance for the development of service delivery processes, including the roles and tasks of service employees, which typically are having a central role in value delivery in service processes. Thereby, the importance of a clear service concept is corroborated. Future research should further confirm *if* and explore under what other conditions lean implementations in service-based organizations positively affect performance. Especially the moderating role of employee involvement/ understanding of both the strategic intent as well as the operational objectives of lean implementation, as key actor in the service delivery system, seems worthy of further enquiry.

The third contribution is that diffusion of a service concept positively affects firm performance. Prior research provided suggestions about how service concepts in service-based organizations via focused process design and optimization can improve firm performance (Ponsignon et al., 2012). Empirical evidence for the relation is hereby provided. Service concept diffusion entails a service concept that is defined, but more importantly that is extensively communicated and well-known by employees, and we argue that developing, articulating and sharing a (compelling) service concept helps to achieve customer focus, deliver the right value-adding services and thereby ultimately improve operational performance. Future research should focus more on in-depth explanations about *how* the service concept relates to ultimate performance, for instance by means of process- or case study research. Especially questions about cause-and-effect seem worthy of further enquiry. Namely, lean implementation entails a relentless focus on customer requirements and this alone can signal the absence of a clear service concept. Hence, lean implementation effects can be either moderated but also mediated by the service concept.

Finally, it is found that organizational size does not seem to affect the results from lean implementations. Prior research looked into the effects of organizational size on lean implementation outcomes and found either significant negative (Shah & Ward, 2003) or insignificant results (Furlan et al., 2011). For services, this research is the first to provide inconclusive empirical support. Explanations for these findings lay in the fact that most likely not the size of a company but its complexity is the primary driver of lean implementation benefit realization. As organizations grow, typically operational challenges increase. That would imply greater potential for improvement, but typically greater complexity impedes impactful lean implementation, as more dedicated and professional leadership is demanded to navigate through complex adoption processes in lean/ quality management system implementation processes (De Mast et al., 2021). Future research should explore more in-depth *why* and *how* service-based firm size could either be positively or negatively related to lean implementation outcomes.

6. Conclusion, implications and limitations

This study contributes to the empirical literature on lean implementation for services by examining how operational performance improvement is achieved. Specifically, it confirms that explicit service concept diffusion affects the outcome of lean implementation processes.

6.1. *Implications*

The study has several implications for managing the lean implementation process in services. First, lean implementation leaders are advised to ensure clarity on what is expected in terms of goals, roles, responsibilities and activities of employees and improvement specialists with respect to the service concept in service-based organizations. Having such clarity enhances their ability to make a meaningful contribution to process improvement initiatives. Second, the effect of lean implementation in service-based organizations is shown not to be undoubtedly positive. Therefore, lean implementation leaders are advised to closely monitor implementation progress and seek frequent consultation with both employees and improvement specialists so that explicit preconditions for impact of the implementation on performance outcomes can be managed.

6.2. *Limitations*

Close attention is devoted to the selection of appropriate and valid scales for construct measurement. The scale used for measuring service concept diffusion was newly developed and hence in contrast to the other scales was not previously validated. Despite a high internal consistency for all factors in our study, this does limit the explanatory power of this construct. Another limitation is the generalizability of the results. Given the fact that data from the Netherlands was gathered, it was not possible to make comparisons between different geographical regions with meaningful differences. Future research opportunities lay in the collection of larger samples that are geographically distributed.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Data availability statement

The data that support the findings of this study are available on request from the corresponding author, M.F. van Assen. The data are not publicly available due to participant privacy restrictions.

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Appendix. Survey items and sources, reliability results and item statistics

A.1.#Lean – Shah and Ward (2007)

A.1.1.#Set-up-reduction (SR)

Range: strongly disagree – strongly agree (5-point Likert scale).
In this business unit (location, department) …

SR1	employees are trained to reduce set-up time.
SR2	we have a structured method to reduce set-up time.
SR3	we continuously try to reduce set-up time.

A.1.2.#Controlled processes (SPC)

Range: strongly disagree – strongly agree (5-point Likert scale).
In this business unit (location, department) …

SPC1	a control system is present that provides information about the production quality and/or backlog.
SPC2	charts showing defect rates are used as tools on the shop floor.
SPC3	we use of process control mechanisms to reduce process variance.

A.1.3.#Pull (PC)

Range: strongly disagree – strongly agree (5-point Likert scale).
In this business unit (location, department) …

PC1	we have a method to keep the work in progress in the primary processes low and evenly (so that workflow and peaks are avoided) – not included in the final scale because of low factor loading.
PC2	we work with pull-control, in which production is initiated from a real customer order.
PC3	we use a pull-control system.
PC4	work at a particular workstation is triggered by a pull-signal from a subsequent workstation.

A.1.4.#Flow

Range: strongly disagree – strongly agree (5-point Likert scale).
In this business unit (location, department) …

Flow1	resources and/or workstations are grouped in such a way that each product family can be produced in a continuous flow.
Flow2	products and/or services are grouped by routing and/or similar process steps.

Flow3 equipment is grouped to produce a continuous flow of families of products. – not included in the final scale because of low factor loading.

A.1.5.#Involved employees (team-based problem solving)

Range: strongly disagree – strongly agree (5-point Likert scale).
In this business unit (location, department) …

TW1 the ability to work and solve problems in teams is a key selection criterion for new employees.
TW2 employees are stimulated by their supervisors to work and solve problems in teams.
TW3 our employees are highly involved in reducing waste. – not included in the final scale because of low factor loading.

A.1.6.#Supplier feedback

Range: strongly disagree – strongly agree (5-point Likert scale).
In this business unit (location, department) …

SF1 our suppliers receive feedback from us on their delivery performance.
SF2 we provide feedback to suppliers to build long-term relationships.
SF3 there is very frequent contact with our suppliers on operational matters.

A.1.7.#Involved customers

Range: strongly disagree – strongly agree (5-point Likert scale).
In this business unit (location, department) …

CInv1 our customers clearly state their requirements and wishes.
CInv2 customers are involved in product and process improvements.
CInv3 we analyze what customer value is.

A.1.8.#Service concept diffusion

Range: strongly disagree – strongly agree (5-point Likert scale).
In this business unit (location, department) …

SC1 the service-concept acts as a guideline for employees on how the product and/ or service should be made and executed.
SC2 the service-concept has been extensively communicated with employees.
SC3 the service-concept is generally known.

A.1.9.#Operational performance (OP)

Respondents were asked to rate their organization's average performance over the last three years.
Range: strongly declined – strongly increased (5-point Likert scale).

OP1 productivity improvement.
OP2 quality improvement.

OP3 first time right ratio of product and services.
Op4 lead time reduction.

Table A1. Reliability and item statistics for first order measurement model ($\chi^2 = 355.556$, df = 263, $p = .000$, CFI = .931, IFI = .934, TLI/NNFI = .915, RMSEA = .048).

	Cronbachs alpha	Alpha if item deleted	Item-to-total correlation	Mean	SD	Item loadings
Set-up reduction	.85					
SR1		.78	.72	2.43	.79	.83
SR2		.82	.68	2.29	.79	.75
SR3		.75	.74	2.63	.81	.83
Controlled processes	.74					
SPC1		.78	.46	2.41	1.12	.55
SPC2		.60	.61	2.58	1.07	.79
SPC3		.57	.63	2.59	1.12	.78
Pull control	.87					
PC2		.85	.74	2.54	1.14	.80
PC3		.77	.82	2.44	.97	.91
PC4		.85	.73	2.30	.97	.82
Flow	.71					
Flow1			.55	3.24	.97	.73
Flow2			.55	3.36	.91	.76
Involved employees	.65					
TW1			.50	4.10	.83	.69
TW2			.50	4.05	.64	.72
Involved customers	.63					
CInv1		.63	.37	3.35	.93	.51
CInv2		.49	.48	3.14	1.16	.68
CInv3		.46	.50	3.00	.95	.65
Supplier feedback	.67					
SF1		.53	.52	3.61	.70	.65
SF2		.55	.50	3.75	.80	.66
SF3		.65	.44	3.30	.92	.62
Service concept	.70					
SC1		.48	.61	2.97	.97	.75
SC2		.56	.56	3.17	.97	.76
SC3		.76	.39	3.74	.92	53
Operational performance	.75					
OP1		.72	.52	4.14	.85	.56
OP2		.66	.62	3.99	.83	.81
OP3		.69	.56	3.55	.71	.70
OP4		.71	.52	3.66	.83	.56

Note: $N = 153$.