MIS Quarterly

SUPPORT STRUCTURES AND THEIR IMPACTS ON EMPLOYEE OUTCOMES: A LONGITUDINAL FIELD STUDY OF AN ENTERPRISE SYSTEM IMPLEMENTATION

Tracy Ann Sykes

Department of Information Systems, Sam M. Walton College of Business, University of Arkansas, Fayetteville, AR 72701 U.S.A. {tracy@tracyannsykes.com}

Appendix A

Review of Research Related to Support Structures in *MIS Quarterly* and *Information Systems Research*

Journal	Year	Authors	Type of system	Type of support	Definition/description of type of support (from article)	Corresponding support structure	Dependent Variable(s)
MISQ	2011	Furneaux and Wade	Large-scale IS	System support	System support availability is defined as the availability of the vendor and other support capabilities considered important to the continued use of an information system.	Change management support	Discontinuance/ Replacement intentions
MISQ	2010	Puhakainen and Siponen	Email (implementation of IS security policy)	Training	The training program must provide necessary information to the educators, so the educators know the theory of how the training program helps people learn. In the case of IS security training, the underlying theories should not only explain how people learn, but also what learning principles are expected to change user compliance with IS security policies. As a second requirement, the underlying theory should provide guidelines for how successful training is to be delivered in practice.	Training	Employees' compliance with IS security policies

Journal	Year	Authors	Type of system	Type of support	Definition/description of type of support (from article)	Corresponding support structure	Dependent Variable(s)
MISQ	2010	Beaudry and Pinsonneault	Suite of applications developed in-house for a bank	Social support	Sympathy, understanding, encouragement, advice and moral support from family, friends and colleagues.	Peer advice ties	IT use
				Instrumental support	Looking for help from colleagues or from online or manual support to enhance ones usage of a given IT.	Peer advice ties, online support	
				Negative social support (mentioned in footnote)	Social undermining/hindrance network.	N/A to the present paper	
MISQ	2010	Strong and Volkoff	ES (SAP)	Power users	Employees seconded from operations to the ES team to help with testing, training and subse-quent support, but ultimately expected to return to their jobs.	Peer advice ties	Identified six domains of misfit between the organization and ES
MISQ	2010	Seddon et al.	ES	Overcoming organizational inertia	The extent to which the employees of the organization are motivated to learn, use, and accept the new system. This includes training, and change management effort and support.	Training, change management support	Organizational benefits from ES use
				Improved access to information	Any step taken to increase provision of timely, accurate, relevant information to key organizational decision makers.	Online support	
MISQ	2009	Kim and Kankanhalli	New ES developed by company	Organizational support	The perceived facilitation pro-vided by the organization to make users' adaptation to the new IS-related change easier. Organiza-tional support includes various mechanisms, such as training and providing resources relevant for learning.	Training, online support, help desk support	User resistance, perceived value [of changing to new system], switching costs, switching benefits
MISQ	2009	Sykes et al.	ES	IT help desks	Formal support mechanisms, such as IT help desks, are often overwhelmed and, in most cases, IT support staff lack business domain expertise that is crucial in fully resolving users' problems. Prior research has shown that employees in organizations are often dissatisfied with formal channels of support such as help desks. IT help desks are par-ticularly hindered by a lack of domain expertise needed for effective use of business applications.	Help desk support	System use

Journal	Year	Authors	Type of system	Type of support	Definition/description of type of support (from article)	Corresponding support structure	Dependent Variable(s)
				Training	In general, the facilitating conditions construct in IS research has focused on formal training, guidance, infrastructure, and help desk support that is available to employees, and these facilitating conditions can foster or hinder system use.	Training	
				Peer support	An employee may introduce a colleague to a useful feature or a shortcut in an application or walk them through a complex processing step that the colleague may not be able to learn on his or her own.	Peer advice ties	
				Power users	The organization used a power user concept for training users. They identified users in each of the business units that were influential in their units and that were interested in the system, and trained them extensively in how to do transaction processing as well as in how processes were changing and being integrated.	Training, peer advice ties	
MISQ	2008	Au et al.	IS used by representatives from airline and hotel industries	End-user support	*IS performance* is defined as the perceived outcome from IS use. The commonly used IS attributes in many previous studies can be classified into three groups: system quality, information quality and support services quality. It has been suggested that EUS is a product of information satisfaction, system satisfaction and support satisfaction.	Help desk support	End user IS Satisfaction
MISQ	2007	Sharma and Yetton	Meta-analysis	Training	Experts explain the application to novice users in classroom settings, demonstrate how to use its technical features, observe the learners practicing and provide feedback.	Training	IS implementation success
MISQ	2007	Liang et al.	ERP system	Top management support (beliefs and participation)	Top management beliefs refers to the subjective psychological state regarding the potential of ERP. Top management participation refers to the behaviors and actions performed to facilitate ERP assimilation.	N/A to the present paper	ERP assimilation

Journal	Year	Authors	Type of system	Type of support	Definition/description of type of support (from article)	Corresponding support structure	Dependent Variable(s)
ISR	2011	Venkatesh et al.	E-healthcare system	Training	A key barrier to success of such systems is the availability of adequate training and support. Typically e-healthcare systems are inflicted on healthcare professionals with little or no training or process change support, thus resulting in adoption taking much longer than expected and benefits not being realized for a long time. By reflecting the connectedness of an individual, in this context, network centrality is the extent to which an individual can obtain information about system features, procedural details, and activities in the new process; knowledge, such as tips and tricks, shortcuts, and details related to the integration of the process and software; and other tangible resources, such as training resources, manuals and tutorials, that can greatly help with using the system.	Training	Quality of care, patient satisfaction
				Process change support	Change management support is also a key factor that fosters successful system implementation. Process change support is mentioned in text and change management support is measured and controlled, but not described in detail.	Change management support	
				Online support	Other tangible resources, such as training resources, manuals and tutorials, can greatly help with using the system.	Online support	
ISR	2011	Ravishankar et al.	KMS	Support of senior executives for IS	KMS was promoted by the CEO and was supported by senior executives in all units.	N/A to the present paper	Implementation success
				Full-time KM team comprising software developers and marketing personnel	The KM team's mandate was to try and make sure that the client facing sales and business development personnel in the corporate unit had the requisite up-to-date information when meeting potential clients. Therefore, the focus of the KMS was on building repositories that contained case studies of past projects, presentations to clients, organizational best practices, etc.	Online support	

Journal	Year	Authors	Type of system	Type of support	Definition/description of type of support (from article)	Corresponding support structure	Dependent Variable(s)
				Document support (Repository)	Contains knowledge resources classified according to category (e.g., best practices, domain, technology). Also contains project profiles, ITS patents and an online library.	Online support	
				Phone support (K-Phone)	K-Phone is an off-the-shelf SMS (mobile messaging) technology to facilitate requesting of key documents by members while on the move. This document-request-and-delivery service is automated with inexpensive technology and small programming effort.	Help desk support	
				Online support (K-Transmit)	Members at all levels in the organization spend significant time reading and responding to e-mails. The KM team latched on to this practice and modeled the "K-Transmit" service around it. Through "K-Transmit," queries posted by members are channeled to the mailboxes of the right audience, and their e-mail replies are tracked and logged in the repository. Thus, with "K-Transmit," the knowledge otherwise floating around gets logged at one place.	Online support	
				Help desk	A dedicated team attends to the queries and requests of the members, thus trying to make this initiative more reachable and useful.	Help desk support	
ISR	2009	Vaast and Walsham	Environmental health exchange network (EHEN)	Training	Access to and use of the EHEN during the formal EH training phase contributed to making the practices related to the EHEN "second nature" for new EH members. The EHEN became available to all students of the National School of Public Health one year after its implementation. They relied on the use of the EHEN during their formal training and this contributed to the subsequent integration of the use of the system in new graduates' regular work practices.	Training	Sharing resources through networks of practice, engaging with peers based on shared practices
				Document support (online repository)	Meetings took place among peers. After these meetings, minutes and other documents were posted on the EHEN and electronic discussions were triggered.	Online support	

Journal	Year	Authors	Type of system	Type of support	Definition/description of type of support (from article)	Corresponding support structure	Dependent Variable(s)
ISR	2008	Ragunathan et al.	ICT	Technostress inhibitors (includes literacy facilitation, technical support provision and involvement facilitation)	Represents organizational mechanisms, such as end user training, support and participation, which are relevant in the context of ICT implementation and use.	Training, help desk support	Job satisfaction, organizational commitment, continuance commitment
				Literacy facilitation (documentation, training and knowledge sharing among team members)	Describes mechanisms that encourage and foster the sharing of ICT-related knowledge within the organization.	Online support	
				Technical support provision (help desk)	Describes activities related to end-user support that reduce the effects of technostress by solving users' ICT problems.	Help desk support	
				Involvement facilitation (encouraging users to explore technology features)	Helps alleviate technostress by keeping users informed about the rationale for introducing new ICTs by letting them know about the effects of such introductions and by encouraging them to use and experiment with new ICTs.	Training	
ISR	2008	Devaraj et al.	eProject (collaboration system)	Training	All subjects received the same hands-on training covering all anticipated uses of eProject.	Training	System use
				Technical support	Technical support was provided foreach core course to automatically maintain the related eProjects so that all assignments appeared as tasks assigned to students and all documents appeared in the projects for electronic distribution.	Help desk support	
ISR	2007	Bala and Venkatesh	RosettaNet PIPs	Training	These are mentioned as important factors for assimilation. For example, extensive business process training (simulation- and game-based) and support programs were used (by Manufacturer K) to teach employees new processes and the fit of different PIPs to help combat employee resistance.	Training	Assimilation of interorganizational business processes standards (IBPS)

Journal	Year	Authors	Type of system	Type of support	Definition/description of type of support (from article)	Corresponding support structure	Dependent Variable(s)
				On-site support	A firm was able to overcome these inertial forces with support from its top management and dominant trading partners who provided not only technical support, but also training and on-site support.	Training, help desk support	
				Top management support	Overcoming resource rigidity in the context of IBPS assimilation requires top management support, technological capability and readiness, and the ability to mobilize resources, i.e., financial and/or human capital.	N/A to the present paper.	
				Employee support	Employee support is mentioned in the paper as an important factor for assimilation.	Peer advice ties	

References

Au, N., Ngai, E. W. T., and Cheng, T. C. E. 2008. "Extending the Understanding of End User Information Systems Satisfaction Formation: An Equitable Needs Fulfillment Model Approach," *MIS Quarterly* (32:1), pp. 43-66.

Bala, H., and Venkatesh, V. 2007. "Assimilation of Interorganizational Business Process Standards," *Information Systems Research* (18:3), pp. 340-362.

Beaudry, A., and Pinsonneault, A. 2010. "The Other Side of Acceptance: Studying the Direct and Indirect Effects of Emotions on Information Technology Use," *MIS Quarterly* (34:4), pp. 689-710.

Devaraj, S., Easley, R. E., and Crant, J. M. 2008. "How Does Personality Matter? Relating the Five-Factor Model to Technology Acceptance and Use," *Information Systems Research* (19:1), pp. 93-105.

Furneaux, B., and Wade, M. 2011. "An Exploration of Organizational Level Information System Discontinuance Intentions," *MIS Quarterly* (35:3), pp. 537-598.

Kim, H. W., and Kankanhalli, A. 2009. "Investigating User Resistance to Information Systems Implementation: A Status Quo Bias Perspective," *MIS Quarterly* (33:3), pp. 567-582.

Liang, H. G., Saraf, N., Hu, Q., and Xue, Y. J. 2007. "Assimilation of Enterprise Systems: The Effect of Institutional Pressures and the Mediating Role of Top Management," *MIS Quarterly* (31:1), pp. 59-87.

Puhakainen, P., and Siponen, M. 2010. "Improving Employees' Compliance through Information Systems Security Training: An Action Research Study," *MIS Quarterly* (34:4), pp. 757-778.

Ragunathan, T. S., Tarafdar, M., Ragunathan, B. S., and Tu, Q. 2008. "The Consequences of Technostress for End Users in Organizations: Conceptual Development and Empirical Validation," *Information Systems Research* (19:4), pp. 417-433.

Ravishankar, M. N., Pan, S. L., and Leidner, D. E. 2011. "Examining the Strategic Alignment and Implementation Success of a KMS: A Subculture-Based Multilevel Analysis," *Information Systems Research* (22:1), pp. 39-59.

Seddon, P. B., Calvert, C., and Yang, S. 2010. "A Multi-Project Model of Key Factors Affecting Organizational Benefits from Enterprise Systems," *MIS Quarterly* (34:2), pp. 305-328.

Sharma, R., and Yetton, P. 2007. "The Contingent Effects of Training, Technical Complexity, and Task Interdependence on Successful Information Systems Implementation," *MIS Quarterly* (31:2), pp. 219-238.

Strong, D. M., and Volkoff, O. 2010. "Understanding Organization–Enterprise System Fit: A Path to Theorizing the Information Technology Artifact," *MIS Quarterly* (34:4), pp, 731-756.

Sykes, T. A., Venkatesh, V., and Gosain, S. 2009. "Model of Acceptance with Peer Support: A Social Network Perspective to Understand Employees' System Use," *MIS Quarterly* (33:2), pp. 371-393.

Vaast, E., and Walsham, G. 2009. "Trans-Situated Learning: Supporting a Network of Practice with an Information Infrastructure," *Information Systems Research* (20:4), pp. 547-564.

Venkatesh, V., Zhang, X., and Sykes, T. A. 2011. "Doctors Do Too Little Technology: A Longitudinal Field Study of an Electronic Healthcare System Implementation," *Information Systems Research* (22:3), pp. 523-546.

Appendix B

Items Used to Measure Key Constructs ▮

Unless otherwise noted, all scales are seven-point Likert scales with anchors strongly disagree, moderately disagree, slightly disagree, undecided, slightly agree, moderately agree, and strongly agree.

Training satisfaction
1. Overall, I was satisfied with the training.
2. The training provided comprehensive coverage of the system and how I would use it in my job.
3. The training materials were comprehensive.

Change management satisfaction
1. The change management support was available whenever I needed it.
2. The change management consultants understood my problems well.
3. The change management consultants resolved the problems I faced.

Online support satisfaction
1. The online support was available whenever I needed it.
2. The online support consultants understood my problems well.
3. The online support consultants resolved the problems I faced.

Help desk satisfaction
1. The help desk support was available whenever I needed it.
2. The help desk consultants understood my problems well.
3. The help desk consultants resolved the problems I faced.

Advice networks
Indicate which of the following individuals are important sources of work-related advice or whom you approach if you have a work-related problem:
<Name 1>
…
<Name n>
Note: Scale ranging from 1 to 7, where 1 = never; 2 = rarely (less than once a month); 3 = a few times a month; 4 = weekly; 5 = daily; 6 = a few times a day; 7 = hourly or more.

System satisfaction
1. I am an enthusiastic user of <system>.
2. All things considered, my continuing to use <system> in my job is… (Extremely Negative to Extremely Positive).
3. All things considered, my continuing to use <system> in my job is… (Extremely Bad to Extremely Good)
4. All things considered, my continuing to use <system> in my job is… (Extremely Harmful to Extremely Beneficial).

Job stress (seven-point Likert scale with anchors never, a few times a year or less, once a month or less, a few times a month, once a week, a few times a week, and every day)
1. I feel emotionally drained from my work.
2. I feel used up at the end of the workday.
3. I feel fatigued when I get up in the morning and have to face another day on the job.
4. Working with people all day is really a strain for me.
5. I feel burned out from my work.
6. I feel frustrated by my job.
7. I feel I'm working too hard on my job.
8. Working with people directly puts too much stress on me.
9. I feel like I'm at the end of my rope.
10. Working at this job is emotionally exhausting.

Job satisfaction
1. Overall, I am satisfied with my job.
2. I would prefer another, more ideal job. (reverse scored)
3. I am satisfied with the important aspects of my job.

Job performance (1 = needs much improvement, 7 = excellent)
1. Quantity of work output.
2. Quality of work output.
3. Accuracy of work.
4. Liaising well with suppliers.

Appendix C

Common Method Bias

As discussed in the method section, all constructs were measured using a survey, thus raising concerns about common method bias. Although the independent and dependent variables were measured at different points in time and job performance being measured from a different source alleviates this concern to some extent, common method bias is still a potential threat to the validity of our results (Podsakoff et al. 2003). To test for common method bias, the marker variable technique was employed (Lindell and Whitney 2001; Malhotra et al. 2006) and then the hypotheses based on the corrected correlations were tested. Specifically, the third smallest positive correlation among the constructs was chosen as a conservative estimate of common method variance (CMV) to produce the CMV-adjusted correlation matrix (Lindell and Whitney 2001). Following Malhotra et al. (2006), the CMV-adjusted correlation matrix to estimate CMV-adjusted path coefficients and explained variance was used. The results showed that even after controlling for CMV effects, all of the path coefficients that were originally significant remained significant, although the magnitude of the coefficients dropped slightly in some cases. These results demonstrate the robustness and the validity of our findings.

References

Lindell, M. K., and Whitney, D. J. 2001. "Accounting for Common Method Variance in Cross-Sectional Research Designs," *Journal of Applied Psychology* (86:1), pp. 114-121.

Malhotra, N. K., Kim, S. S., and Patil, A. 2006. "Common Method Variance in IS Research: A Comparison of Alternative Approaches and a Reanalysis of Past Research," *Management Science* (52:12), pp. 1865-1883.

Podsakoff, P. M., Scott, B. M., Lee, J. Y., and Podsakoff, N. P. 2003. "Common Method Bias in Behavioral Research: A Critical Review of the Literature and Recommended Remedies," *Journal of Applied Psychology* (88:5), pp. 879-903.

Appendix D

Robustness Analysis in PLS: Interrelationships among Outcomes ▰

	System Satisfaction	Job Stress	Job Satisfaction	Job Performance
R^2	.20	.39	.46	.44
Control variables:				
Age	-.04	.07	.03	.02
Gender (1: women)	.03	.04	.03	.01
Organizational tenure	.02	.03	.03	.05
Organizational position	.01	.02	.04	.01
Computer self-efficacy	.05	.04	.00	.02
Pre-impl. job stress		.31***		
Pre-impl. job satisfaction			.23***	
Pre-impl. job performance				.20**
Employee outcomes				
System satisfaction		-.13*	.07	.03
Job stress			-.20**	-.17**
Job satisfaction				.15*
Traditional support structures:				
Training	.03	.01	.01	.02
Online support	.07	-.12*	.04	.02
Help desk support	.08	-.12*	.05	.04
Change mgmt. support	.12*	-.15*	.07	.12*
Advice network support:				
Get-advice centrality	.30***	-.32***	.33***	.34***

Notes: 1. Dependent variables are post-implementation values.
　　　　2. Shaded cells are not applicable.
　　　　3. *p < .05; **p < .01; ***p < .001.

Appendix E

Robustness Analysis in SUR (Still Including Interrelationships among Outcomes)

	System Satisfaction	Job Stress	Job Satisfaction	Job Performance
R^2	.19	.37	.43	.41
Control variables:				
Age	-.03	.04	.02	.00
Gender (1: women)	.03	.03	.03	.01
Organizational tenure	.02	.03	.03	.04
Organizational position	.01	.02	.01	.01
Computer self-efficacy	.04	.02	.02	.02
Pre-impl. job stress		.29***		
Pre-impl. job satisfaction			.19**	
Pre-impl. job performance				.17**
Employee outcomes				
System satisfaction		-.12*	.04	.02
Job stress			-.19**	-.15*
Job satisfaction				.14*
Traditional support structures:				
Training	.03	.01	.01	.01
Online support	.07	-.12*	.04	.02
Help desk support	.05	-.12*	.03	.02
Change mgmt. support	.13*	-.14*	.05	.12*
Advice network support:				
Get-advice centrality	.28***	-.29***	.32***	.31***

Notes: 1. Dependent variables are post-implementation values.

2. Shaded cells are not applicable.

3. *p < .05; **p < .01; ***p < .001.