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There is something about process standards: An empirical analysis

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Abstract

Insights from qualitative information systems research reveal a strong impact of process standardization on the overall process performance like reduced process time or process costs in staff recruitment. Surprisingly, the process owners indicated that an increased use of information systems (IS) in different sub processes such as candidate attraction or applicant tracking triggered overall process standardization. Based on these qualitative research approaches and the additional literature about the antecedents of process standardization and its impact we conducted an empirical survey with 156 process owners in large scale companies to revise these findings. The evaluation of our structural equation model using partial least squares shows that process standardization is a full mediator for the relationship between system usage and process performance measured in process time, cost, and quality and that information systems usage directly and significantly influences process standardization.

Keywords

Business Process Management, Process Standardization, Process Performance, IS Usage, and Human Resources.

1. Introduction

Human resource management has developed from a secondary organizational department to a business unit for organizational effectiveness (Deckop, J.R. & Mahoney, T.A. 1986). As a consequence, information systems supporting Human Resources (HR) processes have received increased management attention and various approaches like HR business process outsourcing (Klaas, B.S. et al. 2001) or HR controlling were discussed and tested in theory and practice. Despite a couple of suitable methods and attempts to value creation in HR, an efficient concept for generating business value is still undiscovered. Among the major deficiencies, a lack of process standardization (Laabs, J. 1998) and information systems usage (Keim, T. et al. 2005) has been identified. Therefore this paper aims to explore the role of process standardization in the context of IS usage and process performance.

As indicated by (Iacobucci, D. et al. 1994) process standardization contributes to transparency and creates comparability within and across firm boundaries especially the highly individualized recruiting process due to several specific target groups contains plenty of room for such improvement. For this tough measurable process a value of IS usage could only be shown for single process parts concerning costs-per-hire and time-to-hire, but not for the entire process. Despite the individualization of single advantages, the overall value of the whole process, measured in

time, cost and quality is still marginal. As the degree of standardization in HR processes is also usually quite low, it seems promising to find out what drives standardization in this context. Therefore we address the following research question:

- What is the role and related impact of process standardization in a general business process as staff recruitment?

We analyze the participating role of process standardization on the effect of IS usage on process performance in staff recruitment. Unfortunately, just few things are known about the impact of process standardization on IS supported processes (Wuellenweber, K. et al. 2008) as well as its interplay with IS usage (Von Stetten, A. et al. 2008), because of almost no existing reference processes (Muenstermann, B. & Weitzel, T. 2008). Therefore we decided to take an explanatory approach to answer our research question. We start this approach by describing two qualitative approaches examining the role of process standardization in staff recruitment with two multinational enterprises in order to provide useful assumptions for our proximate survey. Based on the results of these case studies we develop hypotheses for our structural equation model in section 3. We then analyze our research model with data from 156 large-scale enterprises with regard to our research model by using the partial least square method (PLS) in section 4. We conclude our paper with a discussion about the role of process standardization in IS supported processes as staff recruitment and an interpretation of the findings in our analysis.

2. Theoretical background

Over the last five years a majority of large-scale enterprises in Europe, Asia and the U.S. increased the use of information systems within their recruiting processes (Malinowski et al. 2005) (Florkowski, G. & Olivas-Luja´n (2006). Although quite a lot is known about the systems in use for sub processes as candidate attraction (Stokes, S.L. 2000), applicant tracking (Lee, I. 2007) or pre-selection (Laumer, S. et al. 2009) hardly any approach is known dealing with the explicit contribution of information systems for staff recruitment (Lievens, F. et al. 2002). Within our literature review we found two qualitative approaches dealing with that issue who examined a particular role and influence of process standardization. These two research approaches with a global operating automotive supplier (Von Stetten, A. et al. 2008) and a worldwide leader for pharmaceutical products (Eckhardt, A. & Schaefer, S. 2007) are presented in the following subsections as theoretical base for the assumptions of our research model.

2.1 Case 1: Process standardization in the automotive industry (Von Stetten, A. et al. 2008)

Being part of Western Europe's important automotive branch this still family-owned enterprise is represented in 34 countries worldwide. Nearly 22.000 employees work in the business of mechanical and automotive engineering since over 130 years. Their HR strategy is closely aligned to the corporate strategy and developed on top management level by responsible HR managers. Due to the connection to the corporate strategy key goals of the HR strategy in staff recruitment regard the dimensions time-to-hire and costs-per-hire. In order to fulfill these goals the company uses information systems for the process of candidate attraction and applicant tracking. In the

process of candidate attraction they cooperate with several internet job boards because of their nationwide high coverage to bring large numbers of applicants to the career section on their own corporate website. The following incoming applications could be handled by the candidate management system, which also allows the inclusion of the hiring managers in the operating departments in the applicant tracking process.
The process of standardizing the recruiting processes in this company started in the end of 2006 on the initiative of the head of HR strategy. The first objective of this project was to increase recruiting processes transparency and information with regard to content. Overall the outcomes of this case study could be described in the following way.
(1) The enterprise observed intensively uses information systems in their complete recruiting process especially in candidate attraction and applicant tracking. (2) They identified the individual advantages by information systems use, as decreasing cost for posting job ads online instead in nationwide newspapers, decreasing administrative expenses and paper cost through the databases of used software solution or an improvement of communication between recruiting and operating department through their used candidate management system. (3) The use of several partial individual information systems led to an overview loss and the demand of a more structured and redundant process. (4) Even though all individual advantages were recognized, the overall advantage in decreasing process cost, process time or increasing candidate quality was only small. (5) The encouraging results after the implementation of process standards for example a decrease in time-to-hire of 23 days as well as a decrease of the costs-per-hire of 30 percent leads to the assumption that process standardization influences the impact of IS usage on process cost and process time.

2.2 Case 2: Process standardization in the pharmaceutical industry (Eckhardt, A. & Schaefer, S. 2007)

This enterprise operates in the pharmaceutical and biotechnical business and is one of the major market players in this specific business worldwide and located in Switzerland. More than 90.000 employees worldwide produce record profits over several past years. The increasing profit also led to a high demand of new employees for the groups of skilled workers and professionals (work experience > 4 years) especially in the field of pharmaceutical and biotechnical R&D. This amount of expertise could not sufficiently be found on the demographically small labor market in Switzerland. In order to find this specified knowledge somewhere abroad the enterprise cooperates worldwide with an international operating job board. The corporate websites in every related country offer the direct internal application processing without interface. Several individual designed e-assessment centers are used to provide candidate data including soft factors as leadership or capacity of teamwork. In the individual countries various selection mechanisms are utilized for the purpose of finding the right high-qualified candidates out of incoming applications, external CV-databases offered by job portals and several internal countrywide talent pools containing a total number of two million resumes.
The global harmonizing and standardizing of all recruiting processes was initiated in July 2006 by the head of the global Human Resources Information Systems Shared Services Department and directly reported to the global staffing council (a committee of all chief staffing officers). The set goal was to create a global measurable reference process for better reporting. The conducted

interviews contained a number of interesting findings the most important are named in the following.
(1) The company observed did not only use IS intensively for attracting candidates online and tracking their applications in house but also for selecting the suitable and high-qualified candidates out of bulk of candidates. (2) They were able to find suitable candidates out of a mass of applicants by using algorithm-based recommender systems and e-assessment solutions. (3) The value of the various selection instruments in applicant tracking like recommender systems or e-assessment solutions was limited to the countries frontiers due to the slightly comparable and complicated criteria. (4) A global comparison of all applicants in just one database was hard to manage due to the lacking comparability. Thus the needed number of high qualified candidates from abroad could not be provided for Switzerland. (5) But since the global process harmonization and standardization was brought on its way, the number of high qualified applying, found or recommended candidates for Switzerland increased constantly. The findings indicated an impact of process standardization and lead to a further assumption that process standardization not only influence the impact of IS usage on process cost and process but also on candidate and process quality respectively.

After the description of the theoretical background for our research model and the observation that process standardization seems to play an important role to gain the value of constant information systems usage we operationalize these findings in our research model and verify the findings of prior qualitative research approaches.

3. Research model and construct development

Very few research articles have been published on the interplay of IS usage and standardization. Some outlined that the adoption of process standards in an IS supported business process may result in cost reductions or time savings (Hirschheim, R.A. & Lacity, M.C. 2000) (Muenstermann, B. et al. 2009) as seen in the cases described in the previous section. To focus our process orientation we defined our reference recruiting process based on prior process designs (Breaugh, J.A. & Starke, M. 2000) (Lee, I. 2007) and additional approaches of (Schneider, B. 1995) (Faerber, F. et al. 2003) as a two step process containing the steps candidate attraction and applicant tracking. We will answer our research question by enclosing hypotheses observing a mediating role of process standardization in the relationship between IS usage and process performance as found in prior qualitative research approaches (Von Stetten, A. et al. 2008) (Eckhardt, A. & Schaefer, S. 2007). Our hypotheses were formed on the case study findings and additional results in IS research about the use and value of information systems as well as process standardization.

3.1 Research hypotheses

First of all, we assume that process standardization is positively affected by a frequent IS usage in the candidate attraction process as described in the qualitative research approaches (Von Stetten, A. et al. 2008) (Eckhardt, A. & Schaefer, S. 2007) in section 2. Especially an intensified IS usage during the attraction phase seems to affect the efforts of developing reference processes for staff recruitment (Faerber, F. et al. 2003) (Malinowski, J. et al. 2005). The outcome of several research approaches about e-recruiting (Keim, T. & Malinowski, J. 2006) leads to similar assumptions in

the interplay of IS support in applicant tracking and the integration of process standards. IS resources for advertising job ads and applicant tracking are already provided and frequently used by large-scale companies as seen in the described underlying cases. Based on this theoretical foundation we hypothesize:

H1: IS usage in candidate attraction positively affects process standardization.
H2: IS usage in applicant tracking positively affects process standardization.

We combine these case study findings with the thoughts of further research approaches in process standardization (Davenport, T.H. 2005) (Hirschheim, R.A., & Lacity, M.C. 2000) (Muenstermann et al. 2009), who reveal that process standardization have a significant contribution on process performance. A consistently running process with a high degree of standardization as it particularly appears in candidate attraction also provides the possibility of economies of scale and scope. With regard to the observed reference processes the higher transparency allows the operating departments and top management to identify value creation in the form of decreasing process time and cost. This leads to a better understanding of the process elements for all actors within the recruiting process. Synergies concerning process performance should also be achievable for recruiting and operating department. Reduced transaction costs due to high rates of interaction provide further cost savings as well (Wuellenweber, K. & Weitzel, T. 2007) (Wuellenweber, K. et al. 2008). We also add process quality as a measure of performance as it is highlighted in several research papers (Barua, A. et al. 1996) (Devaraj, S. & Kohli, R. 2003). Quality in form of candidate quality is also an important dimension because of the current situation with a talent shortage in global labor markets (Thompson 2007). According to this, the degree of process standardization should have an impact on the effect of IS usage on process performance (Muenstermann, B. & Weitzel, T. 2008) (Muenstermann, B. et al. 2009). Additionally process standardization seems to mediate the effect of IS usage measured in candidate attraction and applicant tracking on process performance measured in process time, process costs and process quality as found in prior qualitative research approaches (Von Stetten, A. et al. 2008) (Eckhardt, A. & Schaefer, S. 2007). So we hypothesize:

H3: Process standardization positively affects process time and additionally mediates the effect of IS Usage on process time.
H4: Process standardization positively affects process time and additionally mediates the effect of IS Usage on process cost.
H5: Process standardization positively affects process quality and additionally mediates the effect of IS Usage on process quality.

Figure 1 now depicts our research model with the included hypotheses for the individual effects and the role of process standardization. The operationalization of the individual constructs used in our research model is presented in the appendix.

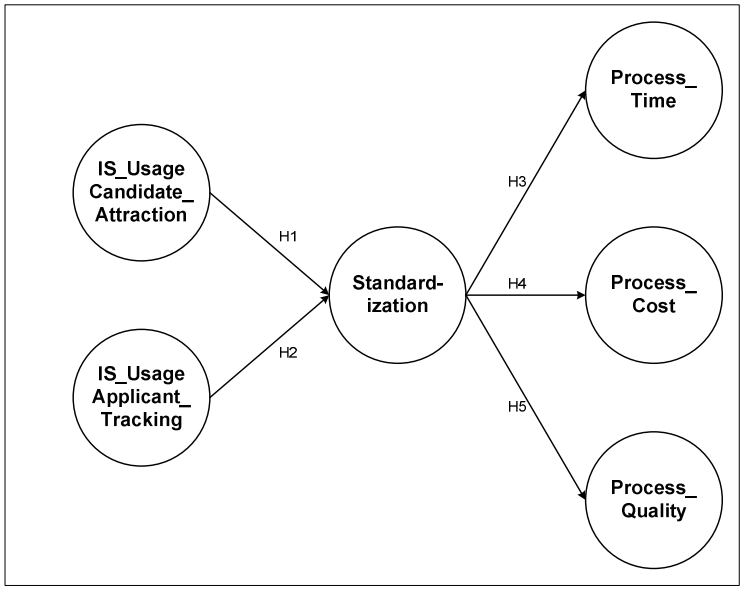

Figure 1: Research model

3.2 Methodology

We used a paper-based questionnaire to empirically test our five hypotheses. Our research model has been operationalized and transferred into a structural equation model. We analyzed our research model with the partial least squares approach. The level of significance to corroborate our hypotheses was chosen as p=0.05. Each construct in our research model is represented by a set of indicators. We measured these indicators on a 7-point Likert scale. We used scales from "strongly agree" to "strongly disagree" for all constructs within our research model. Whenever possible, existing measures from prior empirical studies were adopted. The questionnaire was pre-tested independently with HR managers from different companies in different branches which were not included in the final sample. We modified and finalized our questionnaire based on the insights acquired during the pretests. The original survey was not written in English so the constructs used in our research model have been translated using the back-translation method (Brislin 1970).

We sent our questionnaire to HR managers responsible for the whole corporate recruiting process including the sub-processes candidate attraction and applicant tracking as described above. Overall, 156 usable questionnaires were returned and included in our evaluation. The percentage rate of missing values was less than 8 percent so we used the case-wise replacement (Chin, W.W. 2000) for our PLS analysis.

4. Data analysis

For the data analysis and the testing of our hypotheses we evaluated the datasets in three different parts. At first, we evaluated the reflective measurement model, then we examined the path coefficients as well as the R^2 in our structural model and finally we conducted a mediator analysis to observe the general role of process standardization within our research model.

4.1 Measurement model specification

All constructs used in the model have been derived from the described cases in section 2 as well as prior studies dealing with the issues of information system usage and value as well as process standardization. All constructs within our research model have been operationalized in reflective mode. The quality of reflective measurement models is determined by four major criteria the content validity, the indicator reliability, construct reliability as well as discriminant validity (Bagozzi, R.P. et al. 1979) (Straub, D. et al. 2004).

Content validity describes the degree of how the measured results express the content-semantic part of the construct. The measurement should represent all different dimensions of the construct (Nunnally, J.C., & Bernstein, I.H. 1994). A necessary precondition for content validity evaluation is a very precise content definition of all constructs. To ensure content validity we discussed our constructs in detail with several experts of IS research in the field of process standardization and staff recruitment as well as with HR managers working in a comparable job as our survey participants (Churchill, JR., & Gilbert, A. 1979).

Indicator reliability is tested with view to the individual loadings of all indicators. All loadings observed are significant at the 0.001 level and above the recommended 0.6 parameter value. All indicator loadings under 0.6 parameter value were excluded beforehand (Hulland, J. 1999). We tested the indicator loadings for significance by conducting a bootstrap with 200 samples (Chin, W.W. 1998). The indicator loadings are represented within the appendix.

Construct reliability demands that these indicators which are related to the same construct should strongly correlate with each other (Fornell, C. & Larcker, D.F. 1981). The construct reliability was tested using the composite reliability (CR) and the average variance extracted (AVE). The estimated values were above the recommended thresholds (Bagozzi, R.P. & Yi, Y. 1988) of 0.6 for CR and 0.5 for AVE (with the exception of AVE for Process quality). The results for the quality criteria of our measurement model are visualized in Table 1.

	Quality criteria	
	Composite Reliability (CR)	Average Variance Extracted
IS usage - CA	0.860	0.607
IS usage - AT	0.918	0.693
Standardization	0.914	0.780
Process time	0.829	0.709
Process cost	0.932	0.821
Process quality	0.790	0.485

Table 1: Quality criteria

Discriminant validity describes the difference between single construct measurements and the overall measurement instrument. It can be evaluated by looking at the cross-loadings. They are received by correlating the component scores of each latent variable with both their respective blocks of indicators and all other items that are included in the model. The results show, that the loadings of our reflective indicators are higher for their respective constructs than for any other. Additionally, the square root of the AVE for each construct is higher than the correlations between the individual constructs. Therefore we can subsume that the discriminant validity within our research model is high (Hulland, J. 1999) (Fornell, C. & Larcker, D.F. 1981).

4.2 Structural model evaluation

After the measurement model specification, we analyze the explanatory power of our structural model. The squared multiple correlations (R^2) express the significance of the endogenous variables. To analyze process performance we explained performance with three different categories (time, cost, quality). The achieved results show that 40.2% (R^2=0.402) of process cost, as well as 22.8% (R^2=0.228) of process quality and 21.7% (R^2=0.217) of process time is explained by standardization and the constructs for IS usage. The R^2-value for standardization is 0.284. The corresponding t-values show the level of significance using the magnitude of the standardized parameter estimates between constructs. All path coefficients in the research model exceed the recommended 0.2 level and are highly significant ($p < 0.001$). Figure 2 visualizes the evaluation of the structural model including R^2-values and path coefficients.

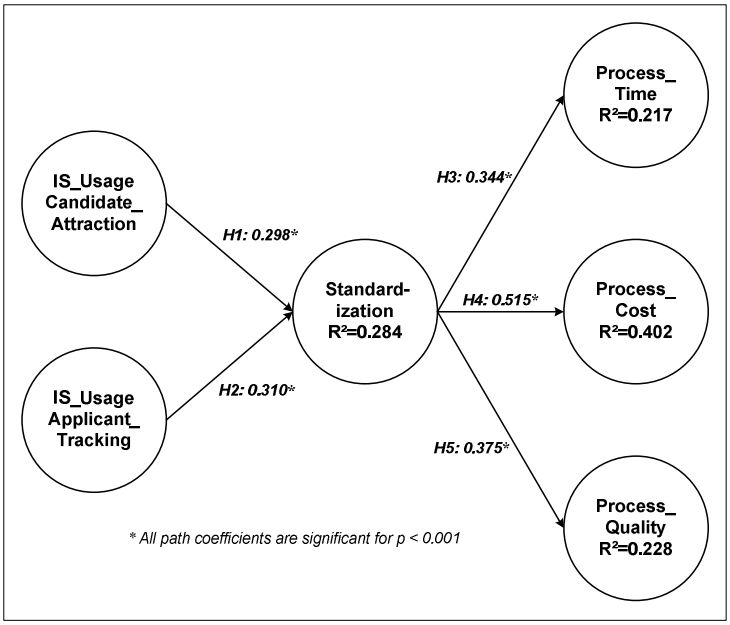

Figure 2: Structural model

4.3 Mediator analysis

The assumptions derived of prior qualitative research approaches (Von Stetten, A. et al. 2008) (Eckhardt, A. & Schaefer, S. 2007) could be enforced by the results of our structural model. Process standardization positively affects process performance and seems to mediate the relationship between IS usage and process performance. In a mediator affected relation the effect of the exogenous variable on the endogenous variable is partially or completely represented by the mediator.

A mediating effect appears if the following conditions are fulfilled, (1) gradual changes of the exogenous variable lead to significant effects on the mediating variable, (2) changes of the mediating variable lead to significant effects on the endogenous variable and (3) the direct path between the exogenous and endogenous variable is insignificant or significantly smaller without a mediating variable. Obtained on our model we could indicate that gradual changes of IS usage in

candidate attraction and IS usage in applicant tracking lead to significant effects on process standardization as seen for the path coefficients in Figure 2. The second condition is also fulfilled as changes of standardization significantly affect the endogenous variables process time, process cost and process quality. Unlike (Klaas, B.S. et al. 2001) who propose to test the conditions 1 to 3 with separated partial models (Iacobucci, D. & Duhachek, A. 2003) plead to proof the significance of the indirect mediated effect. For it the Z-Statistic by (Sobel, M.E. 1982) is a useful measure which shows if the null hypothesis could be rejected or not. The statistical results for this are presented below in Table 2.

Path	$z_{\alpha\beta} = \frac{\alpha * \beta}{\sqrt{(\beta^2\sigma_\alpha^2 + \alpha^2\sigma_\beta^2)}}$			Sign. level
	SE α	SE β	z-value	
CA-Proc_Time	0.0079	0.0105	2.3626	< 0.025
CA-Proc_Cost	0.0079	0.0065	2.7052	< 0.010
CA-Proc_Quality	0.0079	0.0070	2.6770	< 0.011
AT-Proc_Time	0.0052	0.0105	2.6353	< 0.012
AT-Proc_Cost	0.0052	0.0065	3.1389	< 0.004
AT-Proc_Quality	0.0052	0.0070	3.0951	< 0.004

Table 2: z-value and standard errors

The results show that the null hypothesis ("no indirect mediated effect exists") could be rejected for all constructs observed. It also indicates that process standardization acts as mediator for the effect of IS usage on process performance. After the objective evidence for standardization as a full mediator we try to measure the magnitude of the mediating effect. Therefore Iacobucci and Duhachek recommend using the parameter VAF (Variance accounted for) (Iacobucci, D. & Duhachek, A. 2003). The VAF parameters show a high magnitude especially for the mediating effect of process standardization for the relationship between IS usage in candidate attraction and process performance. For example 94 percent of the relation between IS usage and process performance results from the mediator standardization as seen in Table 3.

Path	VAF	Mag. of mediator
CA-Proc_Time	0.94	94%
CA-Proc_Cost	0.76	76%
CA-Proc_Quality	0.66	66%
AT-Proc_Time	0.37	37%
AT-Proc_Cost	0.54	54%
AT-Proc_Quality	0.49	49%

Table 3: Variance accounted for (VAF*)*

5. Implications for further research

Using data from the recruiting process owners in 156 companies our explanatory analysis reveals a significant impact of process standardization on the effect of IS usage on process performance. It is shown that standardization act as full mediator for the relationship between IS usage and process performance measured in time, cost and quality. Furthermore it is demonstrated that the level of IS usage directly influences process standardization and indirectly process performance. Our findings could contain interesting implications for practice and theory. On the one side, we add a new view on the interplay of IS usage and standardization to current literature. On the other side, as standardization mediates the relation between and IS usage and process performance, it also seems to impact time-to-hire, costs-per-hire and candidate quality in IS supported recruiting processes. This confirms the findings of (Wuellenweber, K. et al. 2008) who estimate that a high degree of process standardization could lower process cost. Finally for the new research field of HRIS (human resources information systems) we could encourage the efforts of theory and practice to use more IS in HR. Future studies should consider the level of process standardization as control variable (Wuellenweber, K. et al. 2008) for the recruiting process and add new potential mediator or moderator variables as alignment.

Our findings should be perceived carefully and strictly incipiently. A major problem remains as the current research on standards and standardization lacks a clear concept of standard. We observed that process standards as perceived in practice are responsible for the process. Therefore our research doesn't focus on standards of data interchange (EDI) or quality but on rather transparently structured business workflows. Besides, we estimate an impact of interface standards on overall process standardization because of the structuring of work tasks in modules as described in the cases in section 2. But the focus shift from data to process standards is a huge step that needs much more insight knowledge in order to find out more about the drivers of business processes like the recruiting process. (Wuellenweber, K. et al. 2008) suggest developing a standardization capability on a process level based on resource-based-view constructs to figure out the impact on process performance. All in all the role of process standardization and its impact on success still has to be clearly discovered.

6. Conclusion

Our findings enforce the assumptions coming from qualitative case study research (Von Stetten, A. et al. 2008) (Eckhardt, A. & Schaefer, S. 2007) that process standardization seems to influence the outcomes of recruiting processes measured in time, cost, quality and is driven by the degree of IS usage. Further research has to be done in this field to ensure the role of process standards not only in staff recruitment but also in additional areas. Interesting findings should be possible, when we look forward to further standardization research regarding standard-based value creation and process standard diffusion.

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Appendix

Indicator	Loading	Description
Process-Time-1	0.778	We have reduced the time between the identification of a vacancy and its fill.
Process-Time-2	0.896	We have reduced the time between the posting of the job ad and the final hiring decision.

Process-Cost-1	0.876	We were able to reduce the costs for candidate attraction.
Process-Cost-2	0.907	We were able to reduce the costs for the internal applicant tracking.
Process-Cost-3	0.934	We were able to reduce the average costs per each hire.
Process-Quality-1	0.637	We were able to enhance the overall applicant quality.
Process-Quality-2	0.654	We were able to enhance the quality of applicants' data.
Process-Quality-3	0.768	We were able to enhance the proportion of top candidates.
Process-Quality-4	0.725	We were able to enhance the degree of information for our operating departments.
Process-Stand.-1	0.863	We have a well-regulated process cycle for applicant tracking in our staff recruitment.
Process-Stand.-2	0.871	We have established highly standardized procedures in our staff recruitment.
Process-Stand.-3	0.914	We have documented our actions to a great extent.
Candidate-Attr.-1	0.794	We frequently use online-channels in candidate attraction.
Candidate-Attr.-2	0.769	We frequently attract candidates via internet job boards.
Candidate-Attr.-3	0.843	We use the career section on our corporate website for candidate attraction.
Candidate-Attr.-4	0.704	We use various functionalities of internet job boards for candidate attraction
Appl.-Tracking-1	0.868	We respond to candidates with paper-based applications with an automatic email responder.
Appl.-Tracking-2	0.840	We respond to candidates with digital applications with an automatic email responder.
Appl.-Tracking-3	0.820	We use an information system to support our applicant tracking.
Appl.-Tracking-4	0.802	We store all relevant incoming applications in an internal talent pool.
Appl.-Tracking-5	0.822	We store at least a part of all incoming applications in an internal talent pool.

Table 4: Construct operationalization and indicator loadings
(N.B.: all loadings are significant at the 0.001 level)