

Human Capital of IT Professionals: A Research Agenda

Panel

Abstract

Information Systems researchers have studied various aspects of the role of human capital in the IT workforce such as the definition of IT professionals, human resource practices for managing IT professionals, returns to human capital, human capital and innovation in IT industries, and turnover among IT professionals. This panel argues that the field is at crosswinds of change due to factors such as rapidly changing technologies, organizational processes, technology delivery mechanisms such as cloud computing, new forms of organization such as virtual teams and social networks, outsourcing, offshoring, globalization, and a new generation of IT professionals entering the workforce. These changes in the environment for IT work will affect the roles, jobs, skills and careers of IT professionals and will prompt more inquiry from IS researchers in two main directions: one, some findings from prior research may not hold in this new environment and scholars will need to reexamine these. Two, these changes will raise additional issues, and call for new research on IT human capital. The objective of this panel is to present a framework to identify important trends and changes that will impact IT professionals and to define an agenda for future research on IT human capital.

Keywords: *human capital, IT professionals, research directions*

Introduction

“The most valuable of all capital is that invested in human beings” – Alfred Marshal (1920). This quote holds true especially in Information Technology (IT) occupations because IT is a knowledge intensive function, and people are an integral part of production, development, and management of IT. It is generally accepted that IT jobs are complex, and require knowledge of difficult and abstract concepts which are sometimes hard to monitor and measure. Agarwal and Feratt (2002) note that human capital issues are especially challenging in the IT industry because the pace of technology constantly shifts the required skill-sets, and renders existing skill-sets obsolete. While human capital theory (Becker, 1965) suggests that skills improve with experience, this may not hold for IT skills which experience a decline due to fast changing technology and threat of obsolescence. Researchers such as Luftman et al (2006) and Brancheau et al (1996) suggest that workforce is the top issue facing IT executives.

Therefore, it is not surprising that researchers in Information Systems (IS) have extensively conducted research on topics related to professionals in the IT workforce. In Table 1, we group the existing research in IT human capital into broad categories, and also highlight the main issues that have been studied in each category as well as key references for the same.

Topic	Sample Research Questions	References
Definition	<ul style="list-style-type: none"> • Who is an IT professional? • How do IT professionals act as knowledge brokers in organizations? • What are the key skills and knowledge requirements of IS professionals? 	<ul style="list-style-type: none"> • Kaast-Brown, Guzman 2005 • Pawlowski and Robey 2004 • Lee, Trauth, and Farwell (1995) • Gallagher et al 2010
Careers in IT	<ul style="list-style-type: none"> • Does the dichotomy of career paths – technical versus managerial – still hold for IT professionals? • What are the dynamic career orientations of IT professionals? 	<ul style="list-style-type: none"> • Joseph et al (2005) • Ginzberg and Baroudi (1988)
Compensation	<ul style="list-style-type: none"> • What is the impact of human capital on compensation earned by IT professionals? • Do incumbent employees receive corresponding increases in compensation for their tenure at a particular organization? • Do MBA education and IT experience provide value for IT professionals? 	<ul style="list-style-type: none"> • Ang, Slaughter, Ng 2002 • Slaughter, Ang and Boh (2007) • Mithas and Krishnan (2008)
Training and Outsourced IT service providers	<ul style="list-style-type: none"> • What is the impact of training on employee performance in IT outsourcing firms? • What is the impact of employee training on firm performance in IT outsourcing firms? • Which indicators of ability (technical or functional) are relatively more important for vendors who provide software services through e-markets? 	<ul style="list-style-type: none"> • Bapna et al (2009) • Bapna et al (2010) • Banker et al (2010)
Innovation and R&D	<ul style="list-style-type: none"> • Does employee education lead to higher R&D productivity in IT firms? • What is the role of ability in individuals’ decision to become entrepreneurs vis-à-vis scientists in the IT industry? 	<ul style="list-style-type: none"> • Banker et al (2008) • Wattal and Plehn-Dujowich (2010)
Gender	<ul style="list-style-type: none"> • How do factors in the workplace affect the experience of women IT professionals? • What is the impact of Millennials’ intense interaction with IT on 	<ul style="list-style-type: none"> • Trauth et al (2009) • Trauth et al

	<p>gender stereotypes in the IT workforce?</p> <ul style="list-style-type: none"> • Will women receive lower salaries than men, even when controlling for other human capital factors that may explain the salary inequities? 	<p>(2010)</p> <ul style="list-style-type: none"> • Truman & Baroudi (1994)
IT staffing challenges	<ul style="list-style-type: none"> • How do IT leaders' view the current and emerging market for IT professionals? • What HR practices are followed by industry leaders to meet the challenges in IT labor markets posed by rapidly changing technology and transformation of IT function in organizations? • How do firms ensure that IT professionals have skills needed to compete in an environment of technical and business uncertainty? • What factors motivate different levels of IT managers? 	<ul style="list-style-type: none"> • Luftman and Kempaiah (2007) • Agarwal and Frett (2002) • Schwarzkopf et al (2004) • Couger et al (1979)
Turnover and Burnout	<ul style="list-style-type: none"> • What is the impact of turnover on internal labor market in IT firms? • What factors determine the turnover intentions of IT professionals? • What is the role of exhaustion in turnover intentions of IT professionals? • What are the different routes through which IT professionals leave current employment? 	<ul style="list-style-type: none"> • Slaughter and Ang (2004) • Igbaria and Greenhaus (1992) • Moore (2000) • Niederman et al (2007)
HR Strategies	<ul style="list-style-type: none"> • What is the right HR strategy for managing IT professionals? • How can IT leaders develop a workforce that is capable of fulfilling a strategic role? 	<ul style="list-style-type: none"> • Agarwal and Frett (2001) • Roepke et al (2000)

Controversial Issues and Panelist's positions

Despite extensive research on human capital in the IT profession, the work in this dynamically evolving field is far from over. Forces such as rapidly changing technologies, turbulent markets, new technology delivery mechanisms such as cloud computing, new forms of organization such as virtual teams and social networks, outsourcing, offshoring, globalization, and new generations of employees entering the IT workforce are constantly changing the IT landscape and impacting the job profiles and roles of IT professionals. As a result, findings from prior research which studied IT workers years ago may not be applicable in this reconfigured work setting. The forces of change also create additional research opportunities by raising new issues and calling for fresh perspectives in research on IT human capital. Following is a brief summary of how the panel will discuss each of these issues:

- The panel will first discuss how the evolving context for IT work affects the roles that IT professionals play in their organizations and argue why current research provides insufficient insight. Some IT roles may disappear; others may change; and new roles are likely to emerge. For example, the strategic importance of IT as a tool for innovation as well as for automation increases the need for IT workers in today's environment to contribute toward business innovation; top-line growth through newer information based products, processes and services; and improving internal knowledge flows. While technologies such as cloud computing and forces such as global sourcing are shrinking the "empire" of the IS/IT organization within many firms, cutting-edge companies may use the extra capacity for front-line business innovation through analytics, social media and other technologies. Therefore, the next generation IT worker may need to play a more strategic than technical role to facilitate the linkage between technology and business at a whole new level. Outsourcing, offshoring, and globalization, are other examples of changing contexts for the sourcing of IT work that have dramatic implications for IT roles and jobs. For example, IT workers may need to play boundary-spanning roles that cross not only boundaries within a firm, but also cross organizational, geographic and national boundaries. Current conceptualizations of IT professionals fulfilling traditional technical roles may be insufficient to describe the breadth of activities that these professionals must now accomplish.

- The new and changing roles of IT professionals have profound implications for the human capital (knowledge, skills and abilities or KSAs) that these professionals must have. The panel will discuss how new KSAs may be required and how this involves a re-examination of the traditional profiles of an IT worker. For example, early research suggests that IT professionals are likely to be introverted (Smith, 1989) and have a low social need (Couger et al, 1979). However, with IT playing a strategic role in firms, and individuals with both technical and non-technical (e.g. MBA) backgrounds joining the IT workforce, it is likely that the personality characteristics of the typical IT professional could be different than what research conducted several decades ago would predict. In addition, trends in globalization and the use of cross-cultural teams suggest that IT professionals may require new KSAs such as “cultural intelligence”, i.e., the ability to function effectively in situations characterized by cultural diversity (Ang, Van Dyne, & Koh, 2006). The panel will discuss the need to reexamine such areas where the results of prior research may not be applicable and new research may be needed to understand new skill requirements in the evolving work environment of IT professionals.
- Given the need for new KSAs driven by the emerging and changing roles of IT professionals, the panel will propose a closer investigation into the heavy reliance on use of training by firms to augment the skills of IT workers. The rapid proliferation of technology has also created a huge gap between the demand and supply of relevant skills for IT jobs even in advanced economies such as the United States. This gap is even larger in countries such as India where the quality of the educational system provides few graduates who are directly employable. Employer provided training is emerging as a popular option for complementing the educational system. However, the increasing importance of training calls for new research in several areas: one, research should examine the incentives for firms to provide training to employees, especially in general skills which the employees can easily transfer to other employers if they change jobs. Two, prior research does not examine the impact of different types of training (general versus specific, technical versus business related) on employee and firm performance. Finally, in countries such as India, ecosystems consisting of IT firms and universities are emerging which develop a training curriculum for IT personnel. Research is also needed to examine this linkage between university education and corporate training, and how the two can both complement and substitute each other. Finally, the growing importance of training also calls for research on returns to training at the firm level.
- Finally, the panel will discuss how the changing external and internal contexts and roles in IT are affecting the careers of IT professionals and will identify IT careers as a promising new area of research. MIS scholars have traditionally talked about two main career paths – technical and managerial. However, forces of change in the industry such as outsourcing, globalization, interdisciplinary teams, and inter-organizational systems are expected to lead to a broader set of career paths for IT professionals. It is believed that IT roles are transforming into boundaryless careers which span both organizational and occupational boundaries. Skills such as contract enforcement and vendor management are taking center stage for IT managers as companies source their IT requirements from vendors or use alternate software delivery mechanisms such as cloud computing. One would expect that IT professionals are exposed to cross disciplinary functions within a firm and would find career opportunities outside the IT functions. Research is needed to study the movement of professionals into and out of the IT workforce. Anecdotal evidence suggests that IT leaders such as the CIO are often drawn from non-technical fields.¹ The panel will also discuss the relative effectiveness of professionals with technical versus non-technical backgrounds in IT leadership roles. In addition, the panel will propose for research on new roles in IT. While the popular press is awash with stories on IT entrepreneurs in places such as Silicon Valley, Boston, and Bangalore, very little research in MIS exists on IT entrepreneurs and innovators. Therefore, we also propose the following research questions as deserving a more thorough analysis in future: how do uncertainty and fast pace of technological change impact individuals’ willingness to choose an entrepreneurial career in IT? How well do observable signals of ability such as education and test scores measure the true skills of IT entrepreneurs? How does existing human capital and IT research

¹ <http://www.silicon.com/management/cio-insights/2006/10/18/will-your-next-cio-be-a-non-techie-39163307/>

which is conducted in context of wage-earning employees explain the motivations and traits of IT entrepreneurs?

Panel Structure

The panel will proceed as follows: the moderator will begin by providing a brief summary of the important trends that are affecting IT professionals and human capital issues in IT. This sets the stage for the basic premise of the panel which is that the external and internal contexts in which IT professionals are embedded are changing in ways that are profoundly affecting the jobs, skill requirements and careers of IT professionals, and thus that new research on IT human capital is needed (Ang and Slaughter 2000). The panel will then argue how the changing context of IT work will alter the roles and job requirements for IT professionals. These changes which will in turn affect the knowledge, skills and abilities (KSAs) that IT professionals must have, and the panel will turn to that topic next. The new KSAs have implications for training, which will be discussed, as well as for IT careers, and the panel will address the topics in that sequence. Subsequent to that, the moderator will open the floor to the audience for questions. Finally, each of the panelists will list their concluding thoughts, and the moderator will summarize the main points of the panel discussion, especially highlighting the areas of future research that emerged during the discussion.

In addition, the moderator will create a twitter hashtag for the panel, where audience members can submit questions and real-time feedback on the panel discussion. Questions from this twitterfeed will be monitored continuously and presented to the panel members during the question and answer session.

Biographies of Panelists

Dr. Soon Ang is the Goh Tjoei Kok Chair Professor in International Management & IT at the Nanyang Business School, Nanyang Technological University, Singapore. She is a recognized world authority in global leadership; outsourcing; and cultural intelligence, international organizational behavior, outsourcing, and IT talent management. Dr Ang has won numerous prestigious Best Paper awards at the Academy of Management Meetings; the Hawaiian International Conference on Systems Sciences (HICSS), and the Association of Computing Machinery conferences. She has published in Academy of Management Journal, Social Forces, Communications of the ACM, Information Systems Research, Journal of Management, Journal of Organizational Behavior, Management Science, Organization Science, MIS Quarterly, and others. She is senior editor of Information Systems Research, associate editor of Management Science and Decision Sciences, and is on editorial boards of Organization Science, Journal of Organizational Behavior, Management and Organization Research (MOR), and others.

Dr Ang's publications related to human capital and IT include "Firm-specific human capital and compensation-organizational tenure profiles: An archival analysis of salary data for IT professionals, in Human Resource Management (2007), and "Human capital and institutional determinants of information technology compensation: Modeling multilevel and cross-level interactions" in Management Science (2002).

Dr. Rajiv D. Banker is the Merves Chair and Director of the Center for Accounting and Information Technology at the Fox School of Business, Temple University. Previously, Dr. Banker has served as the Anderson Chair and Dean at the Anderson School of Management at the University of California, Riverside, the Ashbel Smith Chair in Accounting and Information Management, Director of Accounting and Information Management Programs, Director of Center for Practice and Research in Software Management and Director of Center for Excellence in Asian Management at the University of Texas at Dallas (with joint appointments in the accounting and information management, and information systems and operations management areas), Professor of Accounting and Management at Carnegie Mellon University and the Arthur Andersen Chair in Accounting and Information Systems at the University of Minnesota..

Dr. Banker is internationally recognized as a leader in interdisciplinary research in management, and his work has appeared in several leading journals such as MIS Quarterly, Information Systems Research, Communications of ACM, IEEE Transactions in Software Engineering, Academy of Management Journal,

Strategic Management Journal, and *Econometrica*. His research interests include alignment of human capital with business value in IT firms, investments in information technology, software productivity and quality metrics, and management of software development and maintenance. His research on human capital and IT has appeared in journals such as *MIS Quarterly* (titled “CIO Reporting Structure, Strategic Positioning, and Firm Performance”), and presented at ICIS 2008 (titled “Value Contributed by Education in IT Firms”).

Dr. Ravi Bapna is the Board of Overseers Professor of Information and Decision Sciences Department at the Carlson School of Management, University of Minnesota. He also serves as the Executive Director of the Srinu Raju Centre for Information Technology and the Networked Economy (SRITNE) at the Indian School of Business. He served as an associate editor for *MIS Quarterly* and Information Systems Research. Professor Bapna helped launch and serves on the board of the Accenture Management Development Academy in India. He is a member of the Nasscomm Innovation Institute, a think-tank to foster innovation in the Indian IT/ITeS industry.

Dr Bapna’s research examines the impact of training on performance at both individual and firm level in the context of offshore IT services. His work in this area has been supported by grant from leading IT services corporations and he has been presented the following papers at international conferences: “Returns on Human Capital Investments in Offshore IT Services Industry: A Firm Level Analysis” at SCECR 2010, ‘Does Training Improve Performance of Offshore IT workers’ at SCECR 2009, and ‘Human Capital Strategies for Offshore IT Service Firms: On Employability and Attrition’ at Global Sourcing Workshop, 2009

Professor Sandra A. Slaughter is a member of the information technology management faculty and holds the Alton M. Costley Chair. Professor Slaughter currently serves or has served as a Departmental Editor for *Management Science*, Information Systems Department; Senior Editor for *Information Systems Research* (including co-editing a special issue of this journal); and for *Production and Operations Management*. Prior to her academic career, Professor Slaughter spent ten years working as an information technology (IT) analyst and project leader in several leading technology companies. Her research builds upon her practical experience in IT development and focuses on productivity and quality issues and on effective management of IT professionals, as well as compensation, skills and careers of information technology professionals.

Dr Slaughter has extensively published on topics related to human capital and IT. Her publications in this area include “Human capital and institutional determinants of information technology compensation: Modeling multilevel and cross-level interactions” and “Practical Intelligence in IT: Assessing the Soft Skills of IT Professionals”. Her work titled "Why Developers Participate in Open Source Software Projects" won the Best Theme Paper Conference Award at the ICIS conference in Washington, D.C.

Dr. Sunil Wattal, who will moderate this panel, is an Assistant Professor in MIS and Director of the Center for Business Intelligence Programs and Research at the Fox School of Business at Temple University. He completed his PhD from the Tepper School of Business at Carnegie Mellon University. He also holds a Bachelors in Engineering from BITS Pilani (India), an MBA from IIM Calcutta (India), and an MS (Industrial Administration) from Carnegie Mellon University. Dr Wattal's research focuses on the link between human capital and innovation in IT firms, social media in organizations and politics, and outsourcing IT skills through electronic markets. His work has been published or forthcoming in top academic journals such as *Information Systems Research*, *MIS Quarterly*, *Journal of Management Information Systems*, and *IEEE Transactions of Software Engineering*, as well as presented at numerous international conferences.

Dr Wattal has presented multiple papers on human capital and IT at conferences including the following papers at ICIS – “Value Contributed by Education in IT Firms” and “Is Bill Gates the Exception or the Norm – Role of Human Capital in Occupation Choice in IT Industries”, and at AMCIS - “Signaling Mechanisms and Survival of Service Providers in an Electronic Market”.

Participation Statement

All panelists agreed to be part of the panel, and indicated they will register and be present at the ICIS 2011 conference

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