Digitization at Any Cost? Willingness to Trade Efficiency for Organizational, Human, and Relational Costs

Completed Research

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Abstract

This paper investigates how companies value efficiency gains against indirect costs that emerge during the implementation of digitization projects. We look at indirect costs (i.e., organizational, human, and relational costs), since they are typically overlooked or treated as 'black box' by researchers, although they have significant impacts for the implementation of a digitization project (e.g., employees' resistance against the project). Using a discrete choice experiment (DCE), participants of our study had to trade off different digitization projects, characterized by various combinations of indirect costs and levels of efficiency gains. Our insights shed light to the relative importance of different indirect costs, hence provide significant implications for practitioners: Understanding how participants value efficiency gains against indirect costs, companies can reduce the internal resistance of employees against digitization projects by avoiding or minimizing those costs that are perceived unacceptable.

Keywords

Digitization, digital transformation, indirect costs, discrete choice experiment.

Introduction

Digitization, which is defined as the way companies innovate their business processes, structures, and strategies (Brennen and Kreiss 2016), comes at costs. These costs play an important role in shaping the process of digitization. Nonetheless, current research fails to recognize the complexity of the cost issue (Bunduchi and Smart 2010). For instance, Bunduchi and Smart (2010) point out the fact that direct costs are often considered as a single, high-level variable, which reflects only a partial representation of the total - direct and indirect - costs of digitization.

Besides direct costs, which emerge, for instance, from the acquisition of necessary technological components and the related costs of capital, various types of indirect costs may be significant impediments to the digitization of companies. For instance, to make sure that new technology is not underutilized, companies need to invest in on-the-job employee training (Bunduchi and Smart 2010; Irani and Love 2000). Other indirect costs are often more challenging to determine for companies and even more difficult to quantify, which is why they are also called ‘hidden costs’ of digitalization.

This paper is dedicated to a discussion of these indirect costs and, in particular, to answer the research question of how companies trade the indirect costs of digitization against the expected efficiency gains of digitization? Assuming that digitization happens when new technology is implemented within intra-organizational processes, we focus on indirect costs associated with the implementation and use of a technology, i.e., organizational costs, human costs, and relational costs (Bunduchi and Smart 2010; Irani and Love 2000; Ryan and Harrison 2000).
Following Bunduchi and Smart (2010) we define organizational costs as costs that emerge from the effective implementation of new technologies that trigger changes in current organizational practices, structures, and work processes. Human costs are defined as all costs that can be attributed to individuals, such as the time spent by managers and employees to get a new system to work, training costs, or resources that are required in order to deal with staff turnover (Baldwin and Lin 2002; Irani and Love 2000; Ryan and Harrison 2000). Lastly, relational costs are associated with the external networks of organizations in which digitization happens, e.g., a network of business partners (Allen et al. 2000; Gerst and Bunduchi 2005).

To answer our research question, we developed a research model, which Figure 1 depicts. To explore how companies trade indirect costs of digitization against efficiency gains, we perform a Discrete Choice Experiment (DCE), which puts our participants in the position to decide between two digitization projects (digitization project A or B). Contingent on the decision we can determine the trade-off and relative importance of indirect costs about the expected efficiency gains of digitization projects.

**Contribution:** We chose an explorative approach to investigate, how companies trade different kinds of indirect costs of digitization against efficiency gains. We contribute to the literature by shedding light to indirect costs of digitization, which is a topic often neglected by researchers in the IS research discipline. To the best knowledge of the authors, we are one of the first to explore how companies trade these costs against efficiency gains using a discrete choice experiment. Discrete choice experiments are so far only seldom used in IS research, but a frequently applied method in other disciplines such as marketing and healthcare research. Thus, we contribute as well to the richness of methodologies in the field.

Eventually, this study has significant implications for practitioners. In particular, by understanding how efficiency gains are valued against indirect costs, companies can reduce the internal resistance of employees to digitization projects by avoiding or minimizing those costs that are perceived as unacceptable by employees.

![Figure 1. Research Model](image)

The remainder of this paper is structured as follows: In the next section, the methodology, the research design, and the sample of this study are explained. Results are presented and discussed subsequently. Afterwards, we point out the theoretical and managerial contributions of this study. Eventually, conclusions and outlook are provided.

**Methodology**

In the following section, we provide insights into the applied methodology, research design, and the sample. Our experiment is mainly inspired by healthcare research, typically investigating participants’ willingness-to-trade-efficacy (Bech et al. 2011; Cheraghi-Sohi et al. 2008; Hiligsmann et al. 2014). In this study, we focus on the participants’ willingness-to-trade-efficiency against indirect costs of digitization, while defining an increase of efficiency in terms of the expected reduction of process runtime (i.e., process optimization). Please note that we chose an explorative approach, since - to the best knowledge of the authors - we are one of the firsts to explore trade-offs between indirects costs using a DCE.
**Digitization: Willingness to Trade Efficiency for Indirect Costs**

**Discrete Choice Experiments**

Discrete Choice Experiment (DCE) is a methodology which allows for the evaluation of multi-attribute products, programs, or services (for the sake of simplicity, hereafter: products) and the estimation of the participant’s preferences concerning tested attributes (Hensher et al. 2005). DCE is a variant of a Choice-Based Conjoint (CBC) and, therefore, an adequate tool to quantitatively analyse the preferences of individuals. In particular, DCE sheds light on how individuals value attributes of a product (Mangham et al. 2008).

A DCE is conducted under the assumption that participants tend to maximize their utility (Danthurebandara et al. 2011). By proposing hypothetical product selections, researchers aim at revealing a participant’s preferences concerning certain features (attributes) of the selected products. Including variables, such as price or efficacy within the selection process, allows, first, for checking the importance of these variables and, second, for calculating willingness-to-pay (based on participants’ price preferences) or willingness-to-trade-efficiency (based on participants’ efficacy preferences) (Hiligsmann et al. 2014).

The core of DCE is formed by two theories: Lancaster’s characteristics theory (1991) and random utility theory (Manski 1977; McFadden 1974). The first theory explains that the selection of certain goods is influenced by its characteristics fitting the individual’s demands (Lancaster 1991); the second theory postulates that the selection decision is made based on the highest utility expectation by the decision maker (McFadden 1974). The resulting utility function, thus, incorporates observable determinants as well as an error term. Consequently, as long as the utility of an alternative product appears higher, the individual selects the alternative (Berendsen 2015). The error term largely depends on the complexity of the choice set. Consequently, it is crucial for DCE to propose simple selection sets (Danthurebandara et al. 2011).

**Research Design, Attributes, and Levels**

To conduct the DCE, participants of the experiment were asked to select among two projects. Each product represented a digitization project named “Project A” or “Project B” that were randomly assigned to the participants. Each project contained four features representing efficiency (reduction of the process running time) and different types of indirect costs associated with the project implementation. In particular, participants needed to value efficiency against three types of indirect costs, whereas each cost has several levels (Table 1). Based on the theories mentioned above, we assumed that participants select one out of two projects indicating their preference towards a specific combination of features (see for example Figure 2).

<table>
<thead>
<tr>
<th>Project A</th>
<th>Project B</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Indirect Costs</strong></td>
<td><strong>Indirect Costs</strong></td>
</tr>
<tr>
<td>Costs for adjustment of business processes (e.g., implementation of new software interfaces)</td>
<td>Excessive usage of company resources (e.g., IT-resources because of newly emerging processes)</td>
</tr>
<tr>
<td>Additional HR costs (e.g., additional costs for the search of suitable personnel)</td>
<td>Salary adjustments (e.g., because of increased qualities and capabilities of employees)</td>
</tr>
<tr>
<td>Tensions by business partners due to incompatibilities (e.g., new IT system produces data in a new format)</td>
<td>Emotional feelings by business partners (e.g., partners do not support the IT project)</td>
</tr>
<tr>
<td>Efficiency enhancement</td>
<td>Efficiency enhancement</td>
</tr>
<tr>
<td>10% (process optimization)</td>
<td>15% (process optimization)</td>
</tr>
</tbody>
</table>

**Figure 2. Example of a Selection Decision**

Indirect costs and levels were taken from the work of Bundichi and Smart (2010), who conduct a throughout literature review on the costs of process innovation. In their paper, Bundichi and Smart (2010) reviewed different types of costs appearing on all stages of process innovation, i.e., generation, acceptance, and implementation. For our work, we assumed that digitization could be seen as IT-enabled process management (Lederer et al. 2017) or process innovation (BarNir et al. 2003). In particular, we focus on the indirect costs arising when companies implement digitization projects. As a specific case of process innovation, we assume that digitization has the following indirect costs structure: organizational costs.
(Fitzgerald 1998; Irani et al. 1997), human costs (Ryan and Harrison 2000; Irani and Love 2000), and relational costs (Bunduchi and Smart 2010; Allen et al. 2000; Gerst and Bunduchi 2005). These three types of indirect costs became attributes in our DCE. While we are aware of the fact that there are also direct costs during the implementation phase, we decided to omit those costs given issues about comparability, e.g., a digitization project for a specific amount of money might be expensive for small but cheap for a big firm. Based on the analysis performed by the scholars, we developed a set of levels for each attribute. All levels were accompanied by an example and were attempted to be equally long (see Table 1).

As one of our intents is to estimate readiness to trade specific attributes against money, we thought of introducing the direct costs variable (e.g., “price of the project”). Nevertheless, this approach could produce two adverse effects: First, this could unintentionally shift the focus primarily to direct costs, since these are usually emphasized in organizations. Second, the costs of digitization can be perceived very differently by participants. For instance, for participants from a big firm, a price of 10,000 EUR for a digitization project would be negligible, while for a small firm the same price could be an impracticable amount of money.

In order to introduce a quantifiable and easily understandable reference value, we decided to introduce the variable “efficiency (process optimization).” This goes in line with the notion of efficacy, used in health care research (Hiligsmann et al. 2014). Efficiency might play a crucial role. Therefore, we needed to reduce the impact of this factor on the final decision. Hence, we reduced the intervals between the four levels of expected efficiency increases to 1% starting with 10% (see Table 1).

<table>
<thead>
<tr>
<th>Attribute¹</th>
<th>Level</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Organizational Costs</strong></td>
<td>Deceleration of business processes</td>
<td>Excessive usage of company resources</td>
<td>Costs for adjustments of business processes</td>
<td>Costs for adjustments of the company structure</td>
<td></td>
</tr>
<tr>
<td><strong>Human Costs</strong></td>
<td>Increased expenditure of employees’ time</td>
<td>Additional learning costs of employees</td>
<td>Salary adjustments</td>
<td>Additional HR costs</td>
<td></td>
</tr>
<tr>
<td><strong>Relational (lack of trust) costs</strong></td>
<td>Emerging ‘ill feelings’ by business partners</td>
<td>Tensions by business partners due to incompatibilities</td>
<td>Triggering internal discussions by business partners</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td><strong>Efficiency (process optimization)</strong></td>
<td>10%</td>
<td>11%</td>
<td>12%</td>
<td>13%</td>
<td></td>
</tr>
</tbody>
</table>

Table 1. Digitization Project Attributes and Their Levels

**Experimental Procedure and Sample Design**

To collect data, we developed an online questionnaire using Qualtrics®. The number of selection decisions was set to sixteen based on the master plan for the variables/levels as proposed by Kocur and colleagues (1981). Each decision contained two options (Project A or Project B) excluding “none of the proposed” option (Figure 2). All sixteen selection decisions were randomized, eliminating the ordering bias. The order of two decision options inside one selection decision was randomized as well.

¹ In Germany “salary adjustment” means salary increase since a decrease is legally prohibited.
Results

Model specification

We assume that a participant \((q = 1, \ldots, Q)\) faces a choice among \(J \geq 2\) alternatives in each of \(T\) situations. The participants \(q\) is assumed to estimate the full set of offered alternatives in choice situation \(t\) and to choose the alternative with the highest expected utility. If we denote each underlying parameter as \(k\), the utility may be depicted in general form as:

\[
U_{jtq} = \sum_{k=1}^{K} \beta_{qk} x_{jtkq} + \varepsilon_{jtq} = \beta_{q}^{'} X_{jtkq} + \varepsilon_{jtq}
\]

where \(X_{jtkq}\) the full vector of observed explanatory variables, including attributes of alternatives, socio-economic characteristics of the participant and descriptors of the decision context and choice task itself in choice situation \(t\). The components \(\beta_{q}\) and \(\varepsilon_{jtq}\) are not observed by the analyst and are treated as stochastic influences (Hensher 2004).

Assuming that \(\varepsilon_{jtq}\) is an extreme value type 1 random variable, the probability that the alternative \(j\) is chosen by the individual \(q\) is given by:

\[
\pi_j = \frac{\exp[X_j\beta]}{\sum_{k=1}^{J} \exp[X_k\beta]}
\]

where \(\pi_j\) represents the share of the population that chooses \(j\), i.e., it can be interpreted that an individual drawn at random from the population will chose alternative \(j\). For details on the estimation of unknown parameters, see Santos and Silva (2004). We tackle this issue in the section “Robustness check”.

Main results

To estimate our results, we ran a logit regression using Stata. The pseudo-R of our model was .102, the Cox & Snell R was .132, and the Nagelkerke R was .176. The low pseudo-R is explained, first, by the uncaptured in this model direct costs of digitization as well as of other indirect costs which appear on the different stages of digitization, i.e., generation stage (Gupta et al. 2008; Pisano 1997; Antonelli 1994) and acceptance stage (Forman 2005; Markus 2000; Klemperer 1995; Zhu et al. 2006).

After considering each selection between the projects as a separate decision, we analyzed 1,682 projects (i.e., 841 decisions) in total. The results of the logit regression (Table 2) allowed for estimating the importance of each characteristic for digitization decision. The highest coefficients indicate higher importance for the decision maker of the specified item (attribute level) as compared to the baseline. Negative numbers indicate lower importance than by the item used as the baseline. The probability level shows whether the item has a significant influence on the digitization project preference.

After the estimation of coefficients and probability levels, we performed a marginal effect analysis. This test allows predicting to what extent the proposed option (in the set with the baseline item) increases the probability of the option selection. Using marginal effects is a good practice allowing for better understanding and correct interpretation of the logit model coefficients (Hoetker 2007). The marginal effects can be found in Table 2.

Further, we calculated the willingness-to-trade-efficiency (WtTE) based on the notion by Hiligsmann and colleagues (2014). We used the beta coefficients from the logit regression, divided them through efficiency beta coefficient and multiplied by -1. Negative numbers indicate the “price” of the selected feature expressed in percent of efficiency increase, i.e., how many percents of efficiency increase should be proposed to convince the participant to accept this specific feature. Positive numbers indicate that participants are willing to offer efficiency to prefer the item. The WtTE indicators can also be found in the last column of Table 2.


**Digitization: Willingness to Trade Efficiency for Indirect Costs**

<table>
<thead>
<tr>
<th>DV: Decision</th>
<th>Logit Regression</th>
<th>Marginal Effects</th>
<th>WITE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>S.E.</td>
<td>95% LLCI</td>
</tr>
<tr>
<td>--------------</td>
<td>---</td>
<td>------</td>
<td>---------</td>
</tr>
<tr>
<td>Organizational costs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline:</td>
<td>“Deceleration of business processes”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excessive usage of company resources</td>
<td>1.05***</td>
<td>0.15</td>
<td>0.74</td>
</tr>
<tr>
<td>Costs for adjustments of business processes</td>
<td>0.83***</td>
<td>0.15</td>
<td>0.53</td>
</tr>
<tr>
<td>Costs for adjustments of the company structure</td>
<td>1.10***</td>
<td>0.15</td>
<td>0.80</td>
</tr>
<tr>
<td>Human costs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline:</td>
<td>“Increased expenditure of employees’ time”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Additional learning costs of employees</td>
<td>1.20***</td>
<td>0.15</td>
<td>0.90</td>
</tr>
<tr>
<td>Salary adjustments</td>
<td>0.11ns</td>
<td>0.15</td>
<td>-0.18</td>
</tr>
<tr>
<td>Additional HR costs</td>
<td>0.73***</td>
<td>0.15</td>
<td>0.44</td>
</tr>
<tr>
<td>Relational costs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline:</td>
<td>“Triggering internal discussions by business partners”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emerging ’ill feelings’ by business partners</td>
<td>-</td>
<td>0.07ns</td>
<td>0.14</td>
</tr>
<tr>
<td>Tensions by business partners due to incompatibilities</td>
<td>-</td>
<td>0.38**</td>
<td>0.12</td>
</tr>
<tr>
<td>Efficiency</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>constant</td>
<td>-</td>
<td>5.37**</td>
<td>0.56</td>
</tr>
</tbody>
</table>

Note: WITE - willingness to trade efficiency, LLCI - lower level confidence interval, ULCI - upper level confidence interval, *** - p < 0.001, ** - p < 0.005, ns - not significant.

**Table 2. Logit Regression Analysis and Willingness-to-trade-efficiency Calculations**

As a final explorative test, we wanted to check which of the attributes (independent from the selected level) predicts the decision best. Since all levels are a part of one factor, we calculated a general linear model looking only on variances explained. In this event, we used SPSS to calculate the adjusted R². In our first model, we included only items of the attribute “organizational costs,” then we ran a model with only “human costs,” only “relational costs,” and only “Efficiency.” In the end, we also looked at the variance explained by
all items. Human costs explained the highest amount of variance in our dependent variable (adjusted $R^2 = 0.053$), organisational costs followed (adjusted $R^2 = 0.039$), and efficiency was the third best explanation of variance in the dependent variable (adjusted $R^2 = 0.017$). Relational costs or costs concerned with the loss of trust by external partners were less relevant (adjusted $R^2 = 0.001$). All variables together produced a very good model fit (adjusted $R^2 = 0.129$).

**Robustness check**

An alternative explanation for the obtained effects could be the participant itself. To control for this effect, we, first, ran the logit model with clustering observations within each individual. The effects were almost identical to the reported in Table 2. To reassure the effect of each individual is not relevant, we ran the multilevel mixed-effects logistic regression controlling for the variable “id of the participant.” If the effects were present, the effects would have changed. All effects and significances remained the same. The Beta coefficient was $3.90 \times 10^{-13}$ (i.e. < .000001) with a S.E. of .05. We concluded that our model is robust against individual effects.

**Discussion**

In the following, we will shed light on the trade-offs made between the different types of indirect costs. We thereby contribute to the literature by providing insights on the decisions of firms for or against a digitization project. To the best knowledge of the authors, we are one of the firsts to investigate these trade-offs using a DCE. We have, therefore, chosen an explorative approach to gain novel insights on the relative importance of different types of indirect costs.

**Importance of Costs**

As our study shows, people perceive the indirect costs of digitization differently. Moreover, the different perception has a significant impact on the final decision concerning digitization project selection. For instance, if we look at the organizational costs, the most critical item are the costs of adjustment of organizational structure as compared to process speed deceleration. It is essential to notice that the question related to the slowdown of organizational processes during the implementation of a new digitization project. Put differently, when those who are involved in digitization see the (temporary) slowdown in processes they are likely to tend to any other project which does not have this feature. Even the change in organizational structure, which is usually concerned with changes in roles and responsibilities (Balogun 2007), is preferred over the temporary slow down. Excessive company resources usage (marginal effects 0.25) and costs for adjustments of business processes (marginal effects 0.20) are in the middle, i.e., changing processes is less acceptable than adjustments in the organizational structure but still more acceptable than processes slowing down and excessive usage of resources.

Human costs appear to be more important for participants than both organizational and relational costs. Human-costs-related items explain the most variance in the variable “decision.” In the category human costs, learning costs for employees were the preferable feature as compared to an increased need for employees to spend more time to deal with the digitization project. It seems that our participants saw their and their colleagues’ time expenditure as the worst option resulting in avoidance of projects having this feature. Interestingly, though being perceived as a positive sign, salary adjustment was the second reason to reject a project. We assume that this is related to an unconscious implication of the relationship “a higher salary assumes more work”. The fact that this feature has a very small insignificant effect for decisions supports our assumption.

The relational costs were the less impactful group of factors for the final decision concerning the project selection. Incompatibility with partners was the strongest reason to reject a project while triggering discussions were instead a reason to support a decision. Ill-feelings did not show a significant difference to the baseline.

Efficiency showed strongly significant but low marginal effects. The reader has to bear in mind that efficiency was an interval variable and the marginal effect has been calculated for 1 percent of efficiency increase (marginal effect 0.09). This means that in the event a company assumes a 10 percent efficiency increase, its tendency to support this option will grow by 90 percent! The fact that the variance explained
in the dependent variable is relatively low can be due to the fact of only four levels of the attribute with 1 percent difference (10%, 11%, 12%, 13%).

**Willingness to Trade Efficiency**

One of the most exciting parts of our explorative study, is the willingness to trade efficiency estimation. Knowing the relative value of efficiency allows us to calculate the value of all items used in this study. Of course, the willingness to trade efficiency shows the same trend as the calculation of the marginal effects but additionally allows for precise numerical expression. For instance, as we know from the previous section, a temporal deceleration of business processes is the less desired option about organizational costs. If one of the projects is concerned with a temporary process slowdown and the other with organizational restructuring, usually a decision maker would go for the latter option. However, if an alternative project proposes an additional efficiency growth of about 3 percent (>2.93), the decision can change.

The highest relative difference was found between the items “Increased expenditure of employees’ time” and “Additional learning costs of employees” (-3.21), indicating that one has to offer more than 3 percent efficiency difference to make decision makers accept higher workloads for their employees. Relational costs were of less importance for decision makers and even a 1 percent efficiency difference could change the decision to the opposite one.

**Implications for Theory**

There are two aspects which are of importance for IS scholars in the field of digitization and process innovation. First, we showed that indirect costs matter. From now on, scholars have to acknowledge the role of indirect organizational, human, and relational costs when developing theories for the information systems field. We opened a “black box” beyond the price of digitization and even provided scholars with concrete numbers on the value of different costs aspects.

Second, we showed that the indirect costs are very different and we even proposed an ordinal order for those. For instance, the relational costs are of less importance than internal human costs. And the human costs have different aspects which are of varying importance for decision makers. Our data may help explain why firms prefer specific digitization strategies (Matt et al. 2015) as well as why certain digitization projects fail (Veit et al. 2014).

**Implications for Practitioners**

Our study has a straightforward implication for practitioners. First, companies offering services of digitization can use our data to price their projects and position their projects correctly. There is no need to be better than a competitor in all regards: The correct representation of the project, as well as targeted control of specific indirect costs, can help win a battle against competitors.

Second, for firms which aim to implement digitization, our work proposes a clear framing mechanism. The digitization projects are usually manifold, incorporating all different costs aspects. Focusing on specific costs and avoiding discussions on most sensible issues might allow firms to overcome the internal resistance of employees and, thus, implement digitization faster. From now on, the firms have a tool which will help them estimate the degree of acceptance of their initiatives by their personnel. For instance, salary adjustment is not a reason to support a digitization project, at least not in Germany.

**Future Research and Limitations**

Our study has several limitations, though. First, generalizability is an issue since all data were collected in Germany. Local culture and legislation may have an impact. For instance, the item “salary adjustment” might increase uncertainty in other countries, while in Germany this item is perceived as a positive one.

Second, we did not control for the type of organizational hierarchy. As research shows, organizations with flat hierarchies learn faster than organizations with steep hierarchies (Mills and Friesen 1992). Thus, firms with a low degree of hierarchy can learn to change processes more effectively. Since some of our items refer
to adjustments of processes and structures, this might be of relevance and, thus, a good avenue for future studies.

Third, we assumed that efficiency growth would be one of the most impactful factors in our study. Therefore, we set a tiny scale ranging from 10 to 13 percent. Nevertheless, all other items were taken as categorical (yes/no). It was sufficient for this explorative study to know that participants differently value these factors. We recommend future researchers to introduce scales for each of the tested items. For instance, the two scales for process slow down time (e.g., 1 week, 3 weeks, 5 weeks) and scope (e.g., single process, several processes, all processes) would help understand what exactly makes this variable of highest importance among other organizational variables. The same applies to all other categorical variables.

Fourth, in this study, we deliberately focussed on indirect costs. We see great potential in studies comparing directly with indirect costs. Since the direct costs might be of higher value, we propose to introduce smaller scales similar to how we treated efficiency. A price of a digitization product of 10,000 EUR (vs. 11,000 vs. 12,000 vs. 14,000) could help understand the value of different aspects of indirect costs compared to direct costs. The researchers have to bear in mind, however, that such an experiment can be conducted only with firms of similar size and income. As we argued in the methodology section, 10,000 EUR for a big firm might be a too small sum to matter while the total budget of a startup might be half of the price. This also holds for indirect costs, which participants might calculate mentally, e.g., persons full-time equivalents. However, we purposefully decided not to quantify indirects costs given the above presented arguments.

Finally, we would like to stress that each experiment assumes a high degree of abstraction. And this means not only an oversimplification of costs (categorical, yes/no) but also the selection itself. Our experiment forced participants to select between two types of costs. In real life, unfortunately, several costs might arise simultaneously. In this regard both theorists and practitioners will need more studies, incorporating moderation effects and more complex selection options. We think that this could be reached by a series of experiments, focusing on a specific attribute from our study only. Here, our levels will become attributes and new ordinal levels can be introduced. Since digitization becomes one of the dominant parts of firms' strategies, knowledge about indirect costs and digitization perception will grow. We expect more studies shedding light on different facets of digitization to appear shortly. With our experiment, we made the first step in this direction.

Conclusions

In our work we, first, investigated the importance of different indirect costs on the digitization decision. Human costs appeared to be most important, followed by organizational costs, and relational costs. Second, we showed the relative importance of the different aspect of each group of costs. For instance, the (temporary) slowdown of processes is the main reason to reject a solution given the indirect organizational costs. Excessive employees’ workload is the main reason to reject a project from the perspective of human costs. Incompatibility on the side of partners caused by the firm’s digitization is the main relational reason to reject a project. Third, we calculated the willingness to trade efficiency. Put differently; we showed how many percent of efficiency should be offered to outweigh undesired indirect project costs.

REFERENCES

Digitization: Willingness to Trade Efficiency for Indirect Costs


