Spring 3-16-2024

A Model Of IT Staff As Organizational Technology Innovation Capabilities

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ABSTRACT

This paper investigates the role of IT staff in organizational technology innovation, aiming to bridge the gap in understanding their specific contributions. The study develops a multi-level model, considering both IT staff and organizational levels, to identify key capabilities influencing organizational technology innovation success. Theoretical foundations, drawn from organizational learning theory, inform data analysis via an exploration, exploitation, and change management lens. Interviews with healthcare IT innovation professionals analyzed with a grounded theory approach support the model, revealing five major factors at the organizational and IT staff levels, including senior leadership stewardship, collaboration environment, risk mitigation capability, vendor engagement, and policy/practices fitting. The IT staff factors are novel in an organizational level innovation model: risk mitigation and policy and practices fitting with effective vendor interaction. The study offers an avenue for productive future research to improve our understandings of IT staff innovation capability cultivation and management particularly in healthcare settings.

Keywords

Organizational Technology Innovation, Conceptual Model, Grounded Theory, IT Staff, Organizational Capabilities

INTRODUCTION

IT staff roles in organizational technology innovation are important but poorly understood. Recent research finds that IT knowledge and capabilities can compensate for the lack of other resources to make organizational digital advantage (ie. strategic value creation via organizational technology innovation) possible (Karahanna et al. 2019). IT staff are a primary home for organizational IT knowledge and capabilities. And, organizational technology innovation in the form of using technology products to innovate processes and services would likely involve and impact IT staff duties and responsibilities (Tornatzky and Fleischer 1990). Given that we are focused only on this form versus research and development making new technology products, we know IT staff are there, their roles are related, and at the macro level we know they can matter. What exactly are they doing (theoretically) to enable gains in digital advantage?

Theories of organizational innovation and the role of organizational actors exist but do not clarify the role of IT staff. Organizational learning theory identifies organizational staff roles in technology innovation as enacting learning as an input to change management via exploration and exploitation of knowledge (March 1991; Temizkan and Kumar 2015). This theory base serves as a central source for analyzing and understanding effective organizational adaptation and ambidexterity at the organizational level where both activities are necessary to achieve maximum efficacy (Gupta, Smith, and Shalley 2006). Exploration activities look outward to find new knowledge to acquire and use. Exploitation activities scan internally to discover knowledge already existing to apply. The change management process integrates these in the context of an innovation effort to select, prioritize and implement actions to drive progress.

Existing IS literature identifies all manner of IT staff activities that could be categorized as exploration, exploitation, and change management. These activities present a broad menu of possible options. For example, IT staff might explore via training, hiring/poaching, vendor interactions, and outsourcing. They might exploit via knowledge management systems and processes, team interactions, trainings, user involvement, and feedback sessions. They might change manage via boundary spanning, various project management practices, conducting training, developing and disseminating documentation, holding meetings, managing the technologies of collaboration and interaction. The problem is that in a given organizational technology innovation context seeking quick, effective change, there is no way to understand which of these will matter and how leaders should focus in terms of developing organizational capabilities.

To address this problem we developed a model of the IT staff role in organizational technology innovation. We present this multi-level model (IT staff and organizational levels) for understanding the role of IT staff in organizational innovation in terms of key capabilities. The IT staff and organization interfaces are the means through which actors like IT staff have an impact at

the organizational level (Anderson, Potočnik, and Zhou 2014). The multi-level model developed in this study screens through the many possible lower-level attributes that could matter to find the ones that do matter at the higher level via healthcare practitioner interviews and grounded theory analysis. The model positions IT staff as primary agents driving innovation effectivenss through two key mechanisms: exploration via vendor interaction, and exploitation via internal collaboration for prioritization and coordination of changes to ensure policies and practices fits informed by risk mitigation activities.

THEORY DEVELOPMENT

IT staff are the IT workers below top IT management. Plenty of IS research indicates they can be important in organizations. These studies cover many aspects of their roles including their motivation, turnover intentions and impacts (Abdel-Hamid 1992; Ferratt et al. 2005), how they can develop trust in virtual settings (Jarvenpaa, Knoll, and Leidner 1998), what they can do when projects are failing (Thomas and Bostrom 2010) and more. While these studies analyze IT staff management, productivity, and activities, few focus on the role of IT staff in technology innovation at the organizational level of analysis. The organizational level of analysis seeks to identify structures and their consistent roles within organizational routines, often in terms of culture, climate, or change efforts (Ashkanasy and Dorris 2017). It generalizes to organizational capabilities beyond individual projects and workers. We wanted to understand the IT staff impact at this organizational level as a structure interacting within the larger organization.

A multi-level theory approach enables analysis of subunit effects on larger organizational outcomes when a subunit has a distinct role (Klein, Dansereau, and Hall 1994). This is precisely our goal in finding the role of the IT staff in relation to organizational technology innovation structures and outcomes. As an example, in a hospital setting roles of different occupations like nurses, doctors, and managers interacting during innovation efforts and the nature of interactions can be identified and linked to information systems outcomes through a multi-level theory (Lapointe and Rivard 2005). While nurses, doctors, and managers are certainly important for understanding innovation success, it is particularly important for IS researchers to understand the role of IT staff in organizational technology innovation. They are primary organizational actors who implement the technologies and support the use of systems directly in order to meet strategic goals.

A multi-level theory needs to identify at least one lower level focal unit to analyze in relation to a larger or higher level entity (Hitt et al. 2007). In this model our focal unit is the IT staff in relation to their larger organization. This is a team and organization interface, which is particularly rarely studied yet important for understanding how organizations creatively solve the challenges that emerge while innovating (Anderson et al. 2014). Next, a multi-level theory needs to delineate a mechanism to screen through micro factors to justify a necessary and sufficient set, as there will likely be a large body of literature and reviewers will never be satisfied that there are enough included otherwise (Klein, Tosi, and Cannella 1999). In this study, we use interviews with practitioners to identify the common themes that mattered across multiple organizations and locations. This grounded theory approach seeks to inductively discover the important concepts explaining some phenomenon by starting with raw data inputs from the domain of interest (Glaser 1998).

MODEL DEVELOPMENT METHOD AND INTERVIEWS

We selected healthcare as an industry setting for our model development as it is large, generally in need of technology innovation, and matched the domain from the IS paper identifying organizational IT knowledge and capabilities as a compensator for achieving digital advantage (Karahanna et al. 2019). We followed grounded theory development guidance to form the sample along four major criteria: 1. fit the theory to the domain, 2. be understandable to people in the domain, 3. generalize across varying instances of the domain, and 4. be within the control of our focal unit to use the theory (Strauss and Corbin 1990). We sampled people who had been involved in hospital technology innovation projects to ensure we had a consistent domain (criterion 1). We used open interviews to ensure we did not seed their vocabulary (criterion 2). They came from multiple US states with no overlapping organizations to ensure we had samples across instances of the domain (criterion 3). And, we asked them for responses in terms their personal experience working in hospital technology innovation to ensure answers that would fit within the control of the IT staff role (criterion 4).

The interview questions were intentionally very broad to avoid leading the responses. They were selected to tap into interviewees' experience of what factors contributed to their attitudes toward innovation in their healthcare innovation experiences so that they would expose the general dynamics of their roles and organizational influences on them. Each semi-structured interview lasted approximately 30 minutes. Interviews were not recorded in order to encourage interviewees to share positive and negative experiences. Interviewers took notes. Two interviews were by phone and the rest were face-to-face. Each interviewee was asked to answer questions based on the healthcare technology innovation projects in which they had participated. Our interview questions centered on three themes:

1) How eager are you to try new technologies during innovation projects at work? Why?
2) What would make you more innovative?

3) If anything, what discourages you from being innovative?

Twelve healthcare professionals from various organizations across four different US states were interviewed (Table 1). They were identified through existing associations with the researchers. No two came from the same organization. All had been involved in technology innovation projects in hospitals. The majority had worked specifically within IT departments as IT staff. The total number of interviewees was decided based on theoretical saturation indicators in the coding as themes began overlapping. This approach was supported by guidance from prior work which was able to adequately elaborate the dynamics of a sub role (ie. supporting technology innovation efforts) and reach theoretical saturation with a similar number (Thomas and Bostrom 2010).

Table 1 Interviewee Demographics

Title	Organization	Industry Tenure (years)	Job Tenure (years)	IT background or role?
Sr. Project Manager	Teaching Hospital	37	33	Y
PMO Director	Large Insurer	16	4	Y
Sr. Project Consultant	Teaching Hospital	6	3	Y
President	Health Management Consultancy	32	9	Y
Sr. Associate Product Manager	Health Software Provider	6	3	Y
Consultant, Infection Prevention and Control	Public Hospital	36	2	N
Sr. Manager	Specialty Hospital	17	3	Y
Develop Team Lead	Hospital Services Provider	5	3	Y
Data Analytics Project Lead	Large Hospital	12	5	Y
Informatics Project Manager	Healthcare Services Provider	9	2	Y
Public Health Nurse Manager	Medium Health Department	19	5	N
Clinical Informatics Specialist	Large Hospital	6	2	Y

After collecting data, one researcher and a graduate student coded the data independently to identify organizational context versus IT staff level themes related to enabling or disabling innovation. Coders then used an axial-coding approach lightly structured by groupings for exploration, exploitation, and change management with the option to create new 'other' categories followed by open-coding sub-grouped themes independently to identify the theoretical core (Strauss and Corbin 1990). They compared the theme groupings, discussed discrepancies, and reached 100% consensus on five major factors present in all interviews. These five major work-situated factors concerning the organization-team interface divide into two levels, organization and projects. At the organizational level, these factors were: senior leadership stewardship and collaboration environment. At the projects level there were three: risk mitigation capability, vendor engagement, and policy and practices fitting.

MULTI-LEVEL MODEL AND PROPOSITIONS

To develop the multilevel model we integrated the results with sensitivity to our level of analysis. We focus our propositions above the individual, team or project level where individual exploration or exploitation factors may seem unilaterally important (Gupta et al. 2006). We develop them as a synthesis of our interview findings with related IS literature.

Though each factor came up in all interviews, **senior leadership stewardship** was the most emphasized. This 'other' factor included common influences in IS innovation research related to top leadership activities like top-management support (Grover 1993) and championship (Lee and Shim 2007). While supervisory encouragement was indirectly discussed in the interviews, it was not discussed in terms of the interviewees' direct supervisors but rather their perceptions on how senior leadership in their companies are attuned to encouraging innovation. Some respondents mentioned that "leadership [was] important in innovation attitudes" and that "organizations that [had] a Chief Innovation Officer [had] created a specific structure to foster innovation." It was identified in terms of its effect on others as well as empowering IT staff to conduct their activities. However, there was no mention of the need for direct supervisors' intervention. It was more of an organizational impact.

In agreement with the interview and coding results, literature on top-management support indicates that top leader support for a given project will lead to improved innovation outcomes (Iacovou, Benbasat, and Dexter 1995). No staff indicated a personal effect from this support. Rather they talked about the effect traveling through organization-wide improved collaboration with them. The collaboration is the place where the exploitation, exploration, and change management intersect to drive performance (Dahlin 2020). Here, we identify a better collaboration environment in line with prior literature as the leveraging of diverse team knowledge to develop synergistic, innovative solutions that also balance and meet the various stakeholder needs (Levina and Vaast 2008).

The interviews identified the **collaborative environment** as another important 'other' factor for IT staff, which is consistent with general innovation literature (Woodman, Sawyer, and Griffin 1993). Our respondents mentioned how the establishment of an innovation infrastructure that encouraged communication between teams, "idea incubators, bootcamps, crash courses [on design thinking]," and others, influenced the teams' willingness to be innovative. There was consensus among respondents that support from senior leadership trickles down into this collaboration and makes a significant difference in an organization being innovative. Thus,

P1: Higher leadership support leads to an improved collaboration environment. (Organization-Level)

Willingness to take risks accompanies increase in creativity and innovation (Ford 1996). Respondents supported this idea through the themes of risk ("interest in being aware of new technologies, but unwilling in being the first adopters") and failure experiences ("in the past we've gone through investments that have turned out to be sunken costs, obsolete software"). Interviewees gave several specific structural solutions for enabling IT staff to **mitigate risk** in relation to control mechanisms during projects, a change management factor. They related their risk mitigation activities to various stakeholders being confident in changes and therefore more willing to positively support innovation with leadership support important for their legitimacy and motivation to conduct this work.

P2: Higher leadership support leads to improved risk mitigation effectiveness. (Organization-IT Staff Interface)

They also indicated that the quality of collaboration impacted their ability to detect and manage risk. In agreement with the interviews, many IS studies indicate the importance of IT project management and risk management during organizational technology innovation projects point to a secondary level of success prior to overall adoption, usage, or other organizational level innovation project outcomes (DeLone and McLean 2003). This type of success is at the level of the IT staff within an organization and is distinct from usage as it may involve attaining proper data security, establishing system reliability and availability, or other outcomes developing policies and practices fits that would be invisible to end-users or top management (Aladwani 2002). IT staff risk control activities and project management activities lead to this type of success.

Fitting technology changes with policies and practices mattered too, suggesting task-technology fit as a fundamental organizational level activity conducted by IT staff when enabling organizational technology innovation value creation. For example, one of the respondents explained how innovations were implemented in the organization's catheterization lab to improve a specific task in the process. This interviewee indicated that effective innovation required trial and error, and they succeeded due to establishing a safe failure and learning environment. This factor represents exploitation of internal knowledge and specific situational conditions that have to be learned and synthesized. Interviewees indicated the importance of stakeholders cooperating with them to enable this work. They gave examples indicating that the implementation of electronic health records or similar innovations in their organizations required their continuous activities to ensure compliance with existing policies. In some cases, some of these policies inhibited teams from innovating given "minute line-by-line" details.

To solve these problems, respondents suggested the need for the simultaneous internal risk analysis along with configuration and adjustment of technology in collaboration with stakeholders. This finding underscores research about the importance of IT managers aligning internal practices with new technical capabilities (Barrett, Heracleous, and Walsham 2013). It suggests that risk mitigation informs fitting actions during collaboration as the IT staff core role in driving organizational technology innovation effectiveness. The collaboration quality will impact IT staff ability to detect needs and select actions like providing training, troubleshooting technical problems, getting the business processes or data structures right, or do any of the many things cited in prior literature as possible IT staff actions during innovation projects (Levina and Vaast 2008).

P3: An improved collaboration environment leads to improved policy and practices fitting. (Organization-IT Staff Interface)

P4: Higher risk mitigation effectiveness leads to improved policy and practices fitting. (IT Staff-Level)

P5: The efficacy of the IT staff policy and practices fitting occurring within the collaboration environment leads to higher organizational technology innovation success. (IT Staff-Organization Interface)

Finally, respondents talked about the value of effective **interaction with vendors** as a way to bring in knowledge, an exploration factor. They were also very clear that structural mechanisms must be in place to support vendor engagement. For example, one respondent talked about the importance of vendor vetting mechanisms ("implementing new technologies is a multi-phased process that includes tasks such as an evaluation of the technology, a vendor evaluation, a risk assessment"). Another talked about the importance of organizational policies for dealing with vendors ("there is a need for a clearly-defined rulebook for how one engages with outside companies, how partnering should be done, how to get the resources from the central information systems organization, how to prioritize…"). For these policies to be effective, they must be known by participants and executable within the timeline and authority of an innovation project. Ultimately, the respondents were clear in each case that a vendor would be necessary to bring in technical knowledge. Related research points out that if IT staff lack

knowledge in some important way to assess security, integration, or related implementation technical work, they would need to get it somehow to increase their project success. In a hospital setting, vendors are often the most direct source for this type of innovation knowledge (Thomas and Yao 2020). This knowledge would then inform the process and practices fitting.

P6: Vendor interaction effectiveness leads to more effective policy and practices fitting. (IT Staff-Level)

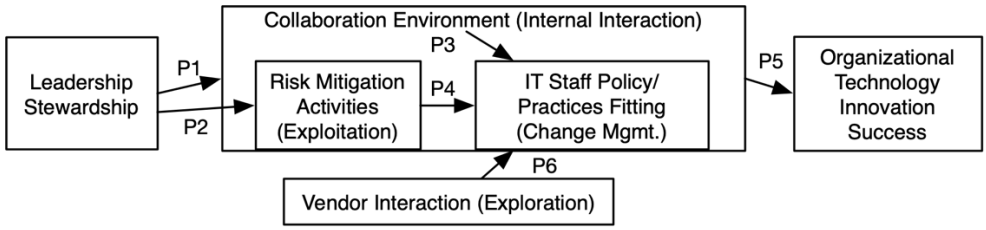

Figure 1 Model of IT Staff as Organizational Capabilities for Technology Innovation

Similarities to and Differences from Existing Models

Some existing models do capture factors that drive organizational innovation. We can see top leadership, systematic innovation capabilities, and some form of collaborative culture resonate over and over (Dahlin 2020; Damanpour 1991; Pedro Carlos Resende Junior, Antonia Regina De Oliveira, and Ricardo Ken Fujihara 2016). Fundamentally, none of those prior models identify the role of the IT staff. We have argued that the IT staff need specific attention among IS researchers, and the specific risk mitigation activities and policy/practices fitting are new major components at the organizational level that prior models have not attributed to them.

LIMITATIONS

This sample of healthcare leaders represents a small slice of one industry. Heathcare is fairly unique in its legal constraints, life or death implications sometimes, and very defined power and control authority during service delivery negotiated between the service organization, insurers, and licensing organizations. The emphasis on specific factors may change significantly in an industry with different characteristics. And, there may be some additional major factors that we have yet to discover were we to capture a larger sample of respondents.

CONCLUSION

We developed and presented a first multi-level model identifying the role and activities of IT staff in organizational technology innovation as organizational level capabilities (Figure 1). The model provides a means for future research to focus on IT staff as a core innovation capability with both exploration and exploitation factors delimited to a parsimonious representation via risk mitigation activities and vendor interaction. For practice the model provides guidance for focusing training, policy support, IT staff role definitions, and organizational assessments to drive more effective organizational technology innovation.

REFERENCES

1. Abdel-Hamid, Tarek K. 1992. “Investigating the Impacts of Managerial Turnover/Succession on Software Project Performance.” *Journal of Management Information Systems* 9(2):127–44. doi: 10.1080/07421222.1992.11517961.
2. Aladwani, Adel M. 2002. “An Integrated Performance Model of Information Systems Projects.” *Journal of Management* Information Systems 19(1):185–210. doi: https://doi.org/10.1080/07421222.2002.11045709.
3. Anderson, Neil, Kristina Potočnik, and Jing Zhou. 2014. “Innovation and Creativity in Organizations A State-of-the-Science Review, Prospective Commentary, and Guiding Framework.” *Journal of Management* 40(5):1297–1333. doi: 10.1177/0149206314527128.
4. Ashkanasy, Neal M., and Alana D. Dorris. 2017. “Organizational Behavior.” in *Oxford Research Encyclopedia of Psychology*. Oxford University Press.
5. Barrett, Michael, Loizos Heracleous, and Geoff Walsham. 2013. “A Rhetorical Approach to It Diffusion: Reconceptualizing the Ideology-Framing Relationship in Computerization Movements.” *Management Information Systems Quarterly* 37(1):201–20.
6. Dahlin, Eric. 2020. “Toward a Relational View of Organizational Innovation: Learning from Previous and Subsequent Stages of Innovation in Large Biopharmaceutical Firms, 1990–2006.” *Prometheus* 36(2):173–97.
7. Damanpour, Fariborz. 1991. “Organizational Innovation: A Meta-Analysis of Effects of Determinants and Moderators.” *The Academy of Management Journal* 34(3):555–90. doi: 10.2307/256406.

8. DeLone, William H., and Ephraim R. McLean. 2003. "The DeLone and McLean Model of Information Systems Success: A Ten-Year Update." *Journal of Management Information Systems* 19(4):9–30. doi: https://doi.org/10.1080/07421222.2003.11045748.
9. Ferratt, Thomas W., Ritu Agarwal, Carol V. Brown, and Jo Ellen Moore. 2005. "IT Human Resource Management Configurations and IT Turnover: Theoretical Synthesis and Empirical Analysis." *Information Systems Research* 16:237.
10. Ford, Cameron M. 1996. "A Theory of Individual Creative Action in Multiple Social Domains." *Academy of Management Review* 21(4):1112–42. doi: 10.5465/amr.1996.9704071865.
11. Glaser, Barney G. 1998. Doing Grounded Theory: Issues and Discussions. Sociology Press.
12. Grover, Varun. 1993. "An Empirically Derived Model for the Adoption of Customer-Based Interorganizational Systems*." *Decision Sciences* 24(3):603–40. doi: 10.1111/j.1540-5915.1993.tb01295.x.
13. Gupta, Anil K., Ken G. Smith, and Christina E. Shalley. 2006. "The Interplay between Exploration and Exploitation." *The Academy of Management Journal* 49(4):693–706.
14. Hitt, Michael A., Paul W. Beamish, Susan E. Jackson, and John E. Mathieu. 2007. "Building Theoretical and Empirical Bridges across Levels: Multilevel Research in Management." *The Academy of Management Journal* 50(6):1385–99.
15. Iacovou, Charalambos L., Izak Benbasat, and Albert S. Dexter. 1995. "Electronic Data Interchange and Small Organizations: Adoption and Impact of Technology." *MIS Quarterly* 19(4):465–85. doi: 10.2307/249629.
16. Jarvenpaa, Sirkka L., Kathleen Knoll, and Dorothy E. Leidner. 1998. "Is Anybody out There? Antecedents of Trust in Global Virtual Teams." *Journal of Management Information Systems* 14:29–65.
17. Karahanna, Elena, Adela Chen, Qianqian Ben Liu, and Christina Serrano. 2019. "Capitalizing on Health Information Technology to Enable Digital Advantage in U.s. Hospitals." *MIS Quarterly* 43(1):113–40. doi: 10.25300/MISQ/2019/12743.
18. Klein, Katherine J., Fred Dansereau, and Rosalie J. Hall. 1994. "Levels Issues in Theory Development, Data Collection, and Analysis." *Academy of Management Review* 19:195–229.
19. Klein, Katherine J., Henry Tosi, and Albert A. Jr. Cannella. 1999. "Multilevel Theory Building: Benefits, Barriers, and New Developments." *Academy of Management Review* 24:243–48. doi: https://doi.org/10.5465/amr.1999.1893934.
20. Lapointe, Liette, and Suzanne Rivard. 2005. "A Multilevel Model of Resistance to Information Technology Implementation." *MIS Quarterly* 29:461.
21. Lee, Cheon-Pyo, and Jung P. Shim. 2007. "An Exploratory Study of Radio Frequency Identification (RFID) Adoption in the Healthcare Industry." *European Journal of Information Systems* 16(6):712–24. doi: http://0-dx.doi.org.library.law.suffolk.edu/10.1057/palgrave.ejis.3000716.
22. Levina, Natalia, and Emmanuelle Vaast. 2008. "Innovating or Doing as Told? Status Differences and Overlapping Boundaries in Offshore Collaboration." *Management Information Systems Quarterly* 32:307–32.
23. March, J. G. 1991. "Exploration and Exploitation in Organizational Learning." *Organization Science* 2:71–87.
24. Pedro Carlos Resende Junior, Antonia Regina De Oliveira, and Ricardo Ken Fujihara. 2016. "Driving Factors of Organizational Innovation." *Journal of Modern Accounting and Auditing* 12(6). doi: 10.17265/1548-6583/2016.06.004.
25. Strauss, Anselm, and Juliet Corbin. 1990. *Basics of Qualitative Research: Grounded Theory Procedures and Techniques*. Newbury Park, CA: Sage Publications.
26. Temizkan, Orcun, and Ram L. Kumar. 2015. "Exploitation and Exploration Networks in Open Source Software Development: An Artifact-Level Analysis." *Journal of Management Information Systems* 32(1):116–50.
27. Thomas, Dominic M., and Robert P. Bostrom. 2010. "Vital Signs for Virtual Teams: An Empirically Developed Trigger Model for Technology Adaptation Interventions." *MIS Quarterly* 34(1):115–42.
28. Thomas, Dominic, and Yurong Yao. 2020. "Supporting Mobile Innovation in the Middle: Hospital IT Manager Attitudes." *Journal of Computer Information Systems* 1–10. doi: 10.1080/08874417.2020.1812132.
29. Tornatzky, Louis G., and Mitchell Fleischer. 1990. *The Processes of Technological Innovation*. Lexington Books.
30. Woodman, Richard W., John E. Sawyer, and Ricky W. Griffin. 1993. "Toward a Theory of Organizational Creativity." *Academy of Management Review* 18(2):293–321.