"Drilling down" on inter-organizational complexities potentially associated with AIS/IS sophistication—An addendum

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ABSTRACT

Extant research regarding technological change scenarios suggest that, to some extent, AIS/IS sophistication is associated with inter-organizational complexities such as small business owner/manager perceptions of forced (mandated) EDI implementations. However, extant research also suggests that the potential factors underpinning the association between perceptions of forced EDI implementations and AIS/IS sophistication are not obvious—thus motivating the need to "drill down" further into this complexity. Results suggest that perceptions of forced EDI implementations may proxy for two small business factors (that is, years using EDI and/or size—in terms of number of employees) and/or one large business factor (that is, the specific "trading partner" associated with the EDI implementation). Perhaps more importantly, as with other possible technological change scenarios, the "drill down" results of this analysis suggest that decomposing perceived inter-organizational complexities may provide insights requiring further investigation of potential intra-organizational complexities.

Key Words: AIS, EDI, IS, inter-organizational complexities

INTRODUCTION AND BACKGROUND

Change management issues may arise when new technological implementations occur—especially when inter-organizational complexities exist (Mahama and Chua, 2016). For example, larger trading partners can force (mandate) smaller trading partners to implement electronic data interchange (EDI) to maintain trading relationships (Udo and Pickett, 1994). However, given the negativity typically associated with force, it is surprising that Durler and Luehlfing (2015)—hereafter "DL"—report that higher (lower) perceptions of forced EDI implementations were associated with higher (lower) AIS/IS sophistication. This unexpected positive association motivates the need to "drill-down" further into this unanticipated finding—especially given that more force (that is, pressure) is often thought to be associated with more resistance to change, not less resistance to change (Hussain, Lei, Akram, Haider, Hussain and Ali, 2018). In this regard, this analysis decomposes and further investigates the unexpected positive association between perceptions of forced EDI implementations and AIS/IS sophistication reported in DL.

From a broad overall perspective, EDI is grounded in any mechanism which allows the electronic systems of two different companies to communicate directly with each other digitally. Importantly, EDI continues to be a technology worthy of further analysis given that EDI provides a standard format that enables various inter-organizational communications (Vincent and Tadesse, 2020). In this regard, the standard format provided by EDI is especially critical when EDI interacts directly with an Information System (IS) and/or an Accounting Information System (AIS).

While systems such as an IS or an AIS are both grounded in the interaction of people, processes and technologies (Matheny, 2016; Raschke and Schatzel, 2022), differences between an IS and an AIS exist. For example, while Raschke and Schatzel (2022) focus on the internal financial controls associated with an AIS, Matheny (2016) focuses on the innovation support role of an IS with respect to current and future core operations. Admittedly, the theoretical and practical objectives of an AIS and an IS overlap in many instances—especially in their need to seamlessly interface with a specific EDI technology. Thus, the remainder of this paper does not differentiate between an IS and an AIS.

MODEL DEVELOPMENT

Regression is the primary data analysis technique employed in this analysis and the variables are summarized as follows. First, the dependent variable, that is, AIS/IS sophistication, is a composite variable and is measured consistent with Telem (1989); thus, the following factors are used to derive the growth stage composite score (that is, the Telem stage): number of computerized systems, number of computers, communication network, level of specialized applications integration, integration of user tasks, and level of general applications integration. Second, the variable of interest is perception EDI forced which is a composite variable derived from the following factors (Durler, 1997): consideration of EDI costs, consultation with trading partner, and usage forced (or usage by choice). Third, there are three groups of control variables: composite control variables, metric control variables and indicator control variables. Each of the specific control variables employed in the model are addressed in the remainder of this section.

The three composite control variables are: computer attitude, EDI attitude and awareness of EDI benefits. First, the computer attitude composite score is derived from comfort factors ranging from fear of (and/or lack of understanding of) computers to perceptions that computers are responsible for many good things enjoyed (now and/or in the future). Second, the EDI attitude composite score is derived from factors associated with perceptions ranging from the expected increased chance of unauthorized orders to the expected increased ease of inventory management. Third, the awareness of EDI benefits composite score is derived from factors such as order efficiency (for example, paper reduction), customer satisfaction/response and error reductions. In summary, these three composite control variables are employed to control for small business owner/manager general perceptions regarding computers, in general, and EDI, specifically.

Additionally, there are two metric control variables: years using EDI and size. Among other possibilities, years using EDI and size may control for small business EDI experiential familiarity (perhaps in ways unlike the above noted composite control variables). Finally, manufacturer affiliation (that is, the specific manufacturer involved with the EDI implementation) is an indicator control variable; in this regard, there were over nine manufacturers included in the analysis. Among other possibilities, manufacturer affiliation may control for specific "trading partner" attributes (potentially impacting inter-organizational EDI activities) and/or larger business attributes in general. Critical aspects of the data collection and research methodology are documented in the following section.

DATA COLLECTION AND RESEARCH METHODOLOGY

Certain data associated with the results of the ANOVA procedures reported in DL are also employed in the regression procedures documented herein; stated specifically, data related to AIS/IS sophistication (that is, the Telem stage), perception EDI forced as well as awareness of EDI benefits are also employed in the regression procedures documented herein. Importantly, additional data (not previously associated with the results of the ANOVA procedures reported in DL) are employed only in the regression procedures in this analysis; stated specifically, data related to computer attitude, EDI attitude, years using EDI, size and manufacturer affiliation are employed only in the regression procedures documented herein.

DL also reported that data related to 189 useable surveys were analyzed using the ANOVA procedure; however, seven of those surveys were missing independent variable data relevant to the regression procedures employed in this analysis. Thus, data associated with those seven surveys were not included in the regression procedures employed in this analysis; stated specifically, only data related to 182 useable surveys were analyzed using the regression procedures documented herein. Given that 182 of the 882 surveys mailed were useable with respect to the data requirements of this analysis, the survey response rate associated with the regression procedure results was 20.6 percent (versus the 21.4 percent response rate associated with the data giving rise to the ANOVA results reported in DL).

With the respect to the research methodology, the components of the regression model displayed in the Appendix (that is, Table 1) are tested using a three phase regression procedure in order to capture the explanatory contribution of the various independent variables (with respect to the Telem stage dependent variable). First, the regression procedure is performed using only the four independent composite variables (of which one is the variable of interest—perception EDI forced) as well as the Telem stage dependent variable (which is also a composite variable).

Second, the two independent metric variables are added to the regression procedure (while none of the previously noted composite variables are removed from the regression procedure). Finally, a series of independent indicator variables are added to the regression procedure (while none of the previously noted composite variables and/or indicator variables are removed from the regression procedure). The results of the three phase regression procedure are documented in the following section.

RESULTS

There are three panels in Table 1 (that is, Panel A, Panel B and Panel C) which correspond to each of the three sequential regression procedures (addressed in the previous section). Specifically, Panel A documents the (phase one) results with respect to the four independent composite variables (which include three control variables as well as the variable of interest) and the composite dependent variable. In turn, Panel B documents the (phase two) results when the two independent metric control variables were added to the regression procedure (while none of the composite variables were removed from the regression procedure). Finally, Panel C documents the (phase three) results when a series of independent indicator control variables were added to the regression procedure (while none of the composite variables and/or indicator variables were removed from the regression procedure). The results associated with each of the three phases in the regression procedure are summarized in the remainder of this section.

To begin, the results of the first phase of the regression procedure are shown in Table 1, Panel A and indicate that perception EDI forced has a statistically significant positive association with the Telem stage dependent variable. Additionally, given that the intercept constant also has a statistically significant association with the Telem stage, this suggests that one or more unidentified/unspecified factors also have a statistically significant association with the Telem stage. Thereafter, the results of the second phase of the regression procedure are provided in Table 1, Panel B and indicate that the addition of the independent metric variables in phase two approximately doubles the overall explanatory contribution of the previously noted results of phase one in terms of the variation of the Telem stage. Importantly, the overall explanatory improvement is statistically significant between the results of phase one and phase two—with both of the independent metric variables (added in phase two) becoming statistically significant on an individual basis. However, perception EDI forced (that is, the variable of interest) became statistically insignificant when years using EDI and size were added to the regression procedure in phase two; this suggests that perception EDI forced is potentially related to years using EDI and/or size. Additionally, the intercept constant also became statistically insignificant with respect to its association with the Telem stage when years using EDI and size were added to the regression procedure in phase two.

Lastly, the results of the third phase of the regression procedure are displayed in Table 1, Panel C and indicate that only one of the independent indicator variables (added in phase three) has a statistically significant association with the Telem stage dependent variable; stated specifically, of all of the manufacturers added to the analysis in phase three, only Manufacturer F became statistically significant with respect to explaining the variation of the Telem stage. Importantly, years using EDI and size remained statistically significant with respect to the regression procedure in phase three. However, since there is no significant overall explanatory improvement between the results of phase two and phase three of the regression procedures, this

suggests that manufacturer affiliation is potentially related to years using EDI and/or size. Interestingly, the results of a supplemental series of sensitivity tests suggest that the results of the regression procedures employed in phase three will vary with respect to manufacturer affiliation if the sample data is stratified by number of years using EDI. Also, given the results of a complementarily factor regression analysis, manufacturer affiliation may proxy for a mixture of the following factors: a work reduction factor, a comfort factor and, to a somewhat lesser extent, a perception EDI is forced factor. Given these additional insights, further "drilling down" on factors potentially associated with manufacturer affiliation may be fruitful with respect to investigating both intra-organizational as well as inter-organizational complexities potentially associated with AIS/IS sophistication.

POTENTIAL IMPLICATIONS

The results of the initial regression procedure in this analysis indicate that perceptions of forced EDI implementations have a statistically significant positive association with AIS/IS sophistication. However, the results of the subsequent regression procedures in this analysis suggest that perceptions of forced EDI implementations may proxy for years using EDI by a dealer and/or the size of the dealer (in terms of number of employees) and/or the specific manufacture affiliated with the EDI implementation. Overall, the "drill-down" results of this analysis suggest that potential intra-organizational as well as inter-organizational complexities require further investigation—especially given their potential generalizability to other current and future technological change scenarios, in general, as well as to specific industries such as consumer goods manufacturing (Engel and Bose, 2014) or health care (Fiaidhi, Mohammed and Mohammed, 2018). Finally, insights from the results of this analysis may benefit blockchain adoptions (Church, Smith and Kinory, 2021) as well as automation adoption decisions with respect to driverless vehicles, employment software and robotic caregivers (Belhadjali, Abbasi and Whaley, forthcoming).

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APPENDIX: TABLE

Table 1: Three Phase Regression Procedure Results

Panel A: Phase One — Composite Variables Only

Multiple R	0.49939
R Square	0.24939
Adjusted R Square	0.23243
Standard Error	0.62505

Analysis of Variance

	DF	Sum of Squares	Mean Square	F	Signif F
Regression	4	22.97546	5.74387	14.70209	0.0000
Residual	177	69.15099	0.39068		

Variables in the Equation

Variable	B	SE B	Beta	Tolerance	VIF	T	Sig T	
EDI Forced	0.246999	0.064732	0.271456	0.837893	1.193	3.816	0.0002	*
Comp Att	0.192588	0.105874	0.142910	0.687062	1.455	1.819	0.0706	
EDI Att	0.214116	0.126180	0.182303	0.367427	2.722	1.697	0.0915	
Aware EDI	0.208715	0.119360	0.177205	0.412927	2.422	1.749	0.0821	
(Constant)	-1.444657	0.427648				-3.378	0.0009	*

Panel B: Phase Two — Composite and Metric Variables Only

Multiple R	0.68913		
R Square	0.47490	R Square Change	0.22551
Adjusted R Square	0.45689	F Change	37.57717
Standard Error	0.52577	Signif F Change	0.0000

Analysis of Variance

	DF	Sum of Squares	Mean Square	F	Signif F
Regression	6	43.75062	7.29177	26.37805	0.0000
Residual	175	48.37583	0.27643		

Variables in the Equation

Variable	B	SE B	Beta	Tolerance	VIF	T	Sig T	
EDI Forced	0.079843	0.058479	0.087748	0.726431	1.377	1.365	0.1739	
Comp Att	0.115981	0.089868	0.086064	0.674722	1.482	1.291	0.1986	
EDI Att	0.166145	0.106946	0.141460	0.361896	2.763	1.554	0.1221	
Aware EDI	0.003537	0.103187	0.003003	0.390942	2.558	0.034	0.9727	
Years EDI	0.049448	0.008818	0.365502	0.706286	1.416	5.608	0.0000	*
Size	0.014136	0.002740	0.310376	0.829328	1.206	5.160	0.0000	*
(Constant)	-0.253142	0.386269				-0.655	0.5131	

* Association with the Telem stage dependent variable is significant at 5%.

(Table Continued)

Table 1: Three Phase Regression Procedure Results (continued)

Panel C: Phase Three — Composite, Metric and Indicator Variables

Multiple R	0.70971	R Square Change	0.02879
R Square	0.50369	F Change	0.95728
Adjusted R Square	0.45556	Signif F Change	0.4828
Standard Error	0.52641		

Analysis of Variance

	DF	Sum of Squares	Mean Square	F	Signif F
Regression	16	46.40333	2.90021	10.46592	0.0000
Residual	165	45.72312	0.27711		

Variables in the Equation

Variable	B	SE B	Beta	Tolerance	VIF	T	Sig T	
EDI Forced	0.091613	0.062623	0.100684	0.635017	1.575	1.463	0.1454	
Comp Att	0.134788	0.091208	0.100020	0.656644	1.523	1.478	0.1414	
EDI Att	0.116564	0.110591	0.099245	0.339265	2.948	1.054	0.2934	
Aware EDI	0.024230	0.105061	0.020572	0.378038	2.645	0.231	0.8179	
Years EDI	0.047208	0.009634	0.348940	0.593229	1.686	4.900	0.0000	*
Size	0.011473	0.002934	0.251902	0.724821	1.380	3.910	0.0001	*
Manfactr A	-0.035677	0.115374	-0.020765	0.667051	1.499	-0.309	0.7575	
Manfactr B	0.073417	0.114490	0.041941	0.703145	1.422	0.641	0.5222	
Manfactr C	0.149440	0.277190	0.030795	0.921912	1.085	0.539	0.5905	
Manfactr D	0.081592	0.149264	0.039477	0.576735	1.734	0.547	0.5854	
Manfactr E	-0.106661	0.166985	-0.039948	0.769012	1.300	-0.639	0.5239	
Manfactr F	0.272155	0.116131	0.183289	0.491731	2.034	2.344	0.0203	*
Manfactr G	0.012384	0.126128	0.005889	0.836045	1.196	0.098	0.9219	
Manfactr H	0.154939	0.148661	0.068109	0.704348	1.420	1.042	0.2988	
Manfactr I	0.078924	0.140526	0.041701	0.545595	1.833	0.562	0.5751	
All Others	0.033615	0.128237	0.019565	0.539947	1.852	0.262	0.7935	
(Constant)	-0.343225	0.428536				-0.801	0.4243	

* Association with the Telem stage dependent variable is significant at 5%.