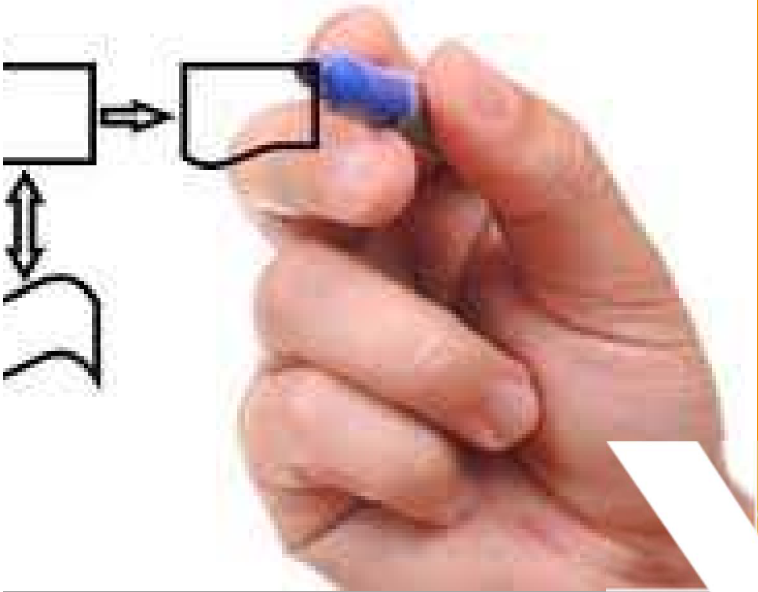

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Process management proficiency

The impact on operational efficiency, customer effectiveness and financial performance

CONTENT

Abstract

This study examines the impact of process management as a multi-dimensional construct (including process orientation, process mapping and process standardization) on operational efficiency performance, customer effectiveness performance and financial performance. The perceived importance of both standardization and delivering customer-specific products in the market are used as possible contingency variables to explain the contextual impact of process management on efficiency and effectiveness. Structural equation modeling is used to analyze survey data collected from 199 participants of various courses and masterclasses at a business school in the period 2012/2013. The results show that process management consists of different elements including process orientation, process mapping and process standardization and improvement. Process orientation and process mapping are prerequisites for process standardization. The latter directly impacts operational efficiency performance and customer effectiveness performance. It also shows that process management does not impact financial performance directly, but indirectly via operational performance and customer performance. This study also shows that organizations must take time i) to enhance the process orientation of their employees, and ii) to map and describe existing processes as a basis for process improvement: the point is to get the basics in order independent of the type of competitive environment.

Key words: Process management, Operational performance, Efficiency, Customer effectiveness

1. Introduction

Process management involves the understanding, mapping and improvement of processes, and is of central interest to much of the field of operations management (Armistead & Machin, 1997; Silver, 2004; Klassen & Menor, 2007). Processes are collections of activities that, taken together, produce outputs for internal and external customers (Ittner & Larcker, 1997; Garvin, 1998). Process management is therefore expected to be a key driver of operational performance. However, research into the impact of process management on performance measures yielded mixed results (Sanders Jones & Linderman, 2014). Some studies reported a positive relationship between process management and performance (Ahire & Dreyfus, 2000; Flynn & Saladin, 2001; Zhang, Linderman & Schroeder, 2012), while others found no impact (Samson & Terziovski, 1999; Nair, 2006). These mixed results could be the result of the specific operational definitions used (Ng *et al*., 2015), as process management is often interchanged with process control (e.g. Flynn, Schroeder & Flynn, 1999). Process management is also utilized as a separate, but broadly defined construct (Ng *et al*., 2015) or contextualized as one element of a broader framework such as the EFQM Excellence model and ISO 9000 (e.g. Terziovski & Guerrero, 2014; Flynn & Saladin, 2001; Wilson & Collier, 2000). Process management is also operationalized as part of a bundle of Lean practices such as customer/supplier involvement, statistical quality control, process focus, and cross-functional teams to measure process management (Ittner & Larcker, 1997; Zhang *et al.*, 2012; Fullerton & McWatters, 2001; Fullerton & Wempe, 2009; Shah & Ward, 2003).

Process management, however, should be studied as a multi-dimensional construct (Silver, 2004; Edwards *et al.*, 2000; Sanders Jones & Linderman, 2014). Sanders Jones & Linderman (2014), for instance, analyzed the impact of process management through three separate components of process management, namely process design, process improvement, and process control, while accounting for competitive intensity as a moderator. They found that process management can be tailored to environmental characteristics to achieve a certain type of performance such as efficiency or (customer) effectiveness. This supports the results of Sutcliffe *et al.* (2000), that the effectiveness of process management is dependent on the task environment. Taking environmental characteristics into account when studying the relationship between operations management practices and different types of performances has become prevalent nowadays

(Sousa & Voss, 2008; Zhang *et al.*, 2012). Gligor *et al.* (2015), for instance, used environmental characteristics as a potential moderator in their examination of the relationship between agility and performance. Inman *et al.* (2011) also distinguish between various dimensions of performance in their study of agile, JIT and performance, while accounting for environmental uncertainty. Process management studies should therefore account for environmental variables.

Another line of research in process management is to study it from a proficiency or maturity perspective (Reijers, 2006) since the process maturity level of an organization determines the extent of adoption of process management (Vergidis, Turner & Tiwari, 2008). However, Spanyi (2010) highlights the complexity of existing process management proficiency models and argues that the relationship between these models and performance is not sufficiently clear, which makes it difficult for management to justify efforts in process management proficiency models. In general, the maturity models use some form of rating system for different components of process maturity (Hammer, 2007; McCormack *et al*., 2009) without addressing the specific interrelationships between these components.

With this study, we aim to fill in these voids by examining the impact of a cumulative model of process management proficiency on operational efficiency and customer effectiveness, while accounting for the perceived importance of standardization in the market and for the perceived importance of delivering customer-specific products in the market as possible moderators. We hypothesize that process management positively impacts operational efficiency performance, customer effectiveness performance and indirectly financial performance. However, we also argue that different components of process management reinforce each other, that process orientation is a condition for process mapping, which is again a condition for process standardization. Our research questions are:

RQ1 – Is there a cumulative model of process management proficiency comprising the components process orientation, process mapping and process standardization?

RQ2 – Is process management proficiency related to operational efficiency performance, customer effectiveness performance and financial performance?
RQ3 – Is the relationship between process management proficiency and performance mediated by the importance of standardization and efficiency in the market or the importance of delivering customer specific products?

This research makes several important theoretical and managerial contributions towards the objective of a better understanding of the working of process management. First, it presents a cumulative model of process management proficiency that explains the relationship between the extent of process orientation, process mapping, and process standardization. Then, it examines the impact of process management proficiency on operational efficiency performance, customer effectiveness performance and financial performance. Finally, it empirically investigates the potential moderating effect of both the importance of standardization and the importance of delivering customer specific products and services in the market on the relationship between process management and operational efficiency performance and customer effectiveness performance.

2. Theory and hypotheses

Process management is popular and frequently used to manage organizations (Pritchard and Armistead, 1999) in various environments (Silver, 2004). An important component of process management is process orientation (Kohlbacher, 2010). From an organizational perspective, process orientation is the approach of having an organizational focus on the business operations, often with an end-to-end perspective, aimed at creating value for customers (Dean & Bowen, 1994; Reijers, 2006). By being process-orientated there is a need to formally manage the processes (Armistead & Machin, 1997; Kohlbacher & Gruenwald, 2011; Bai & Sarkis, 2013; Škrinjar & Trkman, 2013). Process orientation by staff and the ability to think in terms of processes is a prerequisite to determining one's position in the value chain and identifying the (internal) customers and hence customer value in order to improve business processes (Adler & Cole, 1993; Anand *et al*., 2009). Process orientation and process knowledge of workers are also important drivers for effective value stream mapping, for instance, in improvement workshops such as Kaizen-events (Rother & Shook, 2003). An increased process orientation enhances the focus on processes and supports the formalization of processes by process mapping (e.g. Reijers, 2006; Sever, 2007; Škrinjar & Trkman, 2013). We therefore hypothesize that process orientation of staff is positively related to process mapping.

H1: Process orientation of staff is positively related to process mapping

Once processes have been recorded through process mapping, process standardization involves developing measures of how well a process meets customer requirements, and using statistical methods to continuously eliminate variation in processes and outputs (Hackman & Wageman, 1995; Harry & Schroeder, 2000). Hence, having up-to-date documentation of processes (e.g. process map descriptions or value stream maps) is an important step to ensure stable process performance by means of standardization (Jones, 2004; Hammer, 2007; Fullerton & Wempe, 2009). In order to standardize and subsequently improve processes, it is necessary that those involved have a high process orientation and that processes have been described and are up-to-date (Trkman, 2010). Indeed, the comprehensiveness of the specification of how the process is to be executed, is related to the extent to which a process is standardized (Hammer, 2007). It follows that process orientation and process mapping are prerequisites for process standardization and subsequently for improvement. Having up-to-date process maps supports the systematic analysis of processes, the reduction of unnecessary internal customer-supplier relationships and the elimination of non-value adding (dysfunctional) activities (Flynn *et al.*, 1995; Madison, 2005). Having up-to-date process maps also simplifies the reduction of variation in processing time, lead-time and waiting time (Hopp & Spearman, 1996; Shukla *et al.*, 2015). We therefore hypothesize that process mapping is positively related to process standardization.

H2: Process mapping is positively related to process standardization

Process standardization is considered to be a basic performance driver of Lean management for reducing waste and increasing efficiency (Rother & Shook, 2003). Process standardization of operational processes is considered to be of paramount importance for sustaining continuous improvement. Standardized processes are indeed important for providing valid baselines for further improvements, as standardization facilitates root-cause analyses and the sharing of lessons learned across replications of common processes (Madison, 2005). Standardized processes also provide relevant and common experiences to employees that are the basis of process improvement (Adler & Cole, 1993; MacDuffie, 1997; Schiefer, 2002; Anand *et al*., 2009). These improvements are generally geared towards the increase of operational efficiency (Gustafsson & Johnson, 2002; Benner & Tushman, 2003; Yeung, 2008; Kortmann *et al*., 2014; Sanders Jones & Linderman, 2014). Indeed, a literature review conducted by Kohlbacher (2010) reports positive results of process management such as speed improvements (i.e. lead time reduction), quality improvements, cost reduction and improvement of financial performance. This concurs with the findings of Rust, Moorman and Dickson (2002), that streamlining internal processes increases profits through operational efficiency performance (i.e. quality improvement, productivity improvement and cost reduction). Process standardization increases quality and reduces the need for rework and as a result shortens lead times and efficiency (Klassen & Menor, 2007). A systematic analysis of processes to reduce unnecessary internal customer-supplier relationships and the elimination of non-value adding (dysfunctional) activities increases quality and productivity and shortens lead times. We therefore hypothesize that process standardization is positively related to operational efficiency performance.

H3: Process standardization is positively related to operational efficiency performance

A seminal article by Benner & Tushman (2003) hypothesizes that process management is appropriate in markets where standardization and exploitation are primary competitive priorities, but inappropriate for exploration and effectiveness, as variation reduction would negatively affect exploration. The study of Klassen & Menor (2007), however, shows that the applicability of process management is less dichotomous in today's dynamic environments, since process standardization is particularly geared towards the reduction of unnecessary or dysfunctional variation (Hopp & Spearman, 1996), while all remaining or functional variety within a process can be buffered by some combination of capacity, time and inventory. This is the so-called capacity-variety-inventory trade-off (Klassen & Menor, 2007). The reduction of unnecessary or dysfunctional variability (e.g. errors, ineffective systems and poor organization that lead to rework, constantly changing priorities and 'lumpy' demand) will directly result in better operational performance, and indirectly in higher customer effectiveness (Suri, 1998), as it enhances the ability to absorb customer-induced variation (Rafiq & Ahmed, 1998). Indeed, Gustafsson & Nilsson (2003) showed that process orientation has a direct impact on customer satisfaction. We therefore hypothesize that process standardization is positively related to customer effectiveness performance.

H4: Process standardization is positively related to customer effectiveness performance

Ahire & Dreyfus (2000) reported that process management positively impacted performance, though process management has a greater effect on customer satisfaction than on financial results (Wilson & Collier, 2000). Process improvement generally focuses on waste reduction and the realization of flow (i.e. short lean times) to create customer value, and as a result increases customer satisfaction (Rother & Shook, 2003). Atkins *et al.* (2002) also concluded that customer value was created through operational performance such as lowest cost, highest quality, fastest cycle time and, as a result, highest overall customer satisfaction. This concurs with a study by Anderson *et al.* (1998), which reported a positive effect of operational results on customer satisfaction. It also found a positive effect of organizational effectiveness on customer results. A high operational efficiency performance including high quality and short lead times positively affects customer satisfaction (Sila, 2007). We therefore hypothesize that operational efficiency performance is positively related to customer effectiveness performance.

H5: Operational efficiency performance is positively related to customer effectiveness performance

Operational efficiency performance such as higher productivity and higher quality directly affects costs and revenues and thus has a direct, positive impact on profits (Gustafsson & Johnson, 2002). Rust *et al.* (2002) found that quality improvements may concurrently lead to higher revenues and lower costs, therefore to better financial result. Lambert & Pohlen (2001) found that as processes become more efficient and effective, financial performance also improves. Sila (2007) also reports a positive relationship between organizational effectiveness and financial performance due to process management in a Total Quality Management framework. This concurs with Fugate, Stank & Mentzer (2009) who empirically established the link between logistics operations efficiency and effectiveness, and financial performance. We therefore hypothesize that operational efficiency performance is positively related to financial performance.

H6: Operational efficiency performance is positively related to financial performance

Many empirical studies that empirically test the service-profit chain (Heskett *et al.*, 1994) report a positive relationship between customer satisfaction and financial performance (Gustafsson & Johnson, 2002; Wright & Snell, 2002). The general argument is that customer satisfaction creates customer loyalty and retention, which results in repeat purchases, growth in sales, a reduction in operating costs, and an increase in profits (Anderson, Fornell & Lehman, 1994; Das *et al.*, 2000; Bernhardt, Donthu & Kennett, 2000; Yeung & Ennew, 2001). Therefore we have the following hypothesis.

H7: Customer effectiveness performance is positively related to financial performance

Several authors have shown that the relationship between process management and performance depends on the type of market in which the operation is arranged (Sutcliffe, Sitkin & Browning, 2000; Benner & Tushman, 2003; Sanders Jones & Linderman, 2014). In this study we argue that the relationships between process standardization and operational efficiency performance and customer effectiveness performance are moderated by both the importance of standardization in the market and the importance of customer effectiveness in the market.

H8 – The relationship between process standardization and operational efficiency performance is positively moderated by the extent of importance of standardization in the market and negatively moderated by the importance of customer effectiveness in the market.

H9 – The relationship between process standardization and customer effectiveness performance is negatively moderated by the extent of importance of standardization in the market and positively moderated by the importance of customer effectiveness in the market.

To sum up, our theoretical model of process proficiency and performance is illustrated in figure 1.

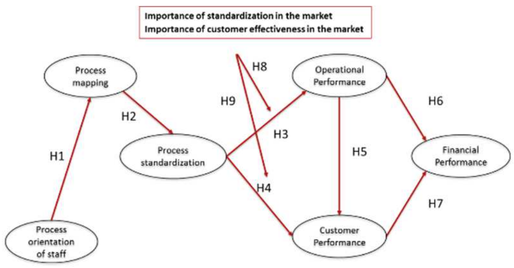

Figure 1. Theoretical model of process proficiency and performance.

3. Methodology

3.1. DATA COLLECTION

We collected data from participants of various Operational Excellence courses and masterclasses at a Dutch business school in the period 2012/2013. Participants were predominantly middle managers and senior-level managers with some knowledge of process management as admission requirements. We deployed a web-based survey approach that participants were required to fill out before they attended the masterclass, mentioning explicitly that we would use the results during the course as a type of an OpX-scan. 80% of the participants filled out the questionnaire resulting in 205 questionnaires, 199 of which were useful for research. Respondents had management titles equivalent to CEO, CFO, COO, Manager Operations, but some were more operational, i.e. project leaders and team leaders. The respondents had an average of 8.5 years work experience with their current organization; see table 1. Non-response bias was evaluated by testing the responses of 21 non-informants for significant differences during the courses (e.g. Mentzer & Flint, 1997), where they were asked to respond verbally to five substantive items related to key constructs of the whole survey. There were no significant differences ($p < .05$) in responses to any item, leading to the conclusion that non-response bias was not a problem.

3.2. MEASURES, SCALE DEVELOPMENT AND PURIFICATION

The process management variables were operationalized using a two-step approach (Brown, 1996). First an extensive literature review search was conducted on established scales of process management and process control to generate a list of scale items for Process Orientation, Process Mapping and Process Standardization. Based on a Q-sort procedure, this list was narrowed down by subject matter experts providing content validity for each scale. We developed a scale for process orientation of staff from items of Samson and Terziovski (1999) and Kohlbacher & Gruenwald (2011) including ‘everyone knows his/her internal customer’ as an example. In addition, we adapted the scales of Kohlbacher & Gruenwald (2011) and Ng *et al.* (2015) to develop a scale for process mapping (PM) and process standardization (PS). Finally, items were estimated through respondents’ perceptual evaluation on a five-point Likert scale. The response categories for each item of the variables process orientation of staff (PO), process mapping (PM) and process standardization (PS) were anchored by 1 (strongly disagree) and 5 (strongly agree); see appendix A.

Operational efficiency performance (OP) was measured using items developed by Adam (1994), Bowersox *et al.* (2000), Yeung (2008), Inman *et al.* (2011), Kortmann *et al.* (2014) and Netland *et al*. (2015). The items incorporate productivity improvement (OP1), quality improvement (OP2), first time right ratio of product and services (OP3) and lead time reduction (OP4). Respondents were asked to rate their organization’s average performance over the last three years. The items were measured using 5-point Likert scales anchored with ‘strongly decreased’ and ‘strongly increased’.

Customer effectiveness performance (CP) and financial performance (FP) were measured using items developed by Choi & Eboch (1998), Bowersox *et al.* (2000), and Gligor *et al.* (2015). Respondents were asked to indicate what their performance was compared with the competitors in their industry with respect to customer satisfaction (CP1), delivery reliability (CP2), quick response of customer complaints (CP3), speed of complaint handling (CP4), growth of profit (FP1) and growth of sales revenue (FP2). The items were measured using 5-point Likert scales anchored with ‘much worse than competition’ and ‘much better than competition’.

The primary approaches for measurement item purification included multiple iterations of confirmatory factor analysis (CFA) with the maximum likelihood estimation (MLE) method that iteratively improves parameter estimates to minimize a specified fit function. We evaluated the unidimensionality, reliability and convergent validity of each scale. Descriptive statistics and a correlation matrix for all constructs are presented in Table 2. Cronbach’s alpha exceeds 0.70 for all constructs, and all item-to-total correlations are higher than 0.40, which indicates satisfactory reliability (Chronbach, 1951).

Construct validity was examined through the adequacy of the model’s fit and both convergent

validity and discriminant validity. A model is considered to be satisfactory if the comparative fit index (CFI) is greater than 0.90, and the root mean square error of approximation (RMSEA) is less than 0.08 (Byrne, 1998). In assessing the overall fit of the model, we looked particularly at the Chi-square statistics, comparative fit index (CFI) and root mean square error of approximation (RMSEA) recommended by the literature (Hu and Bentler 1999). We also evaluated the model's incremental fit index (IFI) and the non-normed fit index (NNFI) as indicated by Browne & Cudeck (1992).
AMOS 22 was used to implement a CFA. Results indicate adequate fit for the measurement model with a Chi-square of 239.006 and 174 degrees of freedom, CFI = 0.941, and RMSEA = 0.043. The model's incremental fit index (IFI) of 0.944 and non-normed fit index (NNFI) of 0.922 also indicate adequate fit (Browne & Cudeck, 1992). For satisfactory convergent validity, the estimated parameters between the latent variables and their indicators should be at least 0.50 (Hair *et al.*, 1998). Results in Table 3 indicate that convergent validity is supported since all constructs just passed this test. However, the average variances extracted from each construct are somewhat low.

3.3. CONTROL VARIABLES AND COMMON METHOD VARIANCE

We used size as the control variable since smaller organizations typically have fewer resources for the implementation of process management or other operations and supply chain management practices (e.g. Cao & Zhang, 2011). The size of the organization was measured by the number of employees (logarithmized). However, we found no significant relationship between size and the constructs in our structural model.

Procedural methods were applied to minimize the potential for common method bias since both the independent and dependent measures were obtained from the same source (Podsakoff & Organ, 1986). We ensured our sample included mid to senior level managers with significant levels of relevant knowledge, which tends to mitigate single source bias (Mitchell, 1985). Common method bias was also reduced by separating the dependent and independent variable items over the length of the survey instrument and by assuring participants that their individual responses would be kept anonymous (Podsakoff *et al.*, 2003). A statistical approach for assessing whether common method bias exists is Harman's one-factor test (Podsakoff *et al.*, 2003). All variables were entered into an unrotated exploratory factor analysis to test whether the majority of the variance could be explained by a single factor, but this was not the case (26%). Therefore, we can conclude that the tests for reliability, validity, overall model fit and common method bias provide adequate support of the appropriateness of the model constructs.

4. Results

4.1. PATH MODEL AND HYPOTHESES TESTING

To estimate the proposed research model illustrated in Figure 1, we employed structural equation modeling (SEM). Results indicate an adequate fit with a Chi-square of 247.785 and 164 degrees of freedom, CFI of 0.919, RMSEA of 0.051 and IFI of 0.923. The standardized coefficient weights and critical ratios (CR) for each causal path are provided in Table 4 for the main effects. Hypothesis 1 was supported (CR = 3.920, $\beta 1$ = .337, $p < .001$), indicating a direct and positive relationship between PO and PM. Hypothesis 2 was also supported (CR = 5.473, $\beta 2$ = .590, $p < .001$), indicating a direct and positive relationship between PM and PS. We also found support for Hypotheses 3 (CR = 4.275, $\beta 3$ = .482, $p < .001$) and 4 (CR = 3.529, $\beta 4$ = .519, $p < .001$) suggesting direct and positive relationships between PS and OP and CP respectively. Hypothesis 5 was not confirmed (CR = −0.065, $\beta 5$ = −.074, $p = .545$). As such, results did not provide support for the hypothesized direct and positive relationship between OP and CP. We did, however, find support for hypothesis 6 (CR = 2.669, $\beta 6$ = .264, $p < .01$) and hypothesis 7 (CR = 3.709, $\beta 7$ = .417, $p < .001$) suggesting direct and positive relationships between OP and FP and CP and FP.

4.2. MODERATION ANALYSIS

We also asked respondents to rate their perceived importance of standardization in the market (ISM) and their perceived importance of customer effectiveness in the market (ICM) for engaging in competition; see Appendix B. To investigate the moderating roles of ISM and ICM in the OP ← PS relationship, a number of steps were followed; see for instance Baron and Kenny (1986). After centering the three variables to reduce the threat of multicollinearity (Aiken and West, 1991), we regressed OP on PS, ISM, and PS×ISM, and subsequently OP on PS, ICM and PS×ICM . As the interaction terms were not significant (F = 4.933, $\beta 8a$ = .083, p = .432) and (F = 6.132, $\beta 8b$ = −.054, p = .545), and multicollinearity (VIF values are close to 1; see appendix B) was not a problem, we can conclude that ISM and ICM do not moderate the relationship between PS and OP. A similar procedure was followed to investigate the moderating roles of ISM and ICM in the CP ← PS relationship, but we did not find any significant interaction terms (F = 9.136, $\beta 9a = -.083$, p = .454) and (F = 9.842, $\beta 9b = .009$, p = .922), and can therefore conclude that ISM and ICM do not moderate the relationship between PS and CP. A summary of the moderation analysis results is available in Table 5.

4.3. COMPETING MODEL

It has been suggested that, in addition to testing the theorized model, researchers compare alternative models by conducting post hoc analysis (Bollen & Long, 1993). To compare models, one should test the overall fit of the competing models based on degrees of freedom, the number of significant hypothesized parameters, and the ability to explain variance in the outcome of interest. Therefore, we also tested a (nested) model with direct relationships between process orientation of staff and process standardization, between process orientation of staff and the performance constructs and between process mapping and the performance constructs. We found a model with Chi-square of 249.809 and 181 degrees of freedom, CFI of 0.938, RMSEA of 0.044, IFI of 0.940 and NNFI of .920, with additional significant relationships between process orientation of staff and process standardization (CR = 4.949, $\beta 10 = .529$, $p < .001$) and between process mapping and operational efficiency performance (CR = 2.323, $\beta 11 = .240$, $p < .01$). However, since the chi-square difference between these nested models is non-significant ($\Delta\chi^2 = 2.024$, (Δdf=17, $p = .99$), we maintain our hypothesized model and summarize our results in figure 2.

5. Discussion

A sample of participants of Operational Excellence masterclasses and courses provides data for assessing process management proficiency. All study scales were determined to be unidimensional, reliable and valid. Results of the path analysis via structural equations modeling showed that the model fits the data adequately well and specifically supports all but one of the hypothesized direct relationships. The results of this study indicate that there is a cumulative model of process management proficiency comprising the components process orientation, process mapping and process standardization. This study shows that these components of process management reinforce each other. This finding is similar to the finding of Sanders Jones & Linderman (2013) that process management requires a multi-dimensional perspective in which various components (process control, process design and process improvement) make a different contribution to competitive advantage and performance. Although Sanders Jones & Linderman (2013), based on Evans & Lindsay (2005), claim that process control is the foundational piece to overall process management making it a necessary condition for organizations, yet not enough to provide a competitive advantage, we show that process orientation and process mapping are indeed foundations for process standardization and improvement. Based on path analysis, we conclude that these components indirectly impact process standardization and improvement: process orientation indirectly impacts process standardization (with a weight of .20), while process mapping indirectly impacts operational performance (.28) and customer performance (.31).

This study shows that process standardization and improvement by the systematic reduction of unnecessary (dysfunctional) variation (in processing time, lead times and waiting times), complexity (i.e. the reduction of unnecessary internal customer-supplier relationships) and the elimination of non-value adding (dysfunctional) activities, impacts operational efficiency performance. Our findings are similar to earlier studies that also show a significant relationship between process management and operational performance (Kohlbacher, 2010; Rust *et al.*, 2002; and Klassen & Menor, 2007): process standardization increases quality, reduces the need for rework, shortens lead times and improves productivity (efficiency). However, our findings also show that process standardization and improvements also increase customer effectiveness performance. That is, the systematic reduction of unnecessary (dysfunctional) variation, complexity and non-value adding (dysfunctional) activities shortens customer response times, increases the speed of complaint handling, delivery reliability and customer satisfaction. These findings concur with the findings of Gustafsson & Nilsson (2003) that process management directly impacts customer effectiveness performance. In concurrence with Sila (2007) and Gligor *et al.* (2015) this study also shows that process management (as part of operations management) does not impact financial performance directly, but indirectly via operational or organizational performance and customer related performance.

5.1. Implications

Process management (i.e. process orientation, process mapping and process standardization and improvement) is important for any organization. This study explicitly shows that there are proficiency levels of process management that impact operational efficiency performance and customer effectiveness performance. The use of process management proficiency as a type of proficiency ladder (similar to Gordon's ladder of consciousness competencies) gives organizations the ability to assess where they stand and take appropriate measures to enhance process management professionalism and so increase operational efficiency and customer effectiveness performance. This study also shows that organizations must take time i) to enhance the process orientation of their employees, and ii) to map and describe existing processes (the documentation of the so-called IST-situation) as a basis for process improvement: *the point is to get the basics in order* independent of the type of competitive environment. The foundation of process optimization is important in environments in which organizations compete on customer effectiveness but also in in environments in which they compete on standardization.

5.2. Limitations and future research

As with other empirical studies, the findings and implications in this study must be interpreted with caution, given the methodological limitations of the research, which presents additional future research opportunities. Firstly, in our study the model was developed and tested using the same dataset. Although the model tested in this study is warranted, the use of multiple datasets would be an appropriate research extension. Secondly, the cross-sectional research design limits the extent to which cause-effect relationships can be inferred. This limitation can be addressed in future research through the collection of longitudinal data. Thirdly, we use perceptual data to measure the constructs of this study. Although Ketokivi & Schroeder (2004) showed that perceptual measures were valid proxies for objective measures, it is worth recognizing the possibility that the perceptions of those surveyed do not provide a completely accurate view of reality. Furthermore, since the environment was proposed as a moderating variable using the participants' perception of the importance of standardization in the market and the importance of customer effectiveness in the market, the use of multiple informants to verify perceptions would be a logical extension. In addition, alternate models of moderation and mediation such as environmental dynamism, munificence and uncertainty munificence, dynamism, and complexity (e.g. Gligor *et al.*, 2015) could be explored in future research.

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NAICS codes	Type of industry	Percentage	Function	Percentage	Years of employment	Percentage
22	Energy	5	CEO	6	<1 year	5
23	Construction	2	CFO	8	1-3 years	12
31 - 33	Industry	17	COO	4	3-5 years	23
43	Wholesale trade	6	Manager Operations	11	5-10 years	15
48 - 49	Transportation and warehousing	3	Department manager	29	10-15 years	1
52	Finance and insurance	9	Finance and control	15	15-20 years	1
53	Real estate and rental and leasing	2	Internal advisor	9	>20 years	8
54	Professional, scientific and technical services	12	Logistics manager	2		
56	Water supply and waste management	1	Project leader	3		
61	Educational services	5	Team leader	3		
62	Health care and social assistance	18	Other	12		
81	Other services (except public administration)	3				
92	Public services	10				
Missing		7				35
Total		100		100		100

Table 1: profile of survey respondents

	Mean	S.D.	PO	PM	PS	OP	CP	FP	ISM	ICM	Size
Process orientation of staff (PO)	3,413	,733	1								
Process mapping (PM)	3,328	,823	,245**	1							
Process standardization (PS)	2,562	,644	,403**	,398**	1						
Operational efficiency performance (OP)	3,883	,600	,193*	,192*	,317**	1					
Customer effectiveness performance (CP)	3,531	,585	,388**	,107	,475**	,234*	1				
Financial performance (FP)	3,395	,835	,233**	,076	,284**	,320**	,360**	1			
Importance of standardization (ISM)	3,600	,720	-,005	,104	,283**	,022	-,089	,162	1		
Importance of customer effectiveness (ICM)	4,196	,645	-,046	,208**	,046	,020	,065	,056	,320**	1	
Size (logarithmized) (FS)	2,99	,880	,107	,134	-,030	-,046	-,054	-.,092	,072	,067	1

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

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

Table 2: Descriptive statistics and correlation matrix for all constructs.

	Crombach alpha for scale	Alpha if item deleted	Item-to-total correlation	Mean	SD	Item loadings
PO	0.766					
PO1		0.740	.492	3.58	0.929	0.506
PO2		0.663	.637	3.58	0.959	0.802
PO3		0.668	.636	3.19	0.885	0.854
PO4		0.747	.494	3.31	1.056	0.525
PM	0.818					
PM1		0.807	.613	3.19	1.073	0.7
PM2		0.734	.675	3.44	0.887	0.791
PM3		0.690	.715	3.36	0.926	0.863
PS	0.700					
PS1		0.676	.404	2.69	0.948	0.501
PS2		0.598	.528	2.33	0.819	0.687
PS3		0.607	.519	2.61	0.790	0.577
PS4		0.631	.477	2.61	0.998	0.586
OP	0.712					
OP1		0.697	.417	4.21	0.767	0.51
OP2		0.594	.585	4.02	0.869	0.778
OP3		0.613	.562	3.61	0.796	0.718
Op4		0.686	.441	3.69	0.840	0.507
CP	0.754					
CP1		0.738	.466	3.73	0.775	0.622
CP2		0.648	.464	3.6	0.726	0.769
CP3		0.640	.634	3.52	0.788	0.685
CP4		0.741	.639	3.28	0.799	0.511
FP	0.852					
FP1			.743	3.3	0.950	0.811
FP2			.743	3.49	0.838	0.916

Table 3: Reliability and item statistics.

Hypothesis	Path	Std. Weights (β)	Critical Ratio	Supported?
H1	PM ← PO	0.337	3.920	Yes; $p < .001$
H2	PS ← PM	0.590	5.473	Yes; $p < .001$
H3	OP ← PS	0.482	4.275	Yes; $p < .001$
H4	CP ← PS	0.519	3.529	Yes; $p < .001$
H5	CP ← OP	− 0.074	-0.065	No; $p = .545$
H6	FP ← OP	0.264	2.669	Yes; $p < .01$
H7	FP ← CP	0.417	3.709	Yes; $p < .001$

Table 4: Direct effects testing results.

Hypothesis	Relationship	Moderator	Std. weights	Supported
H8a	OP ← PS	ISM	.083	No; $p = .432$
H8b	OP ← PS	ICM	−.054	No; $p = .545$
H9a	CP ← PS	ISM	−.083	No; $p = .454$
H9b	CP ← PS	ICM	.009	No; $p = .922$

Table 5: Moderation testing results.

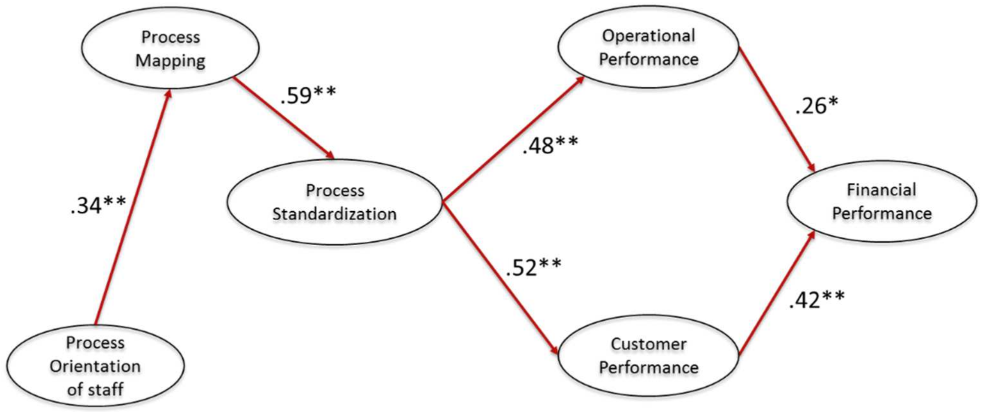

Figure 2. Process management proficiency structural model with standardized estimates (** significant at 0.001 level, * significant at 0.01 level; CFI = 0.919, RMSEA of 0.051 and IFI of 0.923)

	Crombach alpha for scale	Alpha if item deleted	Item-to-total correlation	Mean	SD
ISM	0.820				
ISM1		*.800*	*.540*	3.45	1.016
ISM2		*.749*	*.707*	3.36	.910
ISM3		*.745*	*.726*	3.64	.870
ISM4		*.801*	*.524*	3.82	.855
ISM5		*.796*	*.560*	3.72	1.077
ICM	0.756				
ICM1		*0.677*	*.581*	4.47	.759
ICM2		*0.685*	*.573*	4.09	.767
ICM3		*0.654*	*.602*	4.02	.836

Table B1: Reliability and item statistics (part 2).

Model		Unstandardized Coefficients		Standardized Coefficients	t-value	Significant	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	3.979	.051		78.718	.000		
	PS	.260	.088	.324	2.950	.004	.740	1.352
	ISM	−.015	.074	−.020	−.204	.839	.913	1.095
	ISM×PS	.100	.126	.083	.789	.432	.802	1.246

Dependent Variable: Operational Efficiency Performance =(OP1+ OP2 + OP3 +OP4)/4

ANOVA

Model		Sum of Squares	df	Mean Square	F	Significance
1	Regression	3.514	3	1.171	4.933	.003
	Residual	23.033	97	.237		
	Total	26.547	100			

Table B2: Coefficients for PS, ISM and interaction - Dependent Variable: Operational_Efficiency Performance

Model		Unstandardized Coefficients		Standardized Coefficients	t-value	Significant	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	3.953	.049		80.587	.000		
	PS	.300	.073	.368	4.097	.000	.999	1.001
	ICM	.093	.093	.091	1.010	.315	1.000	1.000
	ICM×PS	−.088	.144	−.054	−.608	.545	.999	1.001

Dependent Variable: Operational Efficiency Performance =(OP1+ OP2 + OP3 +OP4)/4

ANOVA

Model		Sum of Squares	df	Mean Square	F	Significance
1	Regression	4.805	3	1.602	6.132	.001
	Residual	27.688	106	.261		
	Total	32.494	109			

Table B3: Coefficients for PS, ICM and interaction - Dependent Variable: Operational_Efficiency Performance

Model		Unstandardized Coefficients		Standardized Coefficients	t-value	Significant	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	3.542	.059		59.623	.000		
	PS	.512	.104	.549	4.908	.000	.736	1.358
	ISM	-.138	.093	-.151	-1.481	.142	.885	1.130
	ISM×PS	-.113	.150	-.083	-.753	.454	.757	1.322

Dependent Variable: Customer Effectiveness Performance = (CP1 + CP2 + CP3 + CP4)/4

ANOVA

Model		Sum of Squares	df	Mean Square	F	Significance
1	Regression	7.811	3	2.604	9.136	.000
	Residual	23.083	81	.285		
	Total	30.894	84			

Table B4: Coefficients for PS, ISM and interaction - Dependent Variable: Customer Effectiveness Performance

Model		Unstandardized Coefficients		Standardized Coefficients	t-value	Significant	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	3.514	.056		63.185	.000		
	PS	.439	.084	.484	5.259	.000	.997	1.003
	ICM	.102	.097	.097	1.047	.298	.984	1.016
	ICM×PS	.016	.163	.009	.098	.922	.988	1.013

Dependent Variable: Customer Effectiveness Performance = (CP1 + CP2 + CP3 + CP4)/4

ANOVA

Model		Sum of Squares	df	Mean Square	F	Significance
1	Regression	8.287	3	2.762	9.842	.000
	Residual	24.979	89	.281		
	Total	33.266	92			

Table B5: Coefficients for PS, ICM and interaction - Customer Effectiveness Performance

Author: Marcel van Assen (1969) (marcel@opx-instituut.nl) is a management consultant at OpX-Consultants BV and senior trainer at OpX-Instituut. His consulting and training experience covers various operations management, innovation/strategic management and change- & implementation issues. Marcel van Assen is also a distinguished professor of Operational Excellence for Services at Tias, School for Business and Society of Tilburg University and Technical University of Eindhoven, where he's responsible for various courses, workshops and master classes with respect to Operational Excellence.
He holds a M.Sc. in mechanical engineering from the University of Twente, a M.Sc. in strategy and organization from the Open University, and a Ph.D. in business administration from the Rotterdam School of Management, Erasmus University Rotterdam. He is coauthor of various articles and books.

OpX-Instituut
KvK: 58403027
BTW: NL8530.24.418B01
B: Kruisbes 3, 7559RK Hengelo
P: Postbus 8026, 7550KA Hengelo
T: 074-8512819