

A TEMPORALLY SITUATED SELF-AGENCY THEORY OF INFORMATION TECHNOLOGY REINVENTION

Saggi Nevo

School of Business, University at Albany, 1400 Washington Avenue,
Albany, NY 12222 U.S.A. {snevo@albany.edu}

Dorit Nevo

Lally School of Management, Rensselaer Polytechnic Institute, 110 8th Street,
Troy, NY 12180 U.S.A. {nevod@rpi.edu}

Alain Pinsonneault

Desautels Faculty of Management, McGill University, 1001 Sherbrooke Street West,
Montréal, Québec H3A 1G5 CANADA {alain.pinsonneault@mcgill.ca}

Appendix A

IT Adaptation and IT Reinvention in IS Research

Authors	Theoretical Foundations	Research/ Practical Implications	Characteristics of the IT		Characteristics of the Post-Adoption Changes			
			Type of IT	The Intended Use of the IT/Feature	Actions Taken by Users	Results of Users' Action	Terms Used in the Paper	Locus of Change
Past-Oriented IT Adaptation								
Boudreau and Robey (2005)	Human agency	Explains change in enactments of technology	Enterprise resource planning system	To promote online and real-time data-entry	Users imitated the process of data entry that had been prevalent with the legacy system and began entering data into the system in batches.	Batch data-entry	Inertia	Use
				A time-out feature for providing greater security that automatically logs users off after a period of inactivity	Users developed a workaround to beat the time-out feature that, compared to their previous work-related habits, was perceived as limiting mobility.	Security circumvention	Workaround	Use
Cousins and Robey (2005)	Human agency	Explains patterns of technology use	Wireless-enabled PC with a loan processing application	To offer an all-in-one, loan processing application that is accessible from anywhere, anytime	The user and his assistant designed a customer timeline form, independent of the IT; it was reminiscent of the old ways of doing business and involved using obsolete devices.	An alternative, stand-alone, customer time line form	Use	Technology

Authors	Theoretical Foundations	Research/ Practical Implications	Characteristics of the IT		Characteristics of the Post-Adoption Changes			
			Type of IT	The Intended Use of the IT/Feature	Actions Taken by Users	Results of Users' Action	Terms Used in the Paper	Locus of Change
DeSanctis and Poole (1994)	Structuration	Develops adaptive structuration theory	Group decision support system	To promote equal input from all users	The leader of the team sought to reinstate the strict hierarchical structure of the group; she appropriated the system in a manner that allowed her to state a position and then direct others to vote in its favor.	A leader's directive enforcement tool	Appropriation	Use
Desouza et al. (2007)	Adaptive structuration	Studies post-adaptive use of IT	Personal computer	For standardized layout	A user was uncomfortable using the new screen layout so he retrofitted his new work computer to resemble his home computer.	Personalized layout	Customize/ Personalize	Technology
Jensen et al. (2009)	Institutional; Sensemaking	Explains IS implementation	Electronic patient records system	To promote online and real-time data-entry	Users resumed past routines by using the IT in ways that challenged its intended operations and created workarounds through which they reinforced the old ways of working.	Off-line and batch-mode data-entry	Work-around	Technology & Use
Kraut et al. (1989)	Various	Studies technological impact	Computerized record system	To promote sequential resolution of clients' issues	Users sought to recreate the ability to overlap clients, which was the hallmark of the competent service rep, and which the IT had rendered obsolete; they found another way to use a dual screens feature, logging on to the billing database twice and switching back and forth between accounts.	A user-centric tool that allows for parallel service provision	Innovation	Use
Lapointe and Rivard (2005)	Resistance	Explains resistance to IT	Electronic medical records system	A versatile and multipurpose tool intended to be used by doctors for entering data and to allow access to patients' records at all times from different locations	IT's features contrasted with the users' (doctors') work habits and compensation system; the users insisted that several changes be made to the IT.	A diminished IT with 75% of the original functionality removed	Downsize; Resistance	Technology
					Intended users (doctors) perceived a decrease in their political power and sought to regain it; a full-time nurse was assigned to perform data entry.	A new data entry procedure	Resist	Use
Majchrzak et al. (2000)	Structuration	Explains the technology adaptation process	Communication and collaboration technology	An asynchronous communication tool for capturing all user knowledge and project-related information and sharing them continuously with other users and managers	Users were accustomed to having private conversations and sought to regain this structure by excluding management from accessing the IT.	Information and knowledge are shared only among users; managers are excluded	Appropriation	Technology & Use
					Users had been communicating face-to-face before the IT was implemented; to regain some aspects of that pattern of interaction, users coupled all use of the IT with a synchronous teleconference.	Synchronous communication is added	Appropriate	Technology & Use

Authors	Theoretical Foundations	Research/ Practical Implications	Characteristics of the IT		Characteristics of the Post-Adoption Changes			
			Type of IT	The Intended Use of the IT/Feature	Actions Taken by Users	Results of Users' Action	Terms Used in the Paper	Locus of Change
Thomas and Bostrom (2010)	Adaptive structuration	Explains technology adaptation in virtual teams	Content versioning tool	For asynchronous communication	Past habits prompted users to continue sending updated code via email rather than using the content versioning system.	Used as content archiving tool	Adapt	Use
Tyre and Orlikowski (1994)	Sensemaking; Innovation diffusion	Explains technological adaptation	Screen management system	Not specified	When a new screen management system was installed users found a way to maintain their previous patterns of working; some retrofitted the new system to resemble the old one and others modified the start-up procedures to invoke the old system.	Retrofitted to mimic functions of the previous interface	Adaptation; Retrofitting	Technology
Wagner et al. (2010)	Sociomaterial practice	Explains IT project survival	Enterprise system	To enable the modern practice of "time-phased accounting"	Users sought to reinstate their legacy accounting practices and so the IT was modified to mimic "commitment accounting."	Mimics the antiquated and simplistic practice of "commitment accounting"	Accommodate	Technology & Use
Present-Oriented IT Adaptation								
Azad & Faraj (2008)	Frame evolution	Studies stakeholders perspectives	Land registry system	To automatically calculate fees	Users were unable to work with an automatic fee calculation feature that caused them problems; a mechanism for overriding the automatic calculation was added to the system.	Automatic fee calculation overriding mechanism added	Reworking	Technology & Use
Bagayogo et al. (2014)	Various use theories	Propose a new understanding of post-adoption	Microsoft office productivity suite	Not specified	A user who was occasionally asked to transcribe a video simplified the process by writing a macro that would allow him to pause videos so that he could catch up with the writing.	Video-pausing feature	Extending features	Technology
Berente & Yoo (2012)	Institutional; Loose coupling	Explains institutional contradictions when implementing enterprise systems	Enterprise resource planning system	To streamline purchase orders	Users (project managers) found that the new system did not allow them to track money for which they were responsible; separate Web-based tool was created to resolve the issue.	A manager approval system	Not specified	Technology & Use
				To address regulatory requirements	Users found the system to be too complex and changed their use of the system; they circumvented requirements for accurate and detailed information.	Passing compliance to quality control	Circumvent	Use

Authors	Theoretical Foundations	Research/ Practical Implications	Characteristics of the IT		Characteristics of the Post-Adoption Changes			
			Type of IT	The Intended Use of the IT/Feature	Actions Taken by Users	Results of Users' Action	Terms Used in the Paper	Locus of Change
Boudreau and Robey (2005)	Human agency	Explains change in enactments of technology	Enterprise resource planning system	Not specified	Users found that it was not possible to change the line amount on a purchase order; they came up with a workaround, adding an additional line to allow them to modify amounts of purchasing orders.	A change-amount-by line added to the database	Reinvention; Workaround	Technology
				To streamline transactions and foster a paperless office	Users continued to print, viewing it as necessary for records keeping and transaction tracing.	Used for backup printing	Inertia	Use
Davidson and Chismar (2007)	Institutional	Explains IT and structural alignments	Computerized physician order entry system	To promote real-time order fulfillment	Users (lab technicians and nurses) had to address doctors' refusal to use the system as intended; the system was changed to include built-in time delay and order consolidation features.	Built-in time delays and consolidation of physician orders were added	Technology Change	Technology & Use
Goh et al. (2011)	Adaptive structuration; Agency	Examines adaptive routinization of healthcare IT	Computerized documentation system	The feature was intended for vendor use to provide instructions	The necessity of entering billing codes into the system led users to start using a text field, intended for vendor use, for writing the missing information.	Used for communication-tracking	Adapt; Work-around	Use
				Patient information is displayed across disparate pages	Users (physicians) believed that it would be more efficient to view patient information on a single page, using one click; "Clinician Summary" feature was added to the system.	View aggregator added to the system	Refinement	Technology & Use
			Computers on Wheels (COWs)	To serve as a cable-free and battery-powered IT	Due the short lifespan of the batteries users began to attach electric extension cords and plug the COWs into power outlets.	Partially-tethered and semi-mobile IT	Adapt; Refine	Technology
Leonardi (2007)	Social networks	Explains technology-induced organizational change	Incident-tracking tool	To implement a first-come, first-served ticket assignment process	To make the process of ticket assignment more efficient, a user recommended that when initiating a ticket everyone should search the archive to see if another user had dealt with a similar problem in the past; in such a case, that user should be assigned the new problem so it could be expediently resolved.	Supports an archive-based ticket assignment process	Appropriation	Use
				An empty field in the IT	A user felt that incident resolution can be made more efficient; she requested that responses to tickets be documented in an empty field in the IT's database.	The field contains ticket-related information	Appropriate	Use

Authors	Theoretical Foundations	Research/ Practical Implications	Characteristics of the IT		Characteristics of the Post-Adoption Changes			
			Type of IT	The Intended Use of the IT/Feature	Actions Taken by Users	Results of Users' Action	Terms Used in the Paper	Locus of Change
Majchrzak et al. (2000)	Structuration	Explains the technology adaptation process	Communication and collaboration technology	To provide document sharing using an external application viewer	Since the external application viewer took too long to launch for each entry, users requested a screen capture feature, which eliminated the need for external application viewers when sharing documents.	An internal screen capture feature added	Appropriation	Technology & Use
				To allow entry creation and editing open to all users	Users were frustrated when their entries were overwritten during synchronous brainstorming sessions and requested a feature that locked entry creation.	Entry creation blocking feature added	Appropriate	Technology & Use
				To capture all user knowledge and all project-related information and share it continuously with users and managers	Users found documenting all conversations and informal and tacit knowledge to be overwhelming; they began to only documenting implicit knowledge and only when explicitly asked to do so.	A repository of partial user knowledge and project-related information	Appropriation	Use
Monteiro and Rolland (2012)	Practice	Studies trans-situated use of IT	Auditor information system	To use predefined templates and checklists and automate report generation	Users were unable to modify reports as per official procedures and had to resort to creating local copies, modifying them, and storing them locally.	Local copies of reports are modified and stored locally	Standardize	Technology
Orlikowski (1996)	Practice; Sensemaking; Structuration	Develops a situated change perspective	Incident tracking support system	The IT automatically assigns a unique number to each incident entered into the database for indexing purposes	The IT had no built-in indicators of the reliability or relevance of the data, leading users to develop some heuristics for judging the quality of knowledge in the IT's records; users learned each other's identifying codes, and began relying on this identifier to assess the quality of potentially reusable incidents.	The unique number automatically generated by the IT becomes a marker of the reliability of the incident's resolution	Appropriation; Improvisation	Use
				The incident records in the IT were designed to be created by one user and then resolved by another user	Users discovered that they now had a window into the workload of other users, allowing them to resolve customer problems quicker; they browsed through each other's open calls and offered help when possible.	Used for proactive help-giving	Emergence; Improvisation	Use
				For online, real-time data-entry	Users found the feature that enabled direct entry to be limiting: the navigation of the entry screen was incompatible with how customers provided information; users first recorded their interactions with on paper and then entered them into the IT in batch mode.	Two-stage data-entry procedures: first offline and then online	Improvisation	Use

Authors	Theoretical Foundations	Research/ Practical Implications	Characteristics of the IT		Characteristics of the Post-Adoption Changes			
			Type of IT	The Intended Use of the IT/Feature	Actions Taken by Users	Results of Users' Action	Terms Used in the Paper	Locus of Change
Papa and Papa (1992)	Innovation diffusion; Uncertainty reduction	Studies diffusion of re-invention within organizations	IT for multi-line adjustors	To increase memory capacity, quicker access to files, and the elimination of written reports	A user wanted to reduce complexity and to decrease waiting time when switching between claim reports; the user developed a new procedure that made the process more efficient.	A new procedure for switching among different applications	Reinvention	Use
Sun (2012)	Adaptive structuration	Examines user revisions to IT	Text-editing software	To assist with document versioning	A user felt limited by the current state of the technology and decided to slightly modify it to help him better track changes in his documents.	An existing feature is used in a new way; adding details to track changes	Repurpose	Use
Tyre and Orlikowski (1994)	Sensemaking; Innovation diffusion	Explains technological adaptation	Electronic mail system	Not specified	Being overwhelmed by accumulated email prompted a user to change the technology in a manner that would diminish the problem.	New rules for e-mail management were developed	Adaptation	Technology
Wagner & Newell (2007)	Situated learning	Explains the impact of user participation when IT is implemented	Customer relationship management system	Fields in the IT's database are intended for a particular (not specified) purpose.	Users begin to use their IT in ways that were not originally envisioned or intended; they used certain fields for something else because they had tasks that needed to be completed.	The fields are used for another purpose (not specified)	Using	Use
Webster (1998)	Media choice; Systems analysis & design; Privacy	Explains media choice and usage	Desktop video-conferencing	For opportunistic connections by allowing employees to determine others' availability	When a user could not adequately describe an object to someone in Purchasing, out of frustration he used the IT's camera which was intended for opportunistic meetings to virtually share the object.	Used for physical demonstrations and virtual sharing of physical objects	Use	Use
IT Reinvention								
Beaudry and Plinsomeault (2005)	Coping	Explores users coping mechanisms	Account management system	For internally managing client portfolios	A user wanted to have more customers; he created a competitive intelligence capability by interconnecting the IT with a spreadsheet application and creating capabilities for importing and analyzing external data on competitors.	Used as competitive intelligence system	Adaptation; Coping	Technology & Use
Cousins and Robey (2005)	Human agency	Explains patterns of technology use	Voicemail	To provide a way for clients and colleagues to leave messages requiring the user's attention	A user wanted to stay connected and keep track of work-related activities while being away from the office; he began to use the ICT that in a manner that would allow him to do so.	A recording system for the user and his assistant	Use	Use
Goh et al. (2011)	Adaptive structuration; Agency	Examines adaptive routinization of healthcare IT	Computerized documentation system	For managing healthcare documents	Users wanted to provide a better teaching experience for students; they proposed a student learning enhancement capability. They suggested that a series of new training-oriented functionalities be implemented into the IT so that it can be used as an instructional tool.	An instructional tool for enhancing student learning is created	Adaptation; Improving	Technology & Use

Authors	Theoretical Foundations	Research/ Practical Implications	Characteristics of the IT		Characteristics of the Post-Adoption Changes			
			Type of IT	The Intended Use of the IT/Feature	Actions Taken by Users	Results of Users' Action	Terms Used in the Paper	Locus of Change
Kraut et al. (1989)	Various	Studies technological impact	Computerized record system	For describing and tracking customer problems	Users desired to communicate with friends at the workplace; they added an electronic communication mechanism, allowing them to leave notes secretly to one another in a field in the database that was intended for recording customer problems.	An asynchronous communication tool	Circumventing/ Innovation	Technology & Use
Orlikowski (1996)	Practice; Sensemaking; Structuration	Develops a situated change perspective	Incident tracking support system	For supporting and tracking incidents	Users wanted to implement a new organizational structure; they took advantage of several features – universal access to the database, reassignment of call, and automatic notifications – aggregating and reinterpreting them, and creating a tool for enabling labor division.	A labor division capability is added	Change	Use
Orlikowski (2000)	Structuration; Practice	Explains enactment of technologies in practice	Incident tracking support system	For supporting and tracking incidents	Users wanted to train newcomers better; they extracted sample problems from the IT's database and created a training database so that new hires can learn the process of problem resolution.	An instructional tool for training newly-hired employees is created	Improvisation	Technology & Use
			Lotus Notes	For knowledge sharing	Users (consultants) desired a competitive advantage over other users; they recognized that the IT can afford them an opportunity to enhance their individual performance relative to others; therefore, rather than using the IT for sharing knowledge they instead used it to speed up task completion.	Used as productivity-enhancement tool	Technology-in-practice; Enactment	Use

References

Azad, B., and Faraj, S. 2008. "Making e-Government Systems Workable: Exploring the Evolution of Frames," *Journal of Strategic Information Systems* (17:2), pp. 75-98.

Bagayogo, F. F., Lapointe, L., and Bassellier, G. 2014. "Enhanced Use of IT: A New Perspective on Post-Adoption," *Journal of the Association for Information Systems* (15:7), pp. 361-387.

Beaudry, A., and Pinsonneault, A. 2005. "Understanding User Responses to Information Technology: A Coping Model of User Adaptation," *MIS Quarterly* (29:3), pp. 493-524.

Berente, N., and Yoo, Y. 2012. "Institutional Contradictions and Loose Coupling: Post-Implementation of NASA's Enterprise Information System," *Information Systems Research* (23:2), pp. 376-396.

Boudreau, M. C., and Robey, D. 2005. "Enacting Integrated Information Technology: A Human Agency Perspective," *Organization Science* (16:1), pp. 3-18.

Cousins, K. C., and Robey, D. 2005. "The Social Shaping of Electronic Metals Exchanges: An Institutional Theory Perspective," *Information Technology & People* (18:3), pp. 212-229.

Davidson, E. J., and Chrismar, W. G. 2007. "The Interaction of Institutionally Triggered and Technology-Triggered Social Structure Change: An Investigation of Computerized Physician Order Entry," *MIS Quarterly* (31:4), pp. 739-758.

DeSanctis, G., and Poole, M. S. 1994. "Capturing the Complexity in Advanced Technology Use: Adaptive Structuration Theory," *Organization Science* (5:2), pp. 121-147.

Desouza, K. C., Awazu, Y., and Ramaprasad, A. 2007. "Modifications and Innovations to Technology Artifacts," *Technovation* (27:4), pp. 204-220.

Goh, J. M., Gao, G., and Agarwal, R. 2011. "Evolving Work Routines: Adaptive Routinization of Information Technology in Healthcare," *Information Systems Research* (22:3), pp. 565-585.

Jensen, T. B., Kjærgaard, A., and Svejvig, P. 2009. "Using Institutional Theory with Sensemaking Theory: A Case Study of Information System Implementation in Healthcare," *Journal of Information Technology* (24:4), pp. 343-353.

- Kraut, R. E., Dumais, S. T., and Koch, S. 1989. "Computerization, Productivity, and Quality of Work-Life," *Communications of the ACM* (32:2), pp. 220-238.
- Lapointe, L., and Rivard, S. 2005. "A Multilevel Model of Resistance to Information Technology Implementation," *MIS Quarterly* (29:3), pp. 461-491.
- Leonardi, P. M. 2007. "Activating the Informational Capabilities of Information Technology for Organizational Change," *Organization Science* (18:5), pp. 813-831.
- Majchrzak, A., Rice, R. E., Malhotra, A., King, N., and Ba, S. 2000. "Technology Adaptation: The Case of a Computer-Supported Inter-Organizational Virtual Team," *MIS Quarterly* (24:4), pp. 569-600.
- Monteiro, E., and Rolland, K. H. 2012. "Trans-Situated Use of Integrated Information Systems," *European Journal of Information Systems* (21:6), pp. 608-620.
- Orlikowski, W. J. 1996. "Improvising Organizational Transformation Over Time: A Situated Change Perspective," *Information Systems Research* (7:1), pp. 63-92.
- Orlikowski, W. J. 2000. "Using Technology and Constituting Structures: A Practice Lens for Studying Technology in Organizations," *Organization Science* (11:4), pp. 404-428.
- Papa, W. H., and Papa, M. J. 1992. "Communication Network Patterns and the Re-invention of New Technology," *Journal of Business Communication* (29:1), pp. 41-61.
- Sun, H. 2012. "Understanding User Revisions When Using Information Systems Features: Adaptive System Use and Triggers," *MIS Quarterly* (36:2), pp. 453-478.
- Thomas, D. M., and Bostrom, R. P. 2010. "Vital Signs for Virtual Teams: an Empirically Developed Trigger Model for Technology Adaptation Interventions," *MIS Quarterly* (34:1), pp. 115-142.
- Tyre, M. J., and Orlikowski, W. J. 1994. "Windows of Opportunity: Temporal Patterns of Technological Adaptation in Organizations," *Organization Science* (5:1), pp. 98-118.
- Wagner, E. L., and Newell, S. 2007. "Exploring the Importance of Participation in the Post-Implementation Period of an ES Project: A Neglected Area," *Journal of the Association for Information Systems* (8:10), pp. 508-524.
- Wagner, E., Newell, S., and Piccoli, G. 2010. "Understanding Project Survival in an ES Environment: A Sociomaterial Practice Perspective," *Journal of the Association for Information Systems* (11:5), pp. 276-297.
- Webster, J. 1998. "Desktop Videoconferencing: Experiences of Complete Users," *MIS Quarterly* (22:3), pp. 257-286.