

Global and Virtual Teamwork

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Although globalization has been a political and economic concern for centuries (see *Distributed Work*, reviewed below) its impact on the engineering education community has become particularly salient since the publication of the *Engineer of 2020* (NAE, 2003), *Educating the Engineer of 2020* (NAE, 2005) and *The World is Flat* (Friedman, 2005). These and subsequent publications have emphasized the critical need to train globally competent engineers. Academics, practitioners, and policy makers alike have realized that solving the critical problems facing the world today will require close collaboration among engineers from around the world. Not surprisingly, educational institutions are investing significant resources to train students through a multi-pronged approach. These efforts include opportunities for international activities such as study abroad, student exchange, or international research experiences; virtual or online classes offered between institutions in different geographic locations; and, introduction of content about globalization within existing curricula or as new courses. Although these efforts are noteworthy and have met with some success, none of these efforts directly prepare students for the global workplace. One of the primary characteristics of the global workplace is global or virtual teams—teams that are spread across different geographic locations and in which team members collaborate primarily using information technology. To assist engineering educators involved in preparing students for the global workplace—and those interested to learn more about global and virtual teams in general—this review will look at four offerings: a collection of largely theoretical and empirical articles on distributed work (*Distributed Work*); a collection of theory-informed articles targeted towards practitioners (*Virtual Teams That Work*); a detailed social theory based ethnographic study of software engineers working as members of virtual teams (*Virtual Migration*); and a textbook comprised of readings and cases on working internationally (*International Management Behavior*). The books reviewed here are primarily from the management and social sciences areas, an indication that research on global and virtual engineering teams is lacking, and add significantly to our understanding of how to work on global and virtual teams.

Distributed Work

By Pamela J. Hinds and Sara Kiesler (Editors)
MIT Press, 2002, 475 pages

Distributed Work is a volume edited by Pamela J. Hinds and Sara Kiesler and consists of 18 chapters divided across 5 sections. Section 1, History of Distributed Work, consists of two chapters.

In chapter 1 the authors (King and Frost) argue that managing work across distances requires conscious ambiguity to allow local interpretations (they use the Roman Catholic Church and constitutional governance as illustrative cases). Chapter 2 (O'Leary, Orlikowski, and Yates) is a historical study of the Hudson Bay Company and its operations from 1670–1826 and looks specifically at issues of establishment of communication norms and subsequent trust and control that develops over distances. Together, chapters 1 and 2 provide a useful historical background and help the readers realize that global work is not a novel phenomenon but a centuries old tradition that is undergoing significant shifts due to recent advances in information technology. Section 2, Lessons from Collocated Work, consists of four chapters. Chapter 3 (Kiesler and Cummings) is a review of the literature on proximity and distance in work groups that leads the authors to argue that cohesive teams benefit more from technology than those teams that are not cohesive. Chapter 4 (Nardi and Whittaker) emphasizes that face-to-face has a unique role to play even in the era of distributed work, and Chapter 5 (Olson, Teasley, Covi, and Olson) looks specifically at the unique advantages of collocated work. Chapter 6 (Kraut, Fussell, Brennan, and Siegel) reviews work on proximity to identify the opportunities presented by technology to support remote collaborative work. Taken together, the papers in section 2 situate the research on distributed work in the literature on proximity and collocated work. Section 3, Group Process in Distributed Work, is the longest section with six chapters. Chapter 7 (Armstrong and Cole; Armstrong and Peter) is an excellent review of issues that arise in geographically distributed work and provides a perspective from the viewpoint of practitioners. It does a good job of identifying the numerous issues that arise when teams are spread across distances and are culturally diverse. Chapter 8 (Cramton) looks at the concept of attribution and explains how lack of contextual information leads to personal misattributions. Chapter 9 (Mannix, Griffith, and Neale) discusses the concept of conflict, Chapter 10 (Walther) looks at the effect of temporal differences in computer-mediated groups, and Chapter 11 (Mark) looks at conventions for coordination in distributed work groups. The last chapter in this section, Chapter 12 (Mortensen and Hinds), asks us to reconsider our notions of teams and teamwork. It argues that with ever increasing number of teams in workplaces that are spread in different locations, workers often have a very fuzzy conception of what their team is like and even who is on their team. Section 4, Enabling Distributed Work, consists of four chapters that each provides a way in which distributed work can be enabled through the use of technology and processes. Chapter 13 (Weisband) argues for maintaining awareness of team members and their activities across locations. Chapter 14 (Hollingshead, Fulk and Monge) advises an integrated view of transactive memory and public goods approaches to foster knowledge sharing. Chapter 15 (Finholt, Sproull, and

Kiesler) looks at how electronic archives can be used to connect distant employees to seek and provide technical help. Chapter 16 (Moon and Sproull) is a case study of the Linux Kernel and argues that open source software development provides one of the most successful examples of distributed work. Section 5, Distributed Scientific Collaborations, is the last section and consists of two chapters. Chapter 17 (Schunn, Crowley, and Okada) looks at successful distributed collaboration in the cognitive science community whereas Chapter 18 (Walsh and Maloney) draws lessons from scientists in four different fields: biology, mathematics, physics, and sociology.

The value of this book lies in the theoretical and analytical framework offered in the different chapters which introduce the reader to a vocabulary that is useful for having a conversation about issues that are critical for distributed and virtual work. The book is also useful for those who are interested in conducting research in this area. Chapters from this book can be used to frame discussions in class, supported with cases and more applied readings.

Virtual Teams That Work: Creating Conditions for Virtual Team Effectiveness

By Cristina B. Gibson and Susan G. Cohen (Editors)
Jossey-Bass, 2003, 436 pages

Edited by Cristina B. Gibson and Susan G. Cohen, *Virtual Teams That Work* consists of 18 chapters divided across 5 parts. Each part starts with an Introduction and ends with a Summary. Part 1 of the book, Establishing the Foundation: Shared Understanding, Integration, and Trust, consists of 3 chapters that address the need for knowledge sharing and development of shared understanding in virtual teams (Chapter 2, Hinds and Weisband), sense making in global teams (Chapter 3, Mohrman, Klein and Finegold), and building of trust through multicultural communication in virtual teams (Chapter 4, Gibson and Manuel). Part 2 of the book, "The Raw Materials: People and Context," contains three chapters that focus on how to build a virtual team (Chapter 5, Blackburn, Furst and Rosen), pay system for virtual teams (Chapter 6, Lawler III), and how to meet the performance challenge of virtual teams by calculating return on investment (Chapter 7, Levenson and Cohen). Part 3 of the book examines how to design virtual teams for better performance. The three chapters in this section address issues of leadership (Chapter 8, Tyran, Tyran and Shepherd), using social networks and social capital (Chapter 9, Maznevski and Athanassiou), and overcoming barriers to information sharing (Chapter 10, Cramton and Orvis). The fourth part of the book discusses how to use information technology in a positive manner in virtual teams. The three chapters in this part look at the evolution of technology use in global virtual teams (Chapter 11, Riopelle et al.), alignment of technology use and its adaptation when virtual teams are involved in unstructured knowledge work (Chapter 12, King and Majchrzak), and how tasks, work structures, and technologies should be aligned to develop either a team based or a community of practice based virtual team (Chapter 13, Raven). The last part of the book consists of four chapters that examine processes and development of virtual teams—the action. Chapter 14 discusses influence and political processes in virtual teams (Elron and Vigoda), Chapter 15 looks at conflict among members of a virtual teams (Griffith, Mannix and Neale), Chapter 16 is a longitudinal study that

discusses the development of global virtual teams (Gluesing et al.), and Chapter 17 talks about closing the time gap in virtual teams (Klein and Kleinhaus). The last chapter in the book, Chapter 18, is conclusions and implications (Gibson and Cohen).

Some of the more useful aspects of this book, in terms of using it in courses, are the implications section and also the numerous tables and graphs that accompany the chapters in the book. Within these chapters are nuggets of useful concepts such as kinds of teams (p. 252) and so on. These can be used as tools in classes for discussion and for summary of learning that can be taken by students. Chapters in this book complement concepts and chapters from the *Distributed Work* book. Unlike *Distributed Work*, this text is more applied in its approach and each chapter ends with an "implications for practice" section that provides useful guidance on how to apply the principles discussed in the chapter in actual work practice.

Virtual Migration: The Programming of Globalization

By A. Aneesh
Duke University Press, 2006, 194 pages

A. Aneesh's *Virtual Migration* is an in-depth study of software programmers whose skills are migrated across national borders without their physical migration. Drawing on sociological theory, particularly sociology of science, and research on migration and global labor flows, Aneesh presents a vibrant picture of the practice of virtual work. This book is particularly relevant for engineers, and those interested in studies of technology more generally, as it lays out the critical role of the artifacts designed by engineers in how their own work is reorganized by their creations. Moving beyond the role of information technology in communication and collaboration—technologies we usually associate with virtual work such as e-mail and phone—Aneesh examines the role of the software code itself in shaping the work structure. This "rule of code," he argues is critical to understanding the process of virtual work, "It is code that has gained the ability to structure possible forms of work behavior with reduced dependence on human authority relations" (p. 102). The findings are based on field research carried out in India and the USA between January 1999 and June 2000 in multiple phases. Data were collected through a multi-method approach incorporating nonparticipant observations, ethnographic interviewing, and analysis of legislative and trade documents.

The book consists of seven chapters, including the introductory chapter "Of Code and Capital" which provides a quick background and what follows in the book. The author also provides a brief exposition of the methods used for research in Appendix A and several data tables in Appendix B. In Chapter 2, Programming Globalization: Visions and Revisions, the author situates his work with the larger sociological literature on globalization and migration. He argues that present day drive to globalize follows historical technology initiated modes of integration—such as telegraphy and railway—that led to the integration and establishment of nation-states such as India. Now, integration is across borders and with or without physical transfer of labor, it is virtual. Chapter 3, Body Shopping, provides a window on the practice of bodyshopping or physical transfer of programmers and sets up a useful contrast with the core contribution of the book and helps us understand the overall nature of global software programming work and industry. In Chapter 4, Virtual Migration, the author discusses the concept

of virtual migration and provides an analysis of changes in the workplace—digitization of work—that enables work to be performed from anywhere. This has meant that economically migration cannot be seen as physical movement of workers but the process of migration of the actual work. I consider Chapter 5, Actions Scripts: Rule of the Code, the most innovative contribution of this work, especially from an engineering perspective. In this chapter Aneesh outlines his contribution specifying the emergence of programming as the most important aspect of virtual migration. He calls the rule of the code “algocratic governance.” Code plays an important role in organizing power structures in the various applications themselves through the sequencing and embedding of possible choices or lack of them. Chapter 6, Code as Money, outlines Aneesh’s argument that we can think of code in the same manner that we think of as money—“they provide liquidity to labor and merchandise through symbolization.” Chapter 7, Migrations: Nations, Capital, and the State, provides a broader perspective and links discussion of code and virtual migration to larger issues of nation, state, capital, and globalization.

At its core, this is a sociological study framed within the perspectives of global labor flows, migration, and immigration. It provides a unique view from the perspectives of Indians who work as virtual migrants and even actual migrants. Often rhetoric takes over the actual practice and we need, as educators and researchers, an understanding that goes beyond media sound bites. This work provides us with a window on those practices in a unique and accessible manner. Although more useful for graduate courses, certain chapters are feasible for undergraduate courses as well. In addition to courses on global work this is also a good read for software engineering and computer science courses to help prepare students for professional practice. It is important for engineers to develop an understanding of how their work artifacts affect their work structures and processes and how the output of their labor—artifacts created by them—in turn shape the context in which they work. As more and more engineering work gets digitized, the ideas presented here will be relevant to disciplines beyond computer science.

International Management Behavior: Leading with a Global Mindset, Sixth Edition

By Henry W. Lane, Martha L. Maznevski, Joseph J. DiStefano and Joerg Dietz

John Wiley and Sons, 2009, 410 pages

Of the four books reviewed here, this is the closest to a traditional textbook. A highly popular textbook, the 6th edition is a major revision and has resulted in a new format and includes new chapters and cases. The book consists of 9 chapters and 12 case studies. The chapters in the book move progressively from individual and team issues to larger firm and corporation level issues. But as the authors point out in the introduction, the focus of this book is on people who conduct business globally. Specifically, this book focuses on typical situations encountered by managers and their decisions, successes, failures, and rewards. Although at the first glance this book does not seem very applicable to the engineering curriculum, I think that it includes many important lessons that engineers who plan to work in and lead global teams should be aware of. Since this is a textbook, over the past 40 years the authors have been able

to perfect the content of the book in terms of its applicability for teaching and learning, and its relevance to practice. The authors draw on research in the literature as well as their own primary research conducted with global firms and workers across the world.

Chapter 1, which is also Part 1 of the book, introduces the concept of the global mindset and outlines capabilities needed to be a global manager. Part 2 of the book consists of three chapters and focuses primarily on the individual and interpersonal side of global management. From the perspective of using this text in my course, this is the section I believe is the most useful. For instance, Chapter 2 on intercultural effectiveness does a great job of talking about culture not only in its usual connotation of national culture but shows that the concept of culture is shifting and the often promulgated differences among national cultures might not exist or slowly shift. I found the MBI (map-bridge-integrate) model presented in Chapter 3 the most useful concept in the book—easily accessible to students at both the undergraduate and graduate level. As I have argued elsewhere, teaching students the strategy to be able to perceive other peoples’ perspectives and then develop practices that can take those into account is one of the most critical ways for working successfully on global teams (Johri, 2009). The MBI model is the authors’ way of showing how to achieve that. First, we need to understand the differences that exist (Map). Next, we communicate across the differences (Bridge). Finally, we manage those differences via integrating our perspectives. Of course, this is easier said than done and this is where the case studies in the book are helpful. Chapter 4, Managing Global Teams and Networks, provides an interesting perspective through the discussion of social networks and social capital and also includes a section on virtual teams (p. 102–108). There are five cases following this part of which Case 4 (Charles Foster Sends an Email) and Case 5 (The Leo Burnett Company Ltd.: Virtual Team Management) are particularly useful in conjunction with the chapters in that section. The next section, Part 3, moves the discussion from individual issues to organization level issues. The chapters in this section are not very applicable to engineering courses but still there are several interesting sections and cases that can be used while teaching. Chapter 5 focuses on strategy execution and Chapter 6 discusses the challenges facing managers while recruiting and developing talent for their teams. The “war” for talent is increasing around the world and an understanding of how to train and prepare for international assignments and draw more women and underrepresented demographics is crucial. Chapter 7 provides a basis to understand how to manage change. This chapter provides a good understanding of how to assess if change is needed and how to prevent a crisis by anticipating change. The cases that follow Part 3 do a good job of exposing students to the organizational and firm level issues in different countries in Europe and in Chile, China, and South Korea. The case on living and working in Korea from a woman’s perspective is especially unique and interesting. The last section of the book, Part 4, provides something unique when compared with other texts that are reviewed here—a look at individual and corporate level ethical issues. The authors discuss differences between ethical and legal issues and issues of corruption, including a case study (Case 10). Overall, this text provides an amazing array of tools for instructors that they can use as part of their courses. Using case studies, a popular method in business schools, is an extremely useful way of teaching interpersonal issues and this text provides some useful ones.

SUMMARY

Some common threads appear in these books. All four texts argue that working in a global context and on virtual teams is a complex activity and many diverse aspects have to be taken into account by workers in such environments. Whereas *Distributed Work* and *Virtual Teams That Work* primarily provide a social psychological perspective on this process, *Virtual Migration* draws more on sociological theories, and *International Management Behavior* is based in the organizational management and behavior literature. Most critically, these books provide a good understanding of concepts and issues that are equally applicable to global and virtual work irrespective of the disciplinary or organizational context. Workers need to have common ground and mutual knowledge and build trust. They have to avoid conflict and be mutually aware of each others' activities. Use of technology is paramount to the success of dispersed teams but the understanding of the role of technology should not be limited to communication technologies but encompass the tools of labor as well—the technologies that mutually constitute work practices. As educators, it is critical that we provide students with a realistic view of the industry in which they are going to participate. Global and virtual teams are a workplace reality and these four texts do an excellent job of providing both a pragmatic and analytic journey through the workplace. Students not only learn what it is like to work, but also how to shape their work environment in positive ways. As can be seen, neither the readings nor the cases are about engineers or

engineering firms. These texts suggest a direction for future research by engineering educators: global *engineering* work practices or how engineers work with each other in global firms. The need for research in this area is echoed in the *Global Engineering Education Initiative* report (2006), "[T]here is a significant lack of knowledge about proven theories and effective practices for instilling global competence [and]... increasing the knowledge base of proven theories and effective practices for instilling global competencies in engineering graduates...needs to be a major priority" (p. 41–42).

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