

# Organizational Inertia as Barrier to Firms' IT Adoption – Multidimensional Scale Development and Validation

*Research-in-Progress*

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## Abstract

Despite much research on organizational factors affecting firms' IT adoption and use, little attention has been paid to organizations' stickiness to current processes although there were better IT innovations or incentives to switch. Against this backdrop, this research-in-progress paper explicitly conceptualizes and operationalizes organizational level inertia based on a rigorous scale development approach to understand the inertial IS usage of organizations. Building on the extant management and information systems literature and preliminary research in practice, we first define a set of fundamental characteristics of inertia manifested in inert organizations. For each of the identified five sub-dimensions spanning cognitive, behavioral, socio-cognitive, economic and political aspects an appropriate measurement model is developed. Second, we pretest the validity and reliability of the proposed measurement instrument using sample data of 146 small and medium-sized enterprises that continue using paper-based instead of electronic invoices and discuss potential model refinements to encounter problematic indicators and sub-dimensions.

## Keywords

Organizational inertia, inertia scale, multidimensional scale, electronic invoicing, non-adoption.

## Introduction

Understanding factors that facilitate or inhibit the organizational adoption and diffusion of emerging information technology (IT)-based processes or products have long been a concern to researchers and practitioners alike (Jeyaraj et al. 2006). Given that the adoption of IT systems frequently implies significant organizational transformation, organizations often respond rigid and inert resulting in the failure to switch to new technology even if it was a more efficient alternative or there were further incentives to change (Bala and Venkatesh 2007, Polites and Karahanna 2012, Rumelt 1995). Thus, a potential organizational source hindering the adopting of emerging IT is organizational inertia.

The organization theory literature originally defines organizational inertia as “*the inability to enact internal change in the face of significant external change*” (Gilbert 2005, p. 741) and hence, “*the strong persistence of existing form and function*” (Rumelt 1995, p. 2). If the organizational status quo is inefficient, inertia may represent a major cause of organizational failure (Rumelt 1995). The higher the

degree of stickiness of the inert organization, the more effort is required to overcome organizational inertia and to enable internal change driven by external threats or opportunities, such as emerging IT innovations (Besson and Rowe 2012). Therefore, to assess the degree of organizations' inertia, its consequences, for example for the non-adoption of new IT, and potential counteractive management mechanisms, the question of the identification of various forms of inertia arises.

Prior studies in both, management science and the information systems (IS) field, have discussed various manifestations of inertia across diverse contexts and at different levels of analysis (e.g., Besson and Rowe 2012, Furneaux and Wade 2010, Rumelt 1995). However, as Besson and Rowe (2012, p. 115) summarize within their review, all of those “*multiple dimensions play a role, but their interrelationships are not theorized, nor is their cumulative role theorized*”. Furthermore, although most of the extant articles concentrate on organizational level inertia, we could not identify any other study in the literature that conceptualizes and measures organizational inertia as multidimensional construct to quantitatively evaluate both relationships among its correlates and with potential antecedents and consequences.

Therefore, in extension to the research of Polites and Karahanna (2012) at the individual unit, this study attempts to close that gap and contribute to IS research by explicitly conceptualizing and operationalizing organizational level inertia in order to understand the inertial IS usage of organizations. For this, we first define a set of fundamental characteristics of inertia manifested in inert organizations by conducting an extensive literature review and preliminary research in practice. For each of the identified five sub-dimensions spanning cognitive, behavioral, socio-cognitive, economic and political aspects an appropriate measurement model is developed. Second, we test the validity and reliability of the proposed measurement instrument using sample data of 146 small and medium-sized enterprises (SMEs) that continue using paper-based instead of electronic invoicing processes, a contextual setting in which organizational inertia has emerged to play a crucial role.

The remainder of this research-in-progress is structured as follows. We next review the foundations of the organizational inertia theory and put forward the need of a multidimensional scale for organizational inertia. Besides of this, we describe the research context of electronic invoicing adoption. Afterwards, we present the scale development procedure and the empirical evaluation in detail. Finally, we outline our future research endeavor.

## **Theoretical Background**

This section provides the relevant theoretical research concerning organizational inertia in the field of management, organization and information systems (IS) science. In particular, we concentrate our review on the multiple and varied aspects of inertia discussed so far in order to provide the foundation for the subsequent conceptual definition of the construct. We conclude the section by emphasizing the importance of context selection for the research design.

### ***Organizational Inertia as Barrier to Organizational Change***

Discussions about organizational inertia may be as old as the science of organizing and routinizing itself since inertia represents the price for stable and reproducible structures that guarantee the desired reliability and accountability of organizations (Hannan and Freeman 1984). That is, in the face of an external change demanding internal adaptation, such as a new regulation or technology, inert organizations pay with inflexibility, rigidity and thus, resistance (Gilbert 2005). This might be beneficial if the institutional status quo is more profitable than the emerging alternative. However, most of the time, stickiness and attachment to existing patterns rather lead to inefficiencies (Rumelt 1995), which make overcoming organizational inertia essential to readjust the organization with its environment (Besson and Rowe 2012).

Sources and characteristics of organizational inertia are multiple and diverse as extensive theoretical and empirical case studies in the literature about strategy, organizations and IS show. While some articles consider the cumulative impact of all inertia dimensions, for example, on the potential adoption of new strategic initiatives (e.g., Huff et al. 1992), the majority concentrates on specific aspects of inertia: Hannan and Freeman (1984) focus on inertia based on physical investments and social structures, Gilbert (2005) additionally differentiates between resource and routine rigidity as a firm's incapability to break

investment habits and organizational processes respectively, or Rumelt (1995) comprehensively classifies inertia according to five frictions that might occur in organizations and are mainly responsible for the prevention of change: distorted perception, dulled motivation, failed creative response, political deadlocks, and action disconnects.

The literature review regarding the phenomenon of IT-based organizational transformation of Besson and Rowe (2012) summarizes five distinct dimensions of organizational inertia identified to be present in both management and IS research: At all units of analysis socio-cognitive aspects should play a significant role; Influencing facets at business or industry level might be of socio-technical, economic, and political nature; Finally, at the group or individual level negative psychological inertia based on threat perceptions may become determining.

### ***Organizational Inertia as Barrier to Emerging IT Adoption***

Building on the aforementioned concept of organizational inertia, a few scholars in the research field of IT usage theorize and empirically validate the negative impact of inertia on organizations' adoption and use of emerging IT or emphasize the importance of overcoming organizational inertia for IS success.

While Cooper (1994) conceptualize the inhibiting influence of organizational inertia on IT implementation as inherent in a firm's culture, Furneaux and Wade (2010) propose in their theoretical model of IS discontinuance that inertial tendencies of organizations are based on system investment, system embeddedness and mimetic isomorphism.

In the context of IS assimilation, Seddon et al. (2010) as well as Bala and Venkatesh (2007) qualitatively confirm the necessity to encounter organizational inertia for a successful adoption of IS within and across organizations respectively. Besides of the studies of Zhu et al. (2004, 2006a,b) that implicitly analyze structural inertia by discussing the influence of firm size on IT adoption or its value, we could not identify any quantitative study explicitly measuring organizational inertia at the business unit of analysis.

However, from the user perspective, Polites and Karahanna (2012) comprehensively conceptualize and operationalize individual level inertia within the context of technology acceptance. In this setting, they define inertia as "*user attachment to, and persistence in, using an incumbent system (i.e., the status quo), even if there are better alternatives or incentives to change*" (p. 24). Both last-mentioned contingencies, though, are not necessary. They further regard inertia as a combination of subconscious behavior, conscious cognition and affection, each of which can bias a user toward rigidly maintaining the status quo.

Altogether, we conclude that the extant management and IS literature has discussed the concept of organizational inertia from multiple aspects and across various settings. However, there is a lack of a clear, unambiguous definition of organizational level inertia structuring all those facets in the IT adoption context. Moreover, studies that quantitatively measure the influence of organizational inertia as multidimensional construct on firms' (non-)adoption of IT are missing so far.

Taking a first step to close this gap, within this paper, we explicitly conceptualize and operationalize organizational inertia in the context of technology acceptance at the business level. Furthermore, we pretest and refine the proposed measurement model for reliability and validity with data of 146 SMEs non-adopting the electronic invoicing process. The selection of this research setting is explained in more detail now.

### ***The Case of Electronic Invoicing***

An essential part of our research was selecting a context in which an existing, not necessarily IT-enabled, process or product is prevailing and an IT-based alternative is available for use. However, neither should the incumbent process or system face discontinuance nor should the use of the new IT option be obligatory, for example, due to governmental law. Note that the existence or superiority of the alternate system is not a necessary condition, but provides the advantage to more easily recognize inertia. The same is true for the IT innovation requiring profound organizational adaptation and interorganizational coordination. The presence of all those issues may additionally enhance the chance to cover and identify all facets of organizational inertia, for example, also economic or political ones.

One of those outlined technology acceptance settings is represented by organizations' decision to switch from the paper-based to the electronic invoicing process. Definitions of electronic invoicing or simply 'e-invoicing' are varying in both theory and practice. In our study, we describe it as the processing and exchange of digital invoices within and across organizations including e-mail-based PDF-invoices with or without structured data compared to the completely paper-based invoicing process.

Whereas the preceding electronic data interchange (EDI) between organizations was highly partner-specific and mostly unaffordable for the majority of firms (Penttinen and Hyytiäinen 2008), recent technological developments like XML transmitted through open standards (Zhu et al. 2006a) enable enterprises of all sizes to adopt and use e-invoicing over the Internet. Moreover, since the invoice represents one of the fundamental documents in business processes, the implementation of e-invoicing touches on the core of the business, which implies huge organizational transformation and change of internal routines. In addition to technological and organizational factors, influences of the social and political environment should play a crucial role in firms' adoption decision as well (Kreuzer et al. 2013).

We further focus our data collection on companies of Germany, a European country in which e-invoicing is not mandated by regulation. Despite much governmental initiatives that emphasize the benefits of the e-invoicing process for businesses and society (European Commission 2010), the adoption rate, in particular among SMEs, is still very low (Edelmann and Sintonen 2006) suggesting inertial tendencies of organizations.

Therefore, we consider the adoption and use of e-invoicing among SMEs to be an appropriate research setting for the subsequent development and measurement of items reflecting organizational inertia.

## **Scale Development and Validation of Organizational Inertia**

Within this section we systematically develop and evaluate a scale for organizational inertia in six steps that follow established scale development procedures (Churchill 1979, MacKenzie et al. 2011): (1) conceptualization of the construct, (2) generation of a pool of items and assessment of content validity, (3) model specification, (4) data collection, (5) empirical scale evaluation and refinement, and (6) assessment of the second-order construct.

### ***Step 1: Conceptual Definition of the Construct Organizational Inertia***

To develop the conceptualization of the construct organizational inertia, we started with a comprehensive literature analysis across all major IS and management journals and collected previous definitions and uses of the term. In particular, we applied the key words "inertia" and, since closely related, "resistance" to search engines covering all outlets ranked within the MIS Journal rankings<sup>1</sup> and the proceedings of five major IS conferences (ICIS, ECIS, HICSS, AMCIS, PACIS). We further conducted forward- and backward search according to Webster and Watson (2002) within the identified articles to guarantee an extensive review of the relevant literature. In addition, we conducted preliminary empirical studies in practice to consider essential aspects within the domain of organizational inertia that result from an inductive research approach. Besides of two expert interviews with an e-invoicing service provider and an experienced IT consultant specialized in e-invoicing processes, we surveyed 410 accountants or financial managers employed in European SMEs that insist on paper-based invoices in reaction to their wholesaler's inquiry of sending invoices electronically in future. Within the scope of a short questionnaire, we included an open-ended question giving them room for describing further details with respect to their non-adopting decision and influencing factors (see Haag et al. 2013 for further details).

Based on these analyses, we consider Polites and Karahanna's (2012) definition of individual level inertia to be appropriate for the business unit as well. Thus, by applying their description to the formal specifications of our construct's nature, we define organizational level inertia in an IS context as organizations' attachment to, and persistence in, using an incumbent system (i.e., the status quo), irrespective of the existence of better alternatives or motivations to change. Again, we point out that the current process or product does not require the presence of IT when facing an IT-based substitute.

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<sup>1</sup> MIS journal rankings: <http://ais.affiniscape.com/displaycommon.cfm?an=1&subarticlenbr=432>.

We further conceptualize organizational inertia to be reflected in five correlated sub-dimensions spanning cognitive, behavioral, socio-cognitive, economic and political aspects. Cognitive- and behavioral-based inertia have been acknowledged at the organizational unit of analysis, but both show parallels at the individual level since they mainly manifest in the behavior of companies' decision-makers. Here, the cognitive sub-dimension describes that key managers consciously persist to use the prevailing system although they are aware that there might be better, more effective or more efficient alternatives to complete tasks (Polites and Karahanna 2012, Rumelt 1995). For example, managers are satisfied with current results and prefer this predictable satisfaction to uncertainties that come with IT innovations (Huff et al. 1992). Smooth performances of incumbent processes will in turn channel managerial perceptions so that the question to switch systems is unlikely to arise at all (Huff et al. 1992). This implies that the inert use of present IT simply echoes embedded routines and habits of organizational behavior (Polites and Karahanna 2012, Gilbert 2005, Rumelt 1995). Individual inertia of decision-makers is also reflected in collective organizational activities that determine and constitute strategy, vision, norms, and culture of the firm (Cooper 1994, Rumelt 1995, Tushman and O'Reilly 1996). Consequently, organizations with inertial tendencies stick to current systems as response to strong and complex firm values and history. Beyond the specific workforce, institutional and economic commitment may create sunk costs due to prior IT investments as well as transition expenses making inert organizations to non-adopt potentially better alternatives and use existing systems (Furieux and Wade 2010, Hannan and Freeman 1984, Zhu et al. 2006a). Finally, devotion and loyalty are directed and intensified by norms and expectations of customers or suppliers outside the organization, which cannot entirely be satisfied when adopting new technology (Furieux and Wade 2010, Huff et al. 1992). As a consequence, inert organizations rigidly continue with the status quo.

Building on this conceptualization and in line with prior articles, we expect that the degree of organizational inertia is stable at a particular point in time, but varying over time (Huff et al. 1991) and that it depends on the specific case of investigation (Polites and Karahanna 2012). Hence, in our study, we especially refer to organizational inertia as the attachment to, and persistence in, the paper-based invoicing process, irrespective of the existence of e-invoicing and potential motivations to change.

### **Step 2: Generation of Items and Assessment of Content Validity**

In a next step, we developed an initial set of indicator variables that fully cover the concept domain of organizational inertia. We again made use of the extant literature base and our pretests among professionals and either transferred existing items to our contextual setting or deduced new ones from the respective sub-dimension's theoretical definition outlined above. For each sub-scale we restricted the number of items to three because of concerns about questionnaire length. In the end, we asked four researchers well experienced in the field of technology acceptance and econometrics to assess each item's adequacy to represent the respective facet of the content domain of organizational inertia in order to ensure content valid indicators. Table 1 presents the initial structure of the organizational inertia scale.

Construct	Item		Mean	S.D.	$\alpha$
Our organization will continue using our existing invoicing process...					
Cognitive Inertia (Polites and Karahanna 2012)	CognIn1	...even though we know it is not the best way of doing things.	2.96	1.38	0.95
	CognIn2	...even though we know it is not the most effective way of doing things.	3.05	1.37	
	CognIn3	...even though we know it is not the most efficient way of doing things.	2.96	1.35	
Behavioral Inertia (Polites and Karahanna 2012)	BehavIn1	...simply because it is what we have always done.	2.41	1.25	0.92
	BehavIn2	...simply because it is part of our normal routine.	2.14	1.17	
	BehavIn3	...simply because we have done so regularly in the past.	2.23	1.30	

Socio-Cognitive Inertia	SocCogIn1	... because strategic changes are difficult to implement in our organization.	3.33	1.40	0.816
	SocCogIn2	Our organization has a culture of strong norms and values making a change in the existing invoicing process difficult.	3.48	1.34	
	SocCogIn3*	...because the requirements for switching to e-invoicing were unexpected and too fast.	3.47	1.32	
Economic Inertia	EconIn1	...because lots of effort has gone into its optimization.	2.99	1.28	0.823
	EconIn2	...because we have invested much time to learn it.	3.02	1.35	
	EconIn3	...because there is much financial effort involved when switching to e-invoicing.	2.88	1.25	
Political Inertia	PolitIn1	...because our existing network of customers/suppliers does not use e-invoicing.	2.55	1.34	0.829
	PolitIn2	...because our established customers/suppliers do not want to receive/send electronic invoices.	2.48	1.39	
	PolitIn3	...because our most important business partners insist on paper-based invoices.	2.62	1.43	

\* Dropped or reworded in future measurements

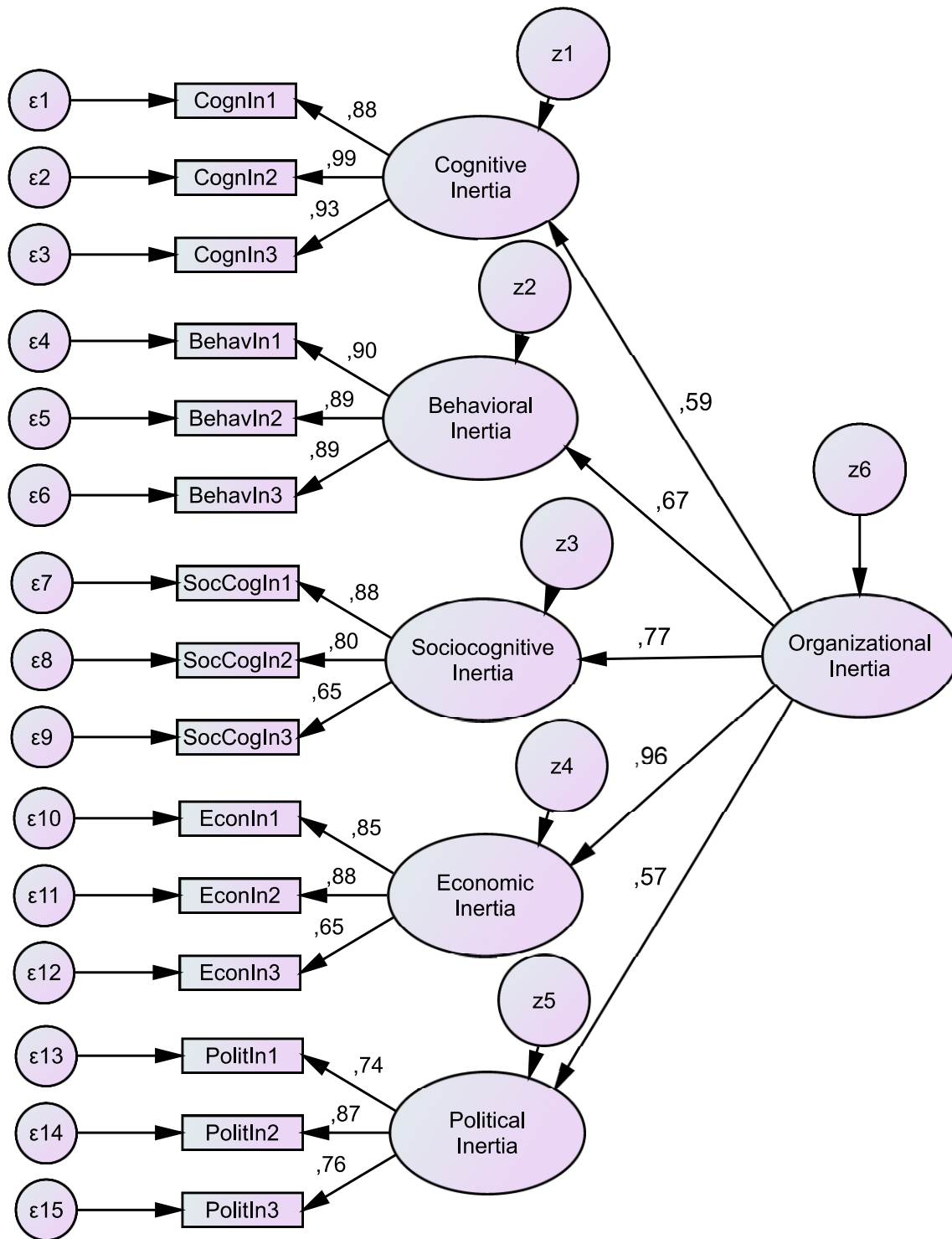
**Table 1. Measurement Items of Organizational Inertia with Means, Standard Deviations, and  $\alpha$ -Reliability**

### ***Step 3: Formal Specification of the Measurement Model***

We formally specified the multidimensional organizational inertia scale as reflective first-order, reflective second-order construct according to the guidelines of Polites et al. (2012) and our construct conceptualization in step 1. That is, all indicators are interchangeable reflections of their respective sub-dimension and the five dimensions are manifestations of the higher-order concept of organizational inertia. Hence, we expect that the relationships flow from the construct to its five dimensions as represented in Figure 1 and that an inertia-based change in one sub-dimension probably implies a change in other sub-dimensions as well. To make the model identified, we fixed one regression weight to 1.0 in each measurement scale (MacKenzie et al. 2011).

### ***Step 4: Data Collection for Scale Pretest***

To evaluate the psychometric properties and validity of the developed organizational inertia scale, we set up a questionnaire including socio-demographics, information on the current invoicing process and the organizational inertia items measured on a 5-point-Likert scale from 'strongly agree' to 'strongly disagree'. Due to the dependence of organizational inertia on situation and case (Polites and Karahanna 2012), we focused our survey on German SMEs that belong to the trade and were not using e-invoicing at that moment. We distributed our questionnaire by means of two channels to meet the minimum sample size recommendations of at best 10 respondents to 1 item (MacKenzie et al. 2011). First, we telephonically contacted 197 firms identified as non-adopters of e-invoicing in our preliminary study, in which they voluntarily declared that we might contact them again for our research. Here, we sent out 169 online questionnaires via e-mail and 6 printed versions via post to those who agreed to participate in our survey. Second, we invited key informants of 3203 craft enterprises randomly drawn from small business trade group databases freely available in the Internet and only included those firms with a currently paper-based invoicing process into the data sample. Among all participants of both channels, we raffled off vouchers as incentive. Altogether, 171 responses were received, 72 from the first (41.1% response rate; 3 e-invoicing user organizations) and 99 (3.1%; 19) from the second round of data collection, and 146 organizations (74.0%: <10 employees, 19.9%: 11-49 employees, 6.2%: 50-249 employees) were included in our final data sample.



**Figure 1. Organizational Inertia as Reflective First-Order, Reflective Second-Order Construct with Standardized Loadings**

### Step 5: Empirical Scale Evaluation and Refinement

We used covariance-based structural equation modeling with AMOS 21 to evaluate the model's fit, validity and reliability of the indicators at construct and item level in order to identify problematic measures.

#### Evaluating the Goodness of Fit of the Measurement Model

At first, we assessed the validity of the hypothesized measurement model. According to the guidelines of MacKenzie et al. (2011) our solution is proper since the estimation procedure converges and all of the variance estimates are positive. Moreover, all critical ratios of the hypothesized individual relationships (see Figure 1) are strongly significant at the  $p < .001$  level, just like the chi-square statistic of 145.134 ( $p=0.0$ ) showing that the sample data deviate from the model. Nevertheless, the chi-square/df ratio falls below the cutoff value of 2.5 and indicates model fit. That is why we also looked at established alternate fit indices and tested the overall model validity. As displayed in Table 2, the Goodness-of-Fit Index (GFI) representing the relative quantity of variance and covariance explained by the model and the root means square error of approximation (RMSEA) are slightly below respectively above the recommended threshold (MacKenzie et al. 2011), but still tolerable (Browne and Cudeck 1993). By contrast, the relative fitting measures, which are less sensitive to sample size and model complexity, like the comparative fit index (CFI) and the normal fit index (NFI) both indicating the proportional improvement in fit compared to the baseline model, as well as Bollen's incremental fit index (IFI) and the Tucker-Lewis coefficient (TLI; Bollen 1989), all meet the suggested criteria of at least 0.9 (Salisbury et al. 2002). Hence, we conclude an acceptable overall fit of our measurement model.

Model	$\chi^2$	df	$\chi^2/df$	GFI	RMSEA	CFI	NFI	IFI	TLI
Hypothesized Second-Order Model	145.134 ( $p=0.0$ )	85	1.707	0.887	0.070	0.962	0.914	0.962	0.953
First-Order Correlated Model	108.642 ( $p=0.018$ )	80	1.358	0.914	0.050	0.982	0.935	0.982	0.976

**Table 2. Fit Statistics for the Second- and First-Order Measurement Model**

#### Assessing Validity and Reliability at Construct and Indicator Level

To assess convergence validity, we calculated the average variance extracted (AVE) of all latent constructs, which should be above 0.05 (Fornell and Larcker 1981). At the first-order level, the AVEs ranged between 0.610 – 0.872 and the AVE of the organizational inertia construct is 0.530. Thus, on average, the majority of variance in the indicators/sub-dimensions is shared with the latent variable. Likewise, construct reliability was confirmed because values for Cronbach's alpha exceed 0.7 (see Table 1; Nunnally and Bernstein 1994).

At indicator level, validity is ensured by large and highly significant relationships between all latent constructs and their items (see Figure 1). However, indicator reliability investigations show that the squared multiple correlations of 'EconIn3' and 'SocCogIn3' are 0.42, and hence, below the 0.5-criterion (MacKenzie et al. 2011). While we will eliminate or replace 'SocCogIn3' from future measurements, we decided to keep the other item within the model to cover the essential aspect of transition costs in the economic-inertia domain as suggested by MacKenzie et al. 2011.

At the second-order, although each first-order sub-dimension is valid, reliability is only guaranteed for socio-cognitive and economic inertia. Likewise, strong and significant measurement error covariances and cross-loadings indicate multi-dimensionality issues especially between the sub-dimensions behavioral and political inertia and suggest some confounded items. However, before directly disregarding or merging important facets of the organizational inertia domain, we decided to firstly reestimate the



measurement model using a new sample of data of another contextual domain. As e-invoicing implies strong interorganizational collaboration and the pull-in of business partners, we consider a case-dependent, idiosyncratic bias of our measurement model.

### **Step 6: Assessment of the Second-Order Construct**

Finally, due to the rather weak model estimates at the second-order level, we compared our hypothesized second-order model, which allows us to also consider residual variances at the dimension level, with the first-order correlated model (without any other purifications). As row three in Table 2 shows, the basic model satisfies all suggested fit statistics' thresholds. In line with prior studies (Marsh and Hocevar 1985) we calculated the ratio of the chi-squares between both models. The resulting value of  $108.642/145.134=0.7486$  is smaller than 0.8, which is considered to be the minimum verification of the second-order model (Marsh and Hocevar 1985). Consequently, our assumption of a second-order construct representing organizational inertia is not confirmed and further tests with different and larger data samples are appropriate.

### **Future Steps: Scale Refinement and Validation**

Beyond our intention to gather new data from different contextual settings, especially concerning the IT artifact, in order to encounter present limitations of the psychometric scale properties, we would like to drive validity evaluations of the scale. In particular, we plan to assess discriminant and nomological validity by assessing differences from and relations to similar, e.g., 'organizational readiness' (Chwelos et al. 2001), or theoretically related constructs, in particular e.g., the 'intention to adopt e-invoicing' (Son and Benbasat 2007). Moreover, comparisons between groups known to vary in inertial tendencies, for instance, firms of different sizes (Bala and Venkatesh 2007) or organizational climates (Cooper 2000) might be worthy of more detailed examinations. Due to the expected time-dependence of organizational inertia, more waves of data gathering at multiple points in time are also recommended (MacKenzie et al. 2011).

All of these outstanding steps together with the initial scale development and validation procedure described in this paper should contribute to the identification of organizations' degree of inertia, its effect on the (non-)adoption of emerging IT, and in particular, potential managerial counteractions.

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