



MIS Quarterly Research Curation on IT Workforce

IT Workforce Research Curation Team:

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IS researchers have devoted significant attention to the IT workforce since the inception of *MIS Quarterly* (Jenkins and Johnson 1977). From 1977 to 2020, *MIS Quarterly* has published 85 articles that have employed diverse methods for examining the individual, organizational, and market issues tied to staffing the IT function in an organization. These studies illuminate not only how changing technologies and market conditions affect demand for the skills and competencies of IT professionals, but also how they influence the design and career paths associated with IT jobs.

1. Focus of this Curation

This curation provides a review of IT workforce research published in *MIS Quarterly*. We include studies directly investigating how organizations manage the individuals, processes, and labor markets that significantly impact the staffing of the IT function. We organize our review according to two clusters - by wave and by theme.

2. Progression of Research in *MIS Quarterly*

Waves of IT Workforce Research

This curation clusters IT workforce research into three waves: the first wave (1977 to 1990), the second wave (1991 to 2003), and the third wave (2004 to present). Against a backdrop of technological and market changes, each wave employs distinct theoretical approaches that contribute to a cumulative understanding of the motivation, skills, competencies, turnover, and careers necessary to effectively manage IT professionals in organizations. We have also seen an expansion in methods, from primarily case-based approaches to incorporate quantitative approaches including surveys and experiments.

The First Wave (1997-1990): IT as a New Profession

The first wave of studies describes how the skills of IT professionals differ from other professional groups. At this point in time, IT had emerged as a core business function and drove the emergence of the IT profession. Early work on this topic evaluates competencies, responsibilities, and behaviors such as systems analysis (Senn 1978; Vitalari 1985), managerial tasks (Martin 1983; Taggart and Silbey 1979) and information-seeking behavior (Lederer and Mendelow 1987; Zmud 1983). Other research from this era focuses on describing the skills and knowledge required for securing specific jobs such as systems analyst (Green 1989) or IT manager (Beath 1991), and for participating in the IT workforce in general (Benbasat et al. 1980; Cheney and Lyons 1980). Leveraging theories of motivation and job design, this wave of IT workforce research outlines a contextualized model of the motivations (Ferratt and Short 1986) and job satisfaction of IT professionals (Baroudi 1985; Goldstein

and Rockart 1984). This first wave of studies establishes a shared understanding of the roles and skills of IT professionals in that era and explains how they differ from other professionals in organizations.

The Second Wave (1991 – 2003): IT as Strategic Resource

The second wave of IT research builds on this shared, contextualized understanding to explain the evolving demands for IT skills and their implications for organizations. At this point in time, IT was seen as a strategic resource, and research from this period discusses the role of IT in organizations. Researchers identify new skills and roles for high performing IT professionals and IT managers, such as change agency (Markus and Benjamin 1996), user-centricity (Roepke et al. 2000), and information-scanning behavior (Watson 1990). This second wave of studies also illuminates the nature of IT work and roles. For example, Lee et al. (1995) describe a shift toward IT professionals needing not only technical skills but also business knowledge and soft skills. They also explain how IT jobs became more specialized. An analysis of 20 years of job advertisements suggests that while programming and management jobs demand a relatively stable skillset, systems analysts require an increasing level of technical knowledge (Todd et al. 1995). Underscoring the importance of IT workforce research, Mata et al. (1995) connect the skills and abilities of IT managers to broader organizational performance. This second wave of research adds depth to our understanding of the connection between changing IT jobs requirements and broader technology trends (e. g., user-centric development processes) and underscores that IT managers have become a critical organizational resource.

The Third Wave: New Forms of IT Organizations

The third wave of research goes beyond examining the connection between skills and technology, highlighting how changing organizational contexts generate changes in IT work. At this point, IT had primarily served as an organizational enabler for new forms of IT organizations. As traditional organizations increasingly leveraged IT to ensure firm-wide standardization and integration, research responded by examining the evolving role of IT professionals in the workplace. For example, Pawlowski and Robey (2004) developed a model that explains how IT professionals transfer knowledge among nonconnected user communities within the organization. With the emergence of new organizational forms such as online communities and distributed work, research began connecting these new work contexts to skill acquisition (Huang and Zhang 2016) and to a motivation to contribute knowledge (Von Krogh et al. 2012). This third wave of research expands our understanding of the IT workforce in traditional employment relationships and extends it to new organizational forms such as open source communities and online labor platforms (Howison and Crowston 2014; Stewart and Gosain 2006).

3. Thematic Advancements in Knowledge

Across these three waves, IT workforce research has examined five dominant themes: (1) IT professional, (2) IT work, (3) governance, (4) organization policy, and (5) IT careers.

IT Professional

Studies categorized in the *IT professional* theme generally focus on the characteristics of individuals working in IT jobs. Researchers have facilitated a better understanding of the essential and unique characteristics of IT professionals by examining the topics of motivation, diversity, experiences, and turnover. Research on motivation has investigated the differences between non-IT and IT professionals and their needs for social interaction (Couger et al. 1979; Ferratt and Short 1986). Venkatesh et al. (2017), for example, employ a “total rewards” perspective of motivation to examine the consequences of motivation-expectation conformance—including perspectives of extrinsic (compensation and benefits), intrinsic (skill development opportunities), and social (work-life

balance) motivations. In comparison to professionals in quantitative and people-oriented domains, IT professionals appear to be more highly motivated by social and intrinsic rewards.

Research on diversity has examined differences in IT professional characteristics relating to gender, race, and culture. Such research examines how gender differences affect motivation (Venkatesh et al. 2017), career advancement prospects (Igarria and Baroudi 1995), and discrimination (Truman and Baroudi 1994). Other diversity research in IS has identified significant individual differences associated with race (Igarria and Wormley 1992), but not with culture (Couger 1986).

Research on job experiences has focused on certain negative aspects of IT employment, including exhaustion, frustration, and conflict (Armstrong et al. 2015; Barki and Hartwick 2001; Schmitt and Kozar 1978). For example, Armstrong et al. (2015) theorizes exhaustion from IT career experience based on job resources and job demands. Positive aspects include mentorship (Eesley and Wu 2020) and experience for risk assessment (Moeini and Rivard 2019). Other studies have examined how the results of IT work affect IT professionals. For example, while Schmitt and Kozar (1978) identify how IT project failure is related to frustration and, ultimately, turnover behavior, Barki et al. (2001) address predictors of interpersonal conflict in IT project teams and evaluate the team- and individual-level consequences of the associated conflict management.

Research on turnover has examined factors that cause IT professionals to leave organizations (Ahuja et al. 2007; Joseph et al. 2007; Moore 2000; Rutner et al. 2008). Moore (2000) identifies work exhaustion and role stressors as central drivers of turnover intention. Building on work exhaustion, Ahuja et al. (2007) theorize that work-family conflict triggers turnover intention for “road warriors” (defined as IT professionals who spend most of their working time at distant client sites). Rutner et al. (2008) examine the turnover consequences associated with emotional conflicts experienced by IT professionals and extend Moore’s theory using the topics of emotional dissonance and job satisfaction. Based on both a narrative and quantitative review of the literature, Joseph et al. (2007) develop an integrative, contextualized model of IT turnover that combined job-related factors with individual attributes and perceived organizational factors.

IT Work

Studies belonging to the *IT work* theme have examined IT job design, and the competencies and behaviors needed to succeed in the IT workforce. Rather than focusing on the personal characteristics or well-being of IT professionals, the IT work theme addresses the skills, tasks, and actions necessary for success in the IT workforce. IT work studies have described broad characteristics of IT work, such as contracting, knowledge work, and collaboration (Ang and Slaughter 2001; Chen and Edgington 2005; Howison and Crowston 2014). Other research has drilled into tasks performed by IT professionals, including programming, maintenance, and management (Ives and Olson 1981; Kim and Westin 1988; Swanson and Beath 1989). Collectively, these studies underscore that IT work is unique: since skills become obsolescent relatively quickly, IT professionals must adopt a continuous learning “mindshift” or orientation toward mastering new business needs, technological shifts, and ways of developing software (Armstrong and Hardgrave 2007).

Research on competencies has examined technical, business, and management requirements. Articles examining technical competencies required for IT work have focused on articulating the necessary skillsets (Cheney and Lyons 1980; Green 1989; Vitalari 1985). For example, Todd et al. (1995) find that technical skills - e.g., for using personal computers, devices, and networks, as well as operating systems, applications, and networking software - are considered the most dominant skills for IT work. Their study also highlights a high demand for business competencies. Business competencies comprise organization-specific knowledge that is not IT-related, including knowledge

of business processes (Bassellier and Benbasat 2004) and user requirements (Lederer and Mendelow 1987; Senn 1978). Management competencies are also required for managing functions and projects associated with IT work. Examples include generalist skills for problem solving (Benbasat and Vessey 1980) and leadership skills necessary to align with stakeholders (Roepke et al. 2000). Collectively, research on competencies underscores the need for IT professionals to develop flexible skillsets as a means of coping with the changing context of IT work in organizations (Markus and Benjamin 1996).

Governance

Studies focusing on *governance* in the IT workforce have examined the control and coordination of work, addressing the distribution of authority and decision rights concerning IT work within and across organizational units including relevant stakeholders. These studies differentiate between two forms of governance: hierarchical and lateral.

Hierarchical governance studies examine the influence of formal and informal control in software process design and managing IT departments. Brown et al. (1999) articulate multiple formal and informal mechanisms that facilitate cross-unit collaboration in IT units. Jenkin et al. (2019) examine the relationship between IT project governance and mutual team understanding. In a study of formal control, Ply et al. (2012) identify mixed implications of greater structure of IT work - IT professionals report lower stress, but also less professional efficacy and job satisfaction at high levels of output control. In a study of informal control, Chua et al. (2012) find that the enactment of clan control in complex IT projects underscores the importance of social capital and norms.

Lateral governance studies examine specific work designs such as outsourcing and online communities. Outsourcing research has examined the role of knowledge codification in cross-group coordination (Kotlarsky et al. 2014). Other studies have examined mechanisms for governing the interaction of organizations and open source communities (Agerfalk and Fitzgerald 2008). Community-based work designs require specific consideration regarding motivation and collaboration. Several research designs have been employed to examine how the structure of the community affects open source work (Jiang et al. 2019; Maruping et al. 2019). Stewart and Gosain (2006) address ideology as a motivation mechanism in the absence of formal controls and highlight the importance of cognitive trust and communication quality as a driver of open source team effectiveness. Von Krogh et al. (2012) extend research on motivation by proposing that social practice and its supporting institutions mediate between motivation and work outcomes. Recognition serves as another driver of motivation, differentiating between feedback-based and quantity-based recognition as drivers of motivation to contribute (Jabr et al. 2014). Ransbotham and Kane (2011) examine membership retention and develop a model for separating knowledge creation and knowledge retention. Huang and Zhang (2016) find that IT professionals participate in online knowledge communities for two reasons: contributing to the body of knowledge can signal superior expertise in the job market and it can also lead to the acquisition of job-relevant knowledge. Taken together, studies on governance shed light on how formal and informal controls shape the motivation, behavior, and performance of IT professionals in the organization.

Organization Policy

Within the *organization policy* theme, research has examined the build-or-buy question of software development and the consequences of work arrangements for the IT workforce. Research on building software typically examines goal-setting, performance, and different work arrangements, while research on buying software examines relationships with external partners.

Research on building software has investigated work arrangements in software development projects (White and Leifer 1986). Kanawattanachai and Yoo (2007) explain how transactive memory

systems, a central mechanism for successful team work, develop in virtual teams in software development projects. When considered alongside sensemaking, a mechanism for developing and enhancing understanding, transactive memory systems enable virtual work in these teams (Vlaar et al. 2008). Research has emphasized that the arrangement of IT work affects the performance of IT professionals. For example, agile software development methods, such as pair programming, improve job satisfaction of IT professionals and their performance in terms of software quality (Balijepally et al. 2009).

Research on external partner work arrangements has examined the relationship between IT professionals and their workplaces. Regarding relationships with external partners, Ang and Slaughter (2001) evaluate differences between employing IT professionals in contract versus permanent positions. They find that the type of employment arrangement significantly influences in-role and extra-role behaviors and performance. Other studies have examined the consequences of professional development and goal-setting on IT professionals (Igbaria and Baroudi 1995; Mehra et al. 2014; Rasch and Tosi 1992). Mehra et al. (2014) highlight that open source participation can improve the skills of software developers. Research examining the consequences of goal-setting clarifies the importance of job-performance ratings in influencing an individual's chance for career advancement (Igbaria and Baroudi 1995). The studies in the organization policy theme underscore that the performance of IT professionals and the IT organization is shaped not only by how managers arrange IT work, but also by the organization's relationship with its IT professionals.

IT Careers

The *IT careers* theme focuses on research topics covering the demands and structure of IT job markets. For career demands, Mehra et al. (2014) examine the consequences of open source participation in labor markets. They show that organizations benefit from the open source participation of IT professionals by positively linking training investments to increased revenue per employee. When researching the structure of careers in the IT workforce, studies have highlighted the positive consequences of fit between the person and job in terms of career orientations such as career advancements and work quality (Igbaria and Baroudi 1995; Shore 1983; Venkatesh et al. 2017) and the negative consequences of misfit between the person and job characteristics, such as exhaustion and turn-away intentions (Armstrong et al. 2015).

Research on career paths highlights the gradual expansion of career opportunities for IT professionals. Igbaria et al. (1991) suggest a dual-path model for IT careers: a technical career pursued by programmers, developers, and architects, and a managerial career pursued by managers and analysts. Reich and Kaarst-Brown (1999) extend this view by articulating a career path from IT into non-IT business-unit positions. More than just becoming IT managers or technical specialists, their work suggests that IT professionals could also pursue careers in related occupations. Some IT professionals might pursue secondary labor-market careers and work in lower-tier jobs - e.g., clerical, craft, or production (Joseph et al. 2012). Across these career paths, research suggests that continuous learning and flexibility can improve job performance and create opportunities for career advancement (Huang and Zhang 2016).

4. Conclusion

Because it is central to the performance of the IT function in organizations, IT workforce represents an enduring theme of scholarship for the *MIS Quarterly*. Against a backdrop of technological and market change, this curation highlights five IT workforce research themes as central: IT professional, IT work, governance, organization policy, and IT careers. From a historic tradition that drew on behavioral, organizational, economics, and design perspectives, IT workforce research is well-

positioned to conduct integrative, multi-level studies that span these conceptual and empirical research traditions. This is particularly important in a diverse world where IT is continuously advancing and expanding into the domains of other professional work.

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