CHAPTER TWO

THE EVOLUTION OF SOCIAL INFORMATICS RESEARCH (1984-2013): CHALLENGES AND OPPORTUNITIES

Introduction

Social informatics (SI) is "the interdisciplinary study of the design, uses and consequences of information technology that takes into account their interaction with institutional and cultural contexts" (Kling 1998, p.52; 1999). SI provides flexible frameworks to explore complex and dynamic sociotechnical interactions. As a domain of study related largely by common vocabulary and conclusions, SI critically examines common conceptions of and expectations for technology, by providing contextual evidence.

This chapter describes the evolution of SI research in the US and UK and identifies challenges and opportunities for future research. We divided SI research into four major periods: an early period of *foundational work* which grounds SI (Pre-1990s), a period of *development and expansion* (1990s), a robust period of *coherence* and influence by Rob Kling (2000-2005)[1], and a period of *diversification* (2006-Present).[2]

Each of the four periods is divided into four sections: principles, concepts, approaches, and findings. *Principles* refer to the overarching motivations and labels employed to describe scholarly work. *Approaches* describe the theories, frameworks, and models employed in analysis, emphasizing the multi-disciplinary and interdisciplinary nature of SI. *Concepts* include specific processes, entities, themes, and elements of discourse within a given context, revealing a shared SI language surrounding change, complexity, consequences, and social elements of technology. *Findings* from seminal SI works illustrate growing insights over time and demonstrate how repeatable explanations unify SI. In the

1 This time period extends 2 years after Rob Kling's death because some of his publications appeared later, and many publications that appeared immediately after his death were not only strongly inspired by him but also a tribute to him and his social informatics research.
2 Due to space limitations, not all relevant publications or scholars are covered.

concluding remarks, we raise questions as to the possible future expansion or extinction of SI research.

Period of Foundational Work (pre-1990s)

Our review begins with early critical studies by Rob Kling and colleagues; Kling and Iacono (1984a; 1984b; 1988; 1989) empirically tested and challenged deterministic discourse surrounding computerization in work and educational settings. These inquiries revealed findings and concepts, which later became central to SI research. This early research was not clearly labeled by the authors as a coherent body of SI work.

Principles

Kling and Iacono (1984b) challenged deterministic narratives surrounding information system implementation; their findings did not support either socially or technologically deterministic discourses. Instead, the evidence supported economically rational arguments explained through metaphors of organizational politics (Kling and Iacono 1984b). They demonstrated that critical analysis provided more accurate explanations of computerization outcomes than simplistic determinisms.

Collaborations between Kling and Iacono produced a definite sociotechnical principle (1989) to explain the complex interrelationship between social and technical variables (1988). Social theorization, grounded in case studies, described the sociotechnical nature of computer-based information systems embedded in social, organizational contexts. Social and technical choices lead to the development, implementation, and adoption of technology, thereby integrating them in context. The sociotechnical nature of computerization served as a guiding principle within developing the interdisciplinary notion of SI research.

Approaches

As a socio-technical approach without definite overarching principles, early research represents the varied, deeply interdisciplinary approaches that continue to be emblematic of SI research. Kling and Iacono employed institutional social shaping approaches, political analysis, and discussed

both a computerization movement framework and sociotechnical studies (1984a; 1984b; 1988; 1989) to emphasize specific topics of analysis, such as technology in education and bureaucratic information systems. These diverse approaches represent the indefinite theoretical boundaries of SI.

In order to understand information and communication technologies (ICTs) in context, an institutional social shaping approach was developed to characterize boundaries, controls, information flows, actors, and rules, which situate computerization (Kling and Iacono 1984a; 1989). This approach was developed from:

- Institutional Theory (Kling and Iacono 1984a);
- Social Control Models from Sociology (Kling and Iacono 1984a);
- Organizational Theory (Kling and Iacono 1989).

The theoretical frameworks employed by Kling and Iacono (1984a; 1984b; 1988; 1989) represent the value of SI approaches to business, political, and social problems traditionally addressed by individual scholarly domains. SI, from the beginning, was not bounded by one overarching theory. Kling and Iacono drew on social theories from other disciplines in order to theoretically contextualize ICTs. First, social control and leverage were analyzed by using political theories of coalition formation, ideologies and preferences, mobilization of support, and legitimacy (Kling and Iacono 1984b). Second, sociotechnical theories were used to explain unanticipated changes or stasis and consider information systems and technologies in context (Kling and Iacono 1989). Third, computerization movement analysis was developed (Kling and Iacono 1988) to characterize beliefs, practices, and discourse surrounding ICT, as well as to differentiate between attributes of computerization movements. Value laden arguments made by computerization movement advocates often establish unrealizable expectations for technology given a context (Kling and Iacono 1988).

Concepts

Through these interdisciplinary approaches, Kling and Iacono articulated what would become key SI concepts to discuss findings, including: change (1988), complexity (1989), context (1984a), control (1984a; 1984b; 1989), efficiency (1989), institutions (1984a; 1989),

management (1984a; 1989), organizational politics (1984b; 1989), power relationships (1984b; 1989), and values (1988). From these concepts, the language of SI developed.

Social context is significant in evaluating technological outcomes (Kling and Iacono 1984a). Institutional and organizational contexts are especially complex, as they designed to achieve efficiency, productivity, and profitability through technology and change (Kling and Iacono 1984a; 1988; 1989). Institutions are of particular importance because of their scale and early-mover role in adopting new technologies (Kling and Iacono 1984a; 1989).

Management and control create unequal distributions of authority, information, and access to technologies (Kling and Iacono 1984a; 1984b; 1989). From these disparities stem conflict within organizational and institutional contexts, for which common resolution is ICT change or stasis; often ICT implementation favors the status quo because powerful actors advocate for their personal benefit and attempt to control change, yet stasis might be the resolution even when ICT does not favor the statue quo (Kling and Iacono 1984a; 1984b; 1988).

Organizational politics and power relationships elegantly reveal the impact of ideologies and interests on ICT outcomes (Kling and Iacono 1984b; 1989), just as social values create norms and barriers to the compromise of those norms, which impact ICT outcomes (Kling and Iacono 1988). Values, in addition to establishing contexts, which may or may not be amenable to ICT change, are also embedded in ICTs themselves (Kling and Iacono 1988).

Findings

In this emerging stage, SI findings were iterated as descriptive accounts of the realities computerization in primarily organizational settings, rather than as prescriptive and technologically optimistic computerization goals. Kling and Iacono discovered that:

- Politics and interests impact ICT outcomes (1984b; 1988; 1989);
- ICT use is situated and context dependent (1988; 1989);
- Context is complex (1984a);
- ICTs favor the status quo (1984a; 1984b);
- ICTs are not value neutral (1988); and
- ICTs have multiple and paradoxical impacts (1989).

These findings explained not only why popular narratives about and expectations for positive organizational technology outcomes were often problematic, but also why contextual assessment and theorization, considering a spectrum of details, was necessary (Kling and Iacono 1984a; 1989).

Kling and Iacono (1984a; 1984b; 1988; 1989) argued that ICTs were not used in vacuums and could not be isolated from the variables surrounding use when planning for, designing, and implementing them.

Period of Development and Expansion (1990s)

Throughout the 1990s, SI developed as an interdisciplinary perspective, forming a relatively cohesive set of principles, clearly labeled by the authors as SI. SI was employed to evaluate social aspects of technologies in diverse contexts, ranging from computerization (Iacono 1996; Kling 1994; 1998; Kling and Star 1997) to the information society (Iacono 1996; Kling 1998).

In addition to new applications, new SI specific approaches were proposed. Lamb described and evaluated informational context as a theoretical construct (1996) and distinct critical and analytical orientations of SI emerged (Kling 1994; 1998). Core concepts were supported and supplemented as SI expanded to include additional collaborators (i.e. Kling and Lamb 1996; 1999).

Principles

From the onset, scholars doing SI research have disagreed about what to call it and what overarching intellectual principles have guided their inquiries. While the 1990s saw a rise in the use of the terms social informatics (e.g. Kling 1998; Kling, Rosenbaum, and Hert 1998) and organizational informatics (e.g. Kling and Star 1997; Kling and Tillquist 1998), other work was simply guided by a sociotechnical perspective (e.g. Kling and Lamb 1996; 1999). Diversity of principles abounded, ranging from social aspects of ICT (e.g. Iacono 1996; Kling 1994; 1996) to human centered approaches to computing (Kling and Star 1997).

SI defined principles within itself as a domain during the 1990s (Kling 1998; Kling, Rosenbaum, and Hert 1998). An interdisciplinary focus on interactions between ICTs and context was important because ICTs were

increasingly tied to social practice, yet primarily viewed as tools, isolated from creators and users, without embedded social properties (e.g. Iacono 1996; Kling, Rosenbaum, and Hert 1998). Kling (1994; 1996) stressed the need to explore social possibilities of computerization, rather than functional computing efficiency and productivity alone. Kling and his colleagues worked to better understand sociotechnical interactions (Kling and Lamb 1996; 1999; Kling, Rosenbaum, and Hert 1998) and social aspects of ICT (e.g. Kling 1994; 1996; 1998), in part to explain rapid technological change and in part to define SI (Kling, Rosenbaum, and Hert 1998).

Organizational informatics examined sociotechnical interactions in organizational contexts in order to understand economic outcomes and consequences (Kling and Lamb 1999). The rise of organizational informatics paralleled increasing computerization in business and growth of e-business; the digital economy was studied to explain viability, processes, and advantages of online business in different industries (Kling and Lamb 1999).

While guiding principles varied, additional scholars were drawn to the issues that Kling and Iacono had earlier considered. Not only was the conversation and focus developing, but also by the end of the 1990s, scholarship evolved around specific SI principles.

Approaches

To develop these principles, a variety of theoretical constructs were employed including newly proposed SI approaches, involving critical (Kling 1994; 1996) and analytical orientations (Kling 1996), and informational context (Lamb 1996). The institutional social shaping approach continued to be employed (Iacono 1996), while structuration and systems theory constructs were also transferred to SI work (Contractor and Seibold 1993; Kling and Star 1997).

The introduction of specific orientations in SI was significant because it structured and legitimated SI approaches and motivations. The critical orientation developed from the earliest SI impulses to challenge thin arguments about technology and computerization through robust empirically supported arguments (i.e. Kling 1994; 1996). The analytical orientation deconstructed specific sociotechnical interactions to characterize social and organizational changes as they occurred (Kling 1996).

For example, Lamb (1996) developed one of the earliest sociotechnical theories within SI: informational context. Lamb (1996) conceptually reframed ICT's social potential as technological mediation, effective interpersonal interaction, and access to power.

The introduction of structuration into SI work was also significant, supporting the social shaping of technology (Contractor and Seibold 1993). Systems theory supported SI insights through the development of human-centered systems (HCS) theory as: social and technical analysis; continued, longitudinal, and iterative development; complex human-machine interactions; and focus on users in development, design, evaluation, and use (Kling and Star 1997).

Theories from other disciplines and new SI theorization increasingly bolstered SI objectives to improve design and understand actual ICT uses and consequences, rather than prescribe design or narrowly explain outcomes through particular disciplinary theories.

Concepts

Growing interests and concerns with all possible variables affecting outcomes in diversifying domains shaped conceptual analysis. Understanding the complex reality of change in sociotechnical environments continued to be a major concern (e.g. Iacono 1996; Kling, Rosenbaum and Hert 1998) and was reflected in the specific language of complexity (Kling 1996; Kling and Star 1997; Kling and Tilquist 1998), and context (e.g. Kling 1998; Lamb 1996).

New concepts and variables—including legitimacy (Kling and Tilquist 1998), externalities (Kling and Star 1997), and social structure (e.g. Contractor and Seibold 1993) were considered as additional scholars identified factors relevant to the use, context, and adoption outcomes of new technologies. Practice-oriented efforts articulated areas of concern for policy makers, information professionals, and educators; however, impact was limited as SI scholarship was not yet very visible.

Findings

Common, repeatable findings continue to unify SI research. Significant work throughout the 1990s reinforced early conclusions, yet identified many more facets of sociotechnical interactions than values (Kling 1996),

power balances (Contractor and Seibold 1993), and situatedness (Iacono 1996), which were previously evaluated. Additional findings included:

- Context impacts implementation and use (e.g Contractor and Seibold 1993; Kling and Tilquist 1998; Lamb 1996);
- Social shaping and context of technology matter (Iacono 1996; Kling 1998; Kling and Star 1997);
- Change is constant (Kling 1996);
- There are unintended consequences of ICTs (Kling and Lamb 1996);
- There is a productivity paradox associated with ICTs (Kling 1998; Kling and Star 1997);
- Outcome distributions are unequal (Kling and Star 1997);
- There are moral and ethical aspects of ICTs (Kling 1996);
- Articulation work is important to avoid consequences (Kling and Lamb 1999);
- External factors affect sociotechnical interaction (Kling and Lamb 1996); and
- ICT users are social actors (Iacono 1996).

These findings illustrated the nuance of situated social and technical interaction. SI findings in this period begin to explain more precisely and under different conditions the role of ICTs in social and organizational change.

Period of Coherence (2000-2005)

During this time SI was most cohesive, yet there was also foreshadowing of diversification and disagreements as early findings begin to be questioned (Agre 2002). SI grew more robust and integrated compared to either before 2000 or after Kling's lingering hold on the domain faded. Kling's influence was most explicit during the early 2000s. During this period, Kling defined SI more concretely (Kling 2000a; 2000b) and collaborated prodigiously (i.e Kling, McKim, and King 2003; Kling, Rosenbaum, and Sawyer 2005). His unexpected passing brought an outpouring of reflective pieces on his impact on scholarship, as well as on the significance of SI (Iacono, King, and Kraemer 2003; Lamb 2003; Lamb and Sawyer 2005; Mansell 2005; Wood-Harper and Wood 2005).

Principles

Labels employed for this kind of work continued to vary; SI principles were refined and diversified at this time. The sociotechnical construct (e.g. Kling 2000a; 2000b; Sawyer and Rosenbaum 2000) and opposition to determinism (Agre 2002; Meyer and Kling 2002; Lamb and Sawyer 2005) still described SI research. These fundamental constructs continued to be useful in explaining ICT design, uses, and consequences, despite the persistence of determinism and the separate treatment of social and technical variables in other disciplines.

Many SI researchers described the dichotomy between standard deterministic models and sociotechnical models (Kling 2000b; Kling and Callahan 2003; Kling, McKim, and King 2003), as identified by Meyer and Kling (2002). Sociotechnical models served practically oriented SI, through which strategies for sociotechnical change could be successfully identified and executed (Kling and Callahan 2003). These models also allowed for differentiation between parallel developments in similar setting with divergent implementation outcomes (Kling and McKim 2000).

Sociotechnical principles were used to identify social and technical facets of context and interaction in various settings (Courtright 2004; Hara and Kling 2002; Kling and Courtright 2003; Sawyer and Tapia 2005). Complex overlapping socially-constructed contexts of culture, organizations, and relationships also frame and influence technology by situating use and iteratively interacting with users and technologies (Kling 2000a; 2000b); Lamb and Davidson argue further that ICTs are socially embedded (2005). Kling provides and expands upon a specific sociotechnical model in which social infrastructure supports or undermines the potential of information technology, based on core SI findings surrounding conceptions of ICT in organizations and society (Kling 2000b).

SI, in principle, has constantly been redefined; Lamb and Sawyer defined SI in terms of its history of opposition to simplistic, deterministic arguments, as well as its sociotechnical orientation (2005). Lamb and Kling emphasize the sociotechnical construct as grounded in the SI findings that ICT users are primarily social actors (2003).

A number of articles, chapters, and entire books have been devoted to specifically explaining SI, including a series of articles in which Kling described SI as the "interdisciplinary study of the design, uses, and consequences of information technologies that takes into account their interaction with institutional and cultural contexts" (2000a, p.218). Some

version of Kling's definition has guided a variety of publications (e.g. Kling 2000b; Kling and Hara 2004; Kling, Rosenbaum, and Sawyer 2005).

However other approaches to explaining SI as a research domain have been developed. Davenport described SI as contextual "practice-based research" to frame work in organizations in terms of stakeholders, unintended consequences, costs and benefits, interactions, externalities, environmental variables, barriers, and boundaries (2005). Also prevalent at this time was the conception of SI as research grounded in specific principles, rather than common motivations. Sawyer and Rosenbaum stated that "SI researchers focus on the social consequences of the design, implementation, and use of ICTs over a wide range of social and organizational settings" (2000, p.89). Kling, Rosenbaum, and Sawyer (2005) argued that SI was an interdisciplinary space for inquiry on similar problems, rather than a new discipline with shared methods and theories; their book first published the SI triangle of technology, institutions, and culture.

Within SI, sub-domains were carved out during this period and specific informatics-centered labels were established, including: critical informatics (Iacono, King, and Kraemer 2003; Kling 2003; Lamb and Sawyer 2005), organizational informatics (e.g. Kling 2000a; Sawyer and Eschenfelder 2002; Sawyer and Rosenbaum 2000), and educational informatics (Kling and Hara 2004). SI was applied enough during this period to necessitate further sub-differentiation.

Furthermore, discussions of the social aspects of ICT not only persisted, but were pervasive (e.g. Davenport 2001; Iacono, King, and Kraemer 2003). There were arguments that social variables are not obfuscated by technology, but rather social and technical environments co-evolve before and after implementation (Kling, Rosenbaum, and Sawyer 2005). Deconstructing practice through SI principles allows social (e.g. Hara and Kling 2002; Kling and McKim 2000), political (Mansell 2005), and economic (Ekbia and Kling 2005; Mansell 2005) boundaries and limitations to be co-examined, rather than be seen as footnotes to study of function.

In fostering socially-rich dialogue surrounding ICT, analysis became more nuanced; what began as a critical orientation became something guided more by principles as the critical perspective (Lamb and Sawyer 2005) and human-centered principles (e.g. Lamb and Kling 2003; Sawyer 2005) expanded to include usability concerns (Kling, Rosenbaum, and Sawyer 2005; Lamb and Kling 2003). For example, acknowledgement of the people who design and use ICTs provides better design and policy solutions for social users (Kling, Rosenbaum, and Sawyer 2005).

SI was guided by clear principles during this period. The development of specific principles particularly indicated the impact and level of participation in this area of scholarship, perhaps foreshadowing the establishment of SI as a scholarly institution. Momentum developed for research attention to sociotechnical problems and changes.

Approaches

Between 2000 and 2005, focus on political and economic aspects of sociotechnical interactions was a major trend (Agre 2000b; Ekbia and Kling 2005; Mansell 2005).

Institutional theory (Lamb and Davidson 2005) and the institutional social shaping approaches (Agre 2000a) continued to ground research. The social shaping of technology (SST), arguably a socially deterministic approach, became a more concrete theoretical approach in SI (Kling and McKim 2000; Sawyer and Tapia 2005). Sociotechnical theory provided a more balanced perspective on social and technical interactions than social shaping theory (Lamb and Kling 2003; Sawyer and Tapia 2005), and synthesized sociotechnical studies (Lamb and Sawyer 2005) of earlier work.

Emphasis on economic and political issues complemented SI's traditional emphasis on design and policy implications (Kling 2000a; 2000b). Economic theory (Agre 2000b; Ekbia and Kling 2005; Mansell 2005)—specifically as a theory of economies of scale (Agre 2000b), the theory of networked society with respect to production relationships (Ekbia and Kling 2005), and rationality through theories of political economy (Mansell 2005)—explained behaviors and interests involved in investment in technology and the benefits of ICT innovation and adoption. By explaining informational, global, and networked attributes of ICTs, economic theory can explain complexity and predictively model for strategic ICT planning (Ekbia and Kling 2005). Political analysis supplemented explanations of resistance to and enforcement of institutional and organizational norms, including strategic practices (Mansell 2005).

A second major trend focused on networks, which was in some ways correlated with the economic theory of networked society (Ekbia and Kling 2005), as well as an understanding of ICT users as social actors (Lamb and Davidson 2005; Lamb and Kling 2003). Network theory, emphasizing relationships and interactions between actors, institutions, and information resources, deconstructed ICT use for collaboration and

coordination to a conceptual level (Lamb and Davidson 2005). Actor-network theory facilitated egocentric analysis to understand important nodes and specific interactions (e.g. Hara and Kling 2002; Sawyer and Tapia 2005). Network analysis provided a modeling mechanism to characterize types of relationships and central importance of specific nodes within communities (Courtright 2005).

The sociotechnical interaction network (STIN) explicitly applied network theory to sociotechnical contexts by including technologies as nodes that interact with actors, groups, and resources (e.g. Kling 2000a; Kling, McKim, and King 2003; Lamb 2003). This contextual application established sociotechnical network models, including the social actor model, to account for the mutually shaping interactions between social and technical factors (e.g. Kling and Callahan, 2003; Meyer and Kling 2002).

Other SI-specific approaches developed recognizing: 1) the importance of empirically grounded discourse for successful outcomes through technical action frames (Iacono and Kling 2001); 2) institutional and technical dimensions of workplaces as ICT interaction contexts in information environments (Lamb, King, and Kling 2003); and 3) the idea that the complexity of sociotechnical innovation, introduction, and change can only be explained through multivariate theoretical combinations as a multiview approach (Wood-Harper and Wood 2005).

Analysis of SI research has revealed critical, normative, and analytical orientations (e.g. Lamb and Sawyer 2005; Sawyer and Rosenbaum 2000). The second orientation—normative—practically and tangibly translates SI into implications for design, policy, or use alternatives (Lamb and Sawyer 2005).

Diverse theoretical approaches resulted in part from the increased visibility of SI and its central scholars, drawing in communication and media scholars, as well as scholars of the political economy. Increased theorization in SI was also important to validate SI discussions.

Concepts

Concepts analyzed during this period included many of the earlier constructs, as well as a new emphasis on coordination (Lamb and Davidson 2005), cooperation (Ekbia and Kling 2005), uncertainty (Courtright 2004), and governance (Agre 2000a), each of which is fundamentally linked to respective theoretical trends: network theory; economic theory; political theory, information environments; and political theory. The concept of sociotechnical systems evolved due to the

networked properties of ICTs in use (Kling 2000a; Sawyer and Rosenbaum 2000).

Context—with specific emphasis on social context (e.g. Kling and McKim 2000; Mansell 2005; Sawyer and Eschenfelder 2002), as opposed to sociotechnical, institutional, and organizational variations—continued to be examined (Iacono, King, and Kraemer 2003; Sawyer 2005). Institutions conceptualized social arrangements, including norms and practices (e.g. Agre 2002; Kling 2003; Lamb and Kling 2003). Organizational environments provided another context in which to examine interactions (Agre 2000b; Ekbia and Kling 2005; Lamb, King, and Kling 2003). These contexts and arrangements of relationships were studied as networks (e.g. Agre 2000b; Ekbia and Kling 2005) and communities (e.g. Kling and Courtright 2003). Attention was also paid to the infrastructure that supports these arrangements (Courtright 2005; Davenport 2001; Kling 2000a).

Interactions were examined as coordination (Lamb and Davidson 2005), cooperation (Ekbia and Kling 2005), collaboration (e.g. Agre 2000a; Kling, McKim, and King 2003), and communication (e.g. Hara and Kling 2002; Lamb 2003; Mansell 2005). By examining these interactions, researchers theorized about power relationships (Agre 2000a; 2002; Ekbia and Kling 2003), organizational politics (Sawyer and Tapia 2005), identity (Lamb and Davidson 2005; Lamb and Kling 2003), management (e.g. Davenport 2001; Kling and Hara 2004; Sawyer and Tapia 2005), control (Ekbia and Kling 2003), complexity (e.g. Iacono, King and Kraemer 2003; Kling, McKim, and King 2003), and dynamics (Courtright 2004).

The introduction of additional political, economic, and network science concepts was important in broadening the scope of the discussion to include larger scale social issues. These themes also reflected research trends in other distinct and tangential areas of study, allowing SI discourse to be accessible and easily integrated with current conversations.

Findings

Findings surrounding social context were verified, and, taken together, reinforced the principle that there is a social shaping of technology (e.g. Kling 2000a; 2000b; Kling, Rosenbaum, and Sawyer 2005), context impacts implementation and use (e.g. Kling 2003), and ICT use is situated and context dependent (e.g. Kling, McKim, and King 2003; Sawyer and Rosenbaum 2000). These findings mutually reinforced SI principles and

conclusions about the significance of analyzing social variables as they situate and interact with ICTs.

Continued critical analysis also revealed evidence to support new conclusions:

- ICTs and their context are mutually shaping (e.g. Agre 2000a; 2000b; Hara and Kling 2002; Sawyer 2005);
- ICTs are sociotechnical network systems (e.g. Iacono and Kling 2001; Lamb and Kling 2003);
- ICTs have social, technical, and institutional natures (e.g. Lamb and Sawyer 2005; Sawyer 2005);
- ICTs are configurable (Kling, McKim, and King 2003; Kling, Rosenbaum, and Sawyer 2005); and
- Technology affects professional identity (Hara and Kling 2002; Lamb and Davidson 2005).

The introduction of new conclusions and findings augmented the set of explanations available to SI scholars, but perhaps more significant was internal debate surrounding earlier claims. Some SI scholars disagreed over whether ICTs favor or reinforce the status quo (Agre 2002; Ekbia and Kling 2003; Meyer and Kling 2002; Sawyer and Rosenbaum 2000). The subtle tension was important because it indicated a self-critical turn within SI. Expansion and refinement of central tenets and assertions of SI signified its diverse and dynamic status.

Period of Diversification (2006-Present)

Diversification of SI has occurred as 1) researchers have begun to self-identify with other labels for their work (for example, sociotechnical and social aspects of ICTs); and 2) very different approaches have been introduced to address similar problems through new theoretical lenses and different conceptual perspectives (for example, the critical perspective).

Principles

Certain early principles have been now dropped, including overt rejection of determinism, either because SI is no longer tethered to its roots

or because discourse has changed over time. The principles guiding SI work include: the sociotechnical (e.g. Davenport 2008; Sawyer and Tyworth 2006; Tapia and Maitland 2009), SI (e.g. Oltmann, Rosenbaum, and Hara 2006; Robbin, et al. 2006; Shachaf and Rosenbaum 2009), social aspects of ICT (e.g. Contractor 2009; Robbin and Day 2006; Shachaf and Hara 2007), critical informatics as an approach (Day 2007; King, Iacono, and Grudin 2007), and the critical perspective (e.g. Day 2007; Robbin and Day 2006).

While this work is labeled in five different ways (sociotechnical, SI, critical informatics, the critical perspective, and social aspects of ICTs), there are two major areas in which all of these types of works are presented and discussed: SI and the sociotechnical. For many researchers, both areas are equally relevant for their work (e.g. Davenport 2008; Sawyer and Tapia 2007), yet for others, these areas differ in relevance and legitimacy (e.g. Contractor 2009). What began as one interdisciplinary set of SI principles is now diverging.

Approaches

Recent SI research has diversified and generated revised theoretical approaches and models for analysis. Interest in network theory (i.e. Contractor 2009; Goggins, Laffey, and Gallagher 2011) and technical action frames (Davenport and Horton 2006; Robbin et al. 2006) continues and older constructs, such as computerization movements, are being revisited (Hara and Rosenbaum 2008). New theories are also being developed, such as IS/IT governance theory (Maldonado, Maitland, and Tapia 2010).

Network constructs enable SI scholars to examine relationships among individuals, institutions, and ICT to identify patterns and sociotechnical interaction (Contractor 2009; Sawyer and Tyworth 2006). Approaches for analysis of networks (Goggins, Laffey, and Gallagher 2011) include the sociotechnical network model (Blincoe, Valetto, and Goggins 2012), social network theory (Contractor 2009), actor-network theory (e.g. Contractor, Monge, and Leonardi 2011; Davenport 2008), and STIN (Meyer 2006; Sawyer and Tyworth 2006; Shachaf and Rosenbaum 2009).

Sociotechnical theory is also developing into a multi-theoretical, integrated framework for sociotechnical studies (Davenport 2008) of interactions (e.g. Sawyer and Tyworth 2006). Specifically, the sociotechnical systems (STS) construct became a popular

conceptualization of information systems, which enable and reciprocally impact social processes (Tapia and Maitland 2009).

IS/IT governance theory assesses control and power implications surrounding access and changes to ICTs (Maldonado, Maitland, and Tapia 2010). Political theory and political economics, as for example rational actor theory (Robbin and Day 2006), explain stakeholders' interests and distributions of computerization outcomes (Maldonado, Maitland, and Tapia 2010; Robbin 2007).

Within SI, specifically constructed social theories include, for example group informatics (Goggins 2006) and behavioral complexity theory of media selection (Shachaf and Hara 2007).

Theoretical approaches furthering SI reflect the desire to revise, fortify, and institutionalize SI as a significant and useful approach to the social analysis of computing (Sawyer and Tapia 2007). Many of these approaches apply relevant theories from other domains to define integrated multi-theoretical frameworks. These developments are valuable to frame scholarly work in SI terms, while continuing to be relevant beyond SI.

Concepts

The language and focus of scholarly inquiries in SI continue to focus on the same earlier concepts of control (e.g. Maldonado, Maitland, and Tapia 2010), complexity (e.g. Contractor, Monge, and Leonardi 2011; Tapia and Maitland 2009), and social context (e.g. Hara and Rosenbaum 2008; Robbin and Day 2006).

Researchers have examined organizational (Tapia and Maitland 2009), institutional (Davenport and Horton 2006), sociotechnical (Goggins, Laffey, and Gallagher 2011; King, Iacono, and Grudin 2007), and technical (Orlikowski and Iacono 2008) changes to understand the complexity (e.g. Robbin and Day 2006) and dynamics (e.g. Robbin et al. 2006; Rosenbaum and Shachaf 2010) of sociotechnical interactions and systems (Tapia and Maitland 2009) in context. Specific conceptualizations of sociotechnical interactions complimented the emphasis on sociotechnical theory during this period and formed the core of sociotechnical research as an area somewhat distinct from SI, in terms of researcher self-identification. These sociotechnical concepts, so central to SI, were also of interest to researchers who did not consider themselves to be in SI, such as Bijker (Bijker 2010; Bijker, Hughes, and Pinch 2012).

Organizations and institutions (Contractor 2009; Sawyer and Tapia 2007), as formally bounded social arrangements, are analyzed for their

economic and governance implications on local and global societies (Davenport and Horton 2006; Maldonado, Maitland, and Tapia 2010). Communities are studied similarly, though their varied structures and formalization have different implications (e.g. Goggins, Laffey, and Gallagher 2011; Rosenbaum and Shachaf 2010). Analysis of organizational, institutional, and community contexts of ICTs also grounds study of more complex processes and dynamics, including institutionalization (Sawyer and Tapia 2007), values (Robbin and Day 2006; Robbin et al. 2006), identity (Robbin and Day 2006; Rosenbaum and Shachaf 2010), and efficiency (Robbin and Day 2006).

The continued use of a shared vocabulary within SI and sociotechnical research implies that the concepts are still useful in synthesizing findings and shaping common, inclusive discussions about social situated ICTs.

Findings

SI research has verified certain findings such as the socially shaped nature of technology, while directing little attention to a number of earlier findings such as the impact of technology on professional identity. At the same time new conclusions are significant; for example, Orlikowski and Iacono (2008) identified five conceptualizations of ICT as: a tool, an ensemble, a proxy, computational, and nominal.

A major focus continues to be the social analysis of ICTs and change. Research re-emphasizes that ICT users are social actors (e.g. Blincoe, Valetto, and Goggins 2012; Rosenbaum and Shachaf 2010) and ICTs comprise sociotechnical network systems (e.g. Contractor 2009; Orlikowski and Iacono 2008). Social dynamics, including political interests and personal preferences (e.g. Maldonado, Maitland, and Tapia 2010; Shachaf and Hara 2007), describe unequal distributions of social change (e.g. Sawyer and Tapia 2006; Tapia and Maitland 2009) and explain why ICTs benefit the status quo (Robbin et al. 2006), as those in power use their power to protect their interests. Yet, while benefits from new technologies are sometimes predictable, there are certainly paradoxical impacts of ICTs (Oltmann, Rosenbaum, and Hara 2006; Sawyer and Tyworth 2006), in part because: ICTs are not value neutral (e.g. Davenport and Horton 2006; Robbin and Day 2006), there are moral and ethical aspects of ICTs (e.g. Robbin et al. 2006; Sawyer and Tyworth 2006), contexts are complex (e.g. Hara and Rosenbaum 2008; Oltmann, Rosenbaum, and Hara 2006), and contexts impact implementation and use

(e.g. King, Iacono, and Grudin 2007; Maldonado, Maitland, and Tapia 2010; Shachaf and Hara 2007).

The constricted focus is consistent with efforts to increase robustness and validity of SI. The collective decrease in variety of claims may have developed from self-critical debate evident in the early 2000s, and is important in consolidating a strong SI core.

Conclusion: Challenges and Opportunities

Considering SI scholarship from past to present, there is a pattern of a central figure, Rob Kling, developing an inclusive space for inquiry and then potential for that space to splinter in his absence.

Early work by Kling and Iacono sought a new social theoretical perspective toward computerization and information systems. SI principles, drawn from early studies, allowed scholars to legitimately account for more diverse variables at a different scale than economists, computer scientists, or sociologists alone at that time. A researcher using the economics of technology approach would likely only consider costs, benefits, and interests and computer scientists would likely only consider technological features and design; SI provided a more holistic, integrated perspective. Furthermore, the sociology of technology would likely consider social statistics and generalize computerization success and failure, while SI explained what happened locally in specific contexts.

Early SI work explained different technological outcomes. However, SI was limited by its relatively nascent stage of scholarship; increased participation and attention were necessary to form a defined approach.

In the 1990s, SI became a more coherent approach, under a common label and with common ideas and terms to explain problems, yet it was not yet recognized as a serious approach to analysis of computing. Scholarly interest was established during this period, providing opportunities for collaboration and consideration of increasingly interdisciplinary and complex situations. Findings and arguments amassed through the 1990s had not yet been internally evaluated or critiqued, despite propensity to question outside arguments and discourse. A challenge as SI further developed would be internal revision and debate over claims, findings, and theories that result from interdisciplinary research on ICTs in society.

The force of Rob Kling as a central, unifying figure was perhaps the most defining feature of the early 2000s. He set an agenda for SI scholarship, collaborated with many of the other primary scholars, and unified SI through a clear definition and opportunities for dialogue through

the Center for Social Informatics at Indiana University, Bloomington. His passing posed an enormous challenge to SI to continue and thrive without his critical commentary or contributions. Yet there were also new opportunities to further refine SI, increase scholarship, and extend collaboration in honor of his legacy through the SI institutions and venues he helped to establish.

Recent SI scholarship has begun to redefine and reinvent the approach. New motivations and labels differentiate within SI, and outmoded, contradicted constructs and concepts are abandoned. This refinement in many ways strengthens the value of this work as rigorous, theoretical and empirically grounded, but in other ways challenges researchers who consider the same problems in subtly different ways by dividing them into sociotechnical studies and SI.

From 2006 to the present, there has been a concerted effort to make SI relevant to practitioners and larger scholarly discussions, by considering political and economic themes and networked environments. These efforts imply that SI is becoming an intellectual institution yet it has been challenged by fragmentation, as some scholars identify with labels other than SI to describe their work. There are important opportunities to grow, as SI provides new models for longitudinal, comparative, and larger scale research. SI seems to be progressively more tied to technology and globalization, increasing its cultural relevance and necessitating continued attention.

One cannot avoid raising questions regarding the future of SI, in light of past evolution and its current state. Is SI on the verge of further diversification, which may lead to new concepts and significant findings, or to numbness and extinction, as scholars focus attention on new, more nuanced, challenges and opportunities?

Understanding seminal SI works, and the changes in themes and designs over time, allows researchers to more firmly ground their work, provides a strategy for students to integrate themselves, and maps a trajectory for development in SI approaches.

This chapter seeks to advance the agenda of SI in two ways, by conceptually identifying key concepts and ideas that unify SI, so as to frame future research, and practically identifying the key challenges and opportunities throughout the history of SI, so as provide grounds on which to build and highlight anticipated tensions moving forward. For SI to thrive as an approach and scholarly discussion, identity resolution is important.

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