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The New Stream of Socio-Technical Approach and Main Stream Information Systems Research

Vafa Ghaffarian*

Malik Ashtar University, Babaie St, Lavizan, Tehran, IRAN

Abstract

The humanistic ideals of the Tavistock Institute produced promising insight on how to combine technical capabilities and social aspects of organizations to address both organizational and employees' needs. This conceptual essay delves into this historical background of social technical approaches. Then it will turn to the early development of socio-technical approaches within the field of Information Systems (IS), and the unfortunate decline of socio-technical design. Next, the paper argues that the socio-technical principles were imported to the field of information systems by researchers like Mumford to guide the design of information systems. However, despite their desirable theoretical principles, they failed to appeal to information systems researchers and practitioners, and subsequently lost ground to emerging best-practices like BPR in the 1990s. The decline has to do with the dramatic transformation of competitive environment and also a dearth of adoptability of the socio-technical design to accommodate rising theoretical and practical needs.

Keywords: Socio-technial approaches; Information Systems

1. Historical background

The socio-technical term was first coined by researchers at the Tavistock Institute of Human Relations in England. The Tavistock Institute was founded in London in 1946 under the auspices of the Rockefeller Foundation. Its initial mission was to weave together social and psychological sciences in order to benefit a society damaged by the effects of the Second World War. Tavistock researchers, including therapists and a wide variety of consultants, strove to formulate techniques that could rehabilitate war-damaged soldiers. Some of these scholars also strongly believed that the same techniques could be employed in organization of work in industry. They suspected that the techniques would be applicable to the work of lower rank employees who spent most of their time on routine and simple tasks without any clear prospect for jobs satisfaction or personal development.

* Tel.: +98 21 22344174 ; fax: +98 21 22485643.
E-mail address: cio@sadegh-net.com.

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This extension of Tavistock agenda to the workplace accentuated a close association between the technical and the social systems within organizations. The "socio-technical" term was meant to underscore this association. The technology, perceived as machines and associated work practices by Tavistock's researchers, was not meant to be the sole controlling factors when a new technological system was implemented. In other words, equal attention should be paid to providing a satisfactory work environment for employees. In this regard, the main innovation of the Tavistock research was the design of technology-supported work arrangements that could enrich work practices using multi-skilled jobs in working teams. The socio-technical approach therefore was a rebellion against Tayloristic practices that represented an instrumental view of workforce of the time.

The tenets of the socio-technical approach were intimately coupled with action research. As the name implies, action research is aimed at changes in the work situations. The term was first used by Tavistock members in the early 1950s as a means to demonstrate that attempts to transform dominant industrial regime should embody both research and therapy. They recognized research not only as a way of increasing knowledge, but also as an attempt that would improve work situations that were regarded as unsatisfactory in human terms. Being a philosophy rather than a pure methodology, action research underscores a set of humanistic principles that in the context of socio-technical approaches denote technology and change [1].

Thus, its early history demonstrates that the socio-technical researchers consistently have pursued a revolutionary objective: the need for humanizing jobs through redesigning practices and propagating democracy at work. This objective led to the formulation of theories that entailed concepts like "quality of working life" [2]. These theories postulated that employees who were involved in the new system should be given a voice in the design process to determine how the new system could improve the quality of their work. In addition, the practical side of the socio-technical approach sought to give equal weight to both technical and social aspects in the design process.

A number of pioneers have outlined how the socio technical principles can translate into practice and be implemented. Albert Chern [3, 4] who was an associate of the Tavistock Institute, introduced socio-technical design principles in a paper in *Human Relations*. Table1 lists these principles.

Table 1: Chern's Principles of Socio-Technical Systems

Compatibility	The design process should be compatible with its objectives. If the design is intended to foster democracy in work situations, the design processes themselves must be democratic.
Minimal Critical Specification	No more should be specified than is absolutely essential. However, the designers should ascertain what is essential.
The Socio-Technical Criterion	Variances, as deviations from expected standards, must be kept as close to their point of origin as possible. In other words, solution to problems should be devised by the groups that directly experience them, not by supervisory groups.
Multifunctionality Principle	In order for groups to respond to the changing work environment, they need a variety of skills. These include skills that go beyond what day-to-day production activities require.
Boundary location	Boundaries exist where work activities pass from one group to another and where a new set of skills is required. However, boundaries should facilitate knowledge sharing. All groups should be able to learn from one another despite the existence of the boundaries.
Information	Information must reside where it is principally needed for action. A socio-technical design gives the control authority to the groups whose efficiency is being monitored.
Support Congruence	A social support system must be in place to enjoin the desired social behaviors.
Design and Human Values	High quality work involves: a. jobs to be reasonably demanding; b. opportunity to learn; c. an area of decision-making;

	d. social support; e. the opportunity to relate work to social life; and *f.* a job that leads to a desirable future.
Incompletion	Practitioners must recognize the fact that the design is an iterative process. It never stops. The new changes in environment require continual revisions of objectives and structures.

2. Early Developments of Socio-Technical Approaches in Information Systems

The philosophy of the socio technical design inspired a number of researchers within the field of information systems. Enid Mumford, greatly influenced by her association with the Tavistock Institute, is by many accounts considered to be the most influential researcher to initiate socio-technical research within information systems [5]. She, along with some other researchers, voiced concern that the bulk of information system research and professional know-how were limited to engineering approaches which centered on the effective construction of reliable technical artifacts.

Her work at Manchester places social context and human consequences at the center of system design. A seminal publication that captures the essence of the early socio-technical discourses was published in the proceedings of the "Human Choice and Computers" conference which took place in Vienna in 1974. The proceedings were edited by Mumford and Sackman [6] and generally express uneasiness about the machine and the way it was perceived to impact society. The overall tone of the conference was critical of the perceived computer's impact on key social institutions like the social order of industrial democracy in the workplace.

Findings from numerous research projects were consolidated by Mumford and her colleagues in Manchester and gave rise to a system development methodology, called ETHICS. ETHICS (Effective Technical & Human Implementation of Computer-based Systems) was proposed by Mumford in the 1970s [7]. This methodology drew upon socio-technical principles and involved a double design effort: the design of technical systems–typically a software system–and the design of work processes. Initially, the two design efforts were conducted separately. The design of software systems followed the technical system analysis method whereas the design of work processes was aimed at the elicitation of "job satisfaction" requirements of workers. The latter analysis involved the application of work quality principles such as multi-skilled jobs. The two streams of design were lumped together in the final stages to achieve a "socio-technical optimization" [1].

According to ETHICS, the starting point was work design, rather than system design, and the methodology placed emphasis on the interaction of technologies and people. The main objective of the method was to develop information systems that are both technically viable, and entail social qualities that would lead to high worker satisfactions [7]. To this end, an information system that is designed to solely meet technical requirements, is "likely to have unpredictable human consequences" [7 , p. 13]. Therefore, ETHICS uncompromisingly pushes for humanistic approaches to system design, and calls attention to scoring the quality of working life in terms of fit between personal achievement and organizational goals.

A critical principle that was a byproduct of the socio-technical philosophy in the field of information system was user participation. It was widely adopted in practice [8, 9]. In its strongest sense, user participation encourages all intended users to get involved in all system development tasks and stages. Nonetheless, in practice, participative design was implemented in a much weaker sense where users were often or typically consulted to learn about the tasks and the technical systems that support them [8].

Nearly parallel developments of socio-technical approaches also took place in countries other than the UK. Notably the socio-technical ideals of the Tavistock Institute found fertile ground in Scandinavian countries. In the later 1960s, "the Norwegian Industrial Democracy Projects" introduced the principle that technology innovation should improve work practices along with productivity measures. This was meant to empower employees to organize their own jobs. In the 1970s, figures like Kristen Nygaard–and more recently Bo Dahlbom, Pelle Ehn, Erik Stolterman and–pioneered the Scandinivian approaches to the social analyses of computing which reflected a strong orientation towards designing systems. The Tavistock approach garnered attention in Scandinavia because it resonated with the socio-political context grounded in deep appreciation for workers' right [10]. This tendency was also reflected in the principles of participatory design and more recently activity theory-centric approaches [11]. In addition, the information system development methodology suggested by Mumford in the UK has been tried in

Denmark and Sweden [12, 13]. In a nutshell, across these countries, social analyses of computing underpin much of information system research.

3. The Decline of Socio-Technical Design

Despite its promising principles, the socio-technical design in information systems failed to proliferate. During the 1990s, economic, business, and technological arenas witnessed dramatic changes; the consequences turned out to be frustrating for advocates of socio-technical design. In the harsh competitive environment, corporations were forced to embark on methods like lean production and business process reengineering that took little consideration of employees' satisfactions and did not produce decent human results [2]. Additionally, despite its progress in places like Scandinavia, few companies in other countries were interested in the adoption of socio-technical design. Downsizing concerns of 1990s involved flatter hierarchies in many firms and led to commonly held assumption that innovative companies require highly skilled groups that can work as members of high performance teams. These gave their members responsibility and autonomy, but included only privileged groups in senior positions. This trend also undermined socio-technical approach, which targeted broad groups of organizational members [1].

In particular, Mumford's ETHICS did not gain momentum in practice. As a methodology, ETHICS was not widely adopted, and where it was implemented the results have been mixed [5]. Socio-technical researchers mainly blamed the prevalent social and political climates, describing them as dystopian. In their view, the climate was predominated by capitalism ideals, vested interests, and monopolies. Thus little room was left for human values and individuals' rights preached by Mumford:

> "The most important thing that socio-technical design can contribute is its value system. This tells us that although technology and organizational structures may change, the rights and needs of the employee must be given as high a priority as those of the non-human parts of the system."[1, p. 338]

In fact, in the competitive environment of 1990s, the socio-technical principles that were rooted in the social-democratic regimes of the 1970s were seen as increasingly utopian. Therefore the socio-technical design was a product of particular socio-political regime. It lost its legitimacy and its relevance when that regime was de-institutionalized in 1990s. Socio-technical approaches as reflected in methodologies like ETHICS concentrated on the "micro" context of the information system design and use. In this way, the design could have missed significant institutional forces that could impact the micro level dynamics. This attachment to immediate contexts could obscure the understanding of the technology implementation, since the macro-context constantly changed. That is why the socio-technical approaches in the 1990s lost sight of the new changes like the social conditions of regulated national economies and unionized labor within which the socio-technical paradigm proved less prevalent [14].

In retrospect, the decline of the socio-technical design can also be partially attributed to its weaknesses and its lack of adaptability to theoretical and professional demands of the information systems community. ETHICS methodology conceptually separated the social from the technical at the point where system development sets social objectives in parallel to setting technical objectives. Although these are finally merged in ETHICS, newer studies of technology in use show that this separation is inherently suspect. For example, Suchman [15] notes that technology and works are entangled and take shape in a situated manner during use.

The socio-technical design has also been criticized for overestimating human capacity to mingle technology and social engineering for achieving social ideals [14]. Again its paucity of insights on the emergent nature of organizational practices could have made researchers too optimistic about the design effectiveness. Scrutinizing Chern's nine principles, Lin and Cornford [16] conclude that a number of these principles are at odds with the emergent nature of work practices. For example, the *socio-technical criterion* asserts that the control must be local, but in emergent change. However, there is no guarantee that such criterion is sustained in use. Finally the misuse of socio-technical approaches let managers manipulate work practices, take an instrumental approach, and therefore trivialize the core socio-technical ideas during 1980s and 1990s [17, 18].

Criticisms were also leveled against the undue certainty that was projected by socio-technical approaches. These approaches mostly draw on system theory which appeared to be a very insightful way to synthesize complex entities like socio-technical systems. The certainty expressed by systems theoretical studies as to what constitutes a desirable socio-technical system was challenged by interpretive traditions. Basically, what is desirable is a matter of interpretations and relate to the subjectivity of the people. For instance, Checkland's soft system methodology

allows multiple interpretations to be manifested. Seen this way, any theories dealing with social phenomenon should be able to portray parties holding differing "world-view" [19].

4. The New Stream of Socio-Technical Approaches

Despite the declining appeal to the socio-technical design, social approaches to the study of information systems did not vanish. In the 1990s, new research interests in the social dimensions of information systems emerged. These were directed to the relationship between information systems development and use and resultant social and organizational changes. The new stream of research has offered fresh insights into the ways new technologies mediate almost all situations of modern organizations [20-24]. Drawing heavily on social theories, this wave of socio-technical research has informed the field of information systems which, as engineering or as a branch of business studies, has been more inclined to inform practice than to explain socio-technical processes [14].

To stage a fruitful comeback, the new stream abandoned some principles of old socio-technical design, a mainly system development methodology. To begin with, the new socio-technical research has taken a critical theoretical perspective which does not tend to translate directly into system development practices. Essentially the critical agenda of socio-technical research, and its humanistic objectives are not glossed over, but the new socio-technical research has discarded simplifying dichotomies such as "empowerment versus managerial control" or "liberation or domination" by ICT. Also, there have been changes in the role of the researcher as an expert activist who seek immediate and direct improvement in workplaces. These changes in turn have led to emergence of a greater interest in theoretical analyses.

These shifts have their antecedents in diminishing legitimacy of the critical researcher as an activist in the socio-technical design approach of the 1970s and 1980s [25]. To address the competitive market regime of the 1990s, the new socio-technical research began to identify a much more complex set of conflicting interests and power dynamics in ICT development and use contexts rather than taking an intervention-centric approach [e.g., 22, 26]. Unlike the old socio-technical design, the new stream lends new emphasis to more subtle issues regarding people experience with ICT in the contemporary social contexts [27].

While the old views were mainly concerned with individual workers in information systems design [28], the new approaches shift the focus from individual workers and solutions such as autonomous work teams to social settings, and collective actions (Kling, What Is Social Informatics and Why Does It Matter). Therefore, in contrast to the old socio-technical views that reduced context to specific work processes (improved by ICT), the new approaches indicate a holistic perspective of context which aim to incorporate the interactions of the different levels of social analysis [29].

The new theoretical approaches also gravitate towards abstract social sciences. They distanced themselves from the way that ICT functionalities and organizational changes were conceptualized based on the system theory that underpinned much of the old socio-technical approach. Nevertheless, the two share a concern over the relationships of the technical and the social in the spreading of ICT. Overall, the new stream engenders a novel theory-conscious orientation to information systems research, using social sciences to shed light on information systems questions. Therefore, the main mission of new approaches can be thought as searching for conceptual vocabularies and epistemological fundamentals that allow researchers to capture and interpret complex and multi-faceted socio-technical information systems phenomena.

The need for more epistemological perspectives of society and technology, more capable of capturing human social experiences, found support from a wave of new social theories that were imported into the field of information system. For example, Wanda Orlikwoski's work [30-32] which inspired Gidden' structuration theory [33], and also insight borrowed from the sociology of technology [e.g., 34, 35, 36] permeate the information systems scholarship.

This new socio-technical approach to research is the current dominate perspective. While sharing the same philosophical roots, it has moved away from early approaches to design. It has shifted focus from rather being a prescriptive system development methodology, to being a more abstract and theory-oriented view of ICT in contemporary organizations. In particular, the new social-technical approach that emerged in the 1990s is strongly inspired by the broader stock of social science theory (i.e. structuration theory or theories from science and technology studies), and seems more able to address the multiple substantive issues that are associated with ICT [37]. These theoretical insights are critical in contrast to the old socio-technical approaches that had some distinctive blindspots in dealing with rapidly changing contingencies of workplaces and malleable technologies that lend

themselves to user improvisation [38, 39].

5. The IS Socio-Technical Research vs. IS Mainstream Research

There seems to be a widespread ethos within the information system research community that the IS research is socio-technical by definition. The belief is premised on the assumptions that management science and organization science are characterized by a socio-centric persona while computer science is techno-centric. Information systems scholarship, a field highly dependent on these reference disciplines, combines both perspectives and therefore holds a distinctive socio-technical identity [40]. In his editorial introduction, Lee echoes the same belief and describes the socio-technical nature of information systems research:

> Research in the information systems field examines more than just the technological system, or just the social system, or even the two side by side; in addition, it investigates the phenomena that emerge when the two interact. This embodies both a research perspective and a subject matter that differentiate the academic field of information systems from other disciplines. In this regard, our fields so called reference disciplines are actually poor models for our own field. They focus on the behavioral or the technological, but not on the emergent socio-technical phenomena that set our field apart. For this reason, I no longer refer to them as reference disciplines, but as contributing disciplines at best [41, p. iii].

However, one can distinguish between mainstream information systems research and the wealth of information systems research that is particularly inspired by the socio-technical principles. The latter strives to truly accommodate the interplay between the technical and the social sides of information systems. These studies all share the same assumption that information systems are social systems. They direct attention to social contexts within which ICT use unfolds [9, 20, 30, 42, 43]. As mentioned before, in the 1990s the research on the social dimension of information systems became more theoretically sophisticated by drawing on several theoretical and epistemological traditions of the social sciences [e.g., 21, 23].

The socio-technical approaches to studying information systems are distinct from the rest of information systems research (also called standard models [2]) in terms of (a) specific views on context and perceived boundaries (b) underpinning rationalities and (c) ways they conceptualized the interaction of ICT and social orders and processes. These differences will be discussed in details in what follows.

5.1. The View of Context

5.1.1. The Standard Models

In standard models the object of research is de-contextualized. That is, the focus of research is to contribute to professional traditions of "best practices", irrespective of contextual particularities. This trend, generally emanating from the general business literature, has focused researchers' attention to best-practices like Total Quality Management (TQM) or Business Process Reengineering (BPR). The standard models "de-problematized time, space and the uses of ICT" [44, p. 3]. This could be because a "globalization" discourse implicitly underpins much of this research and tends to assume the exertion of uniform economic imperative around the globe [43]. In addition, they tend to ignore the temporal dimension of ICT, and as Orlikowski and Baroudi [45] suggest, about 90% of IS research represents a single-snapshot data collection method which does not include observations and data collection over time.

Many practitioners and academicians have adopted policies, strategies and research agendas based on the assumption of universal imperatives that are considered valid across multiple contexts. The result has been uniform guidelines for exploiting the potential of new ICT [46, 47]. Such an acontextual perspective to ICT exploitation has been powerful in terms of promoting the significance of ICT in the contemporary economies [48]. However, they have entailed the risk of frustrating local efforts to make sense of new technologies based on local contingencies [49].

When it comes to the study of the technological change or the interaction between technological change and socio-organizational change, a great deal of information research is concerned with the technology itself with a

focus on development, management and exploitation of ICT. Examples are research on information systems development [50, 51] , information system management [52, 53], and strategy [54]. While the main emphasis is placed on developing, managing and exploiting ICT, this stream of information systems research does not take into account social changes stemming from the technical innovation.

As far as the boundaries of context are concerned, standard models pays little attention to the environment of the organization. The breadth of literature within information systems has investigated the strategic implications of ICT, highlighting the significance of competitive pressures on organizations. This literature has sought to provide guidance for managers on harnessing strategic potential of new ICT in order to secure a competitive position within the environment of the organization [52, 55-57]. Such studies tend to draw on contingency analyses, which inform the choice of strategy based on environmental contingencies. Nevertheless, this view of organization's environment does not delve into the processes through which a particular technological change is related to its context.

5.1.2. The Socio-technical Approach

In contrast to acontextual approaches, context is problematized in the socio-technical approach. In other words, in their analysis, the scholars who focus on situating work seek to examine all contextual factors. This type of enquiry leads to a holistic view of context, which does not diminish or remove contextual elements, even those with limited influence. Data collection and analysis, as such, aim to dig as deeply as possible to disclose particularities of a specific context (or contexts). No variable is controlled. Context arises from activity and is produced and reproduced in the course of the activity at hand. Instead of causal relationships, the situated scholar develops narratives as profound explanations of the phenomenon and the context within which it arises [i.e. 24]. In this view, context is not taken as fixed or delineable, but is defined dynamically.

The socio-technical researchers shift their focus away from ICT to the heterogeneous networks of institutions and people within which ICT is called to play a role [58]. ICT innovation and its social context are considered intertwined. Therefore, as Callon and Law put it, any distinction between ICT and society as context is an over simplification which obscures the complex processes where human and technologies jointly construct socio-technical entities [59]. In this light, the degree to which these types of contextual insights are valid depends on the extent to which the contextual settings and the heterogeneous network, from which actors cognitive and emotional resources stem from, are problematized and understood [43].

As mentioned before, the standard models of information research take a bounded view of context that reduces contextual insights into parsimonious explanations. On the contrary, socio-technical approaches argue for building situational and temporal conditions directly into their theories, and relate these to conceptualizations of embedded technology. Pettigrew [60] succinctly idealizes this process. Pettigrew looks into the history of emergent change in organizations, arguing that events are situated in their settings. The changes Pettigrew suggests are shaped by the organization's social, economic and political context. Context, in his view, influences action even as it is also being shaped by actions. His analysis mainly rests on two dimensions of context: the horizontal and the vertical (See Fig.1). This argument is echoed by Suchman [61], who focuses on a much different context. She suggests that scholars should situate the research phenomena in extended spatial and temporal relations. These dimensions will be discussed further bellow.

In a horizontal analysis of context, researchers are concerned with the temporal sequences of events. This includes past, present, and the future aspects of events. For instance, if the current state of an information system were the phenomenon under study, researchers would seek to investigate when the first interactions between the system and the organizations started [e.g., 62, 63]. These scholars would further complement this historical analysis with a synthesis of the current situation, and some cogent predictions regarding how the context might be evolving into the near future. A vertical analysis of context focuses the researcher's attention to the interplay among broader and more bounded levels of the social milieu. Even though assumptions regarding discrete context levels may seem both a difficult and perhaps a risky proposition, it is a common analytic effort. Certainly isolating an influence rooted in only one level of social abstraction will lead to a less rich picture.

Fig. 1. the horizontal and vertical dimensions of contexts

It is helpful to bring up a study that exemplifies the socio-technical view where context is more carefully developed along vertical and horizontal components. Orlikowski's [31] study of the social shaping of a groupware technology accounts for the metamorphism of the technology over time while a longitudinal investigation is undertaken. In addition, the study offers insight into the social structures at both group and organization levels. Through structurational analysis, she reveals that these social structures represent the contextual forces that exert influence over the technology use. In this vein, Orlikowski's contextual enquiry is sufficiently attentive to both horizontal and vertical dimensions of analysis.

5.2. The Underpinning Rationality

5.2.1. The Standard Models

The standard models of information systems research underscore norms of rationality and technical efficiencies. Technical/rational knowledge is concerned with systematic reasoning, decision making, and governing practices through techniques, and technologies [64]. The technical/rational perspectives can be traced to resource dependency theory [65, 66]. Resource dependency theory strives to explain the decision making capacity of managers, and has widely pervaded business management literature. The standard models tend to underscore "the decision making processes of managers". As Kling et al [58] contend, these conventional rationalities tilt towards economic and technological determinism based on which humans act to maximize their utility.

The direct consequence of technical/rational perspectives is the development of well-calculated processes and technological methodologies to fulfill particular organizational requirements and to motivate certain organizational improvement either operational or strategic. For example, the ideas of strategic planning and business process re-engineering [54, 57] stand for general "rational" principles that can guide the successful implementation and adoption of ICT in the quest for unambiguous organizational objectives. Seen this way, information systems practices and associated organizational change are treated as processes of technical reasoning and acting which are ruled by such concerns as software construction, administrative control and economic gain. In these processes, all the weight is given to rational capabilities of information systems and professional users which are seen as unambiguously driving the information systems innovation and steering actions towards well-formulated targets.

However, empirical evidence constantly challenges the sole emphasis on the general rational principles. Numerous empirical investigations in the field of information systems often come across human activities that are considered "irrational" by technical and economic rationalities [67]; these activities unavoidably interfere with rational, planned and methodical actions that drive the overall organizational performance. These seemingly irrational elements are situated within particular organizational settings. For this reason, socio-technical researchers view the development and use of ICT as intertwined in social fabrics of organizations, since they are emergent, incremental, and more accurately described as improvisation rather that pre-calculated [32, 39, 68].

5.2.2. The Socio-technical Approach

The assumption that information systems innovation in design and practice are only guided by technical/rational management and engineering activities has been repeatedly challenged by socio-technical researchers [42, 67, 69-71]. By the same token, studies suggest that information systems projects are often confronted with obstacle, and are either rejected altogether or fail to deliver expected outcomes. These types of projects have been frequently observed in health care sector [72-74], and the context of developing countries [75-78].

The socio-technical accounts do not dispense with technical/rational assumptions, however, they seek to expand the frame of mainstream corpus of information research. Such widening of perspective involves new dimensions of enquiry, where research is required to recognize the subjectivity of different involved actors. This means that researchers should reach out to other actors who have a bearing in the development and implementation processes. In addition to ICT specialists, immediate users, and business executives who are conventionally included in the information research, socio-technical research seeks to include other legitimate actors in the ICT innovation scene: the operators, the customers, the citizens, the gendered individuals, the "poor", the government and the like [25].

Therefore, socio-technical approaches complements technical/rational perspectives by directing attentions to the context within which "the web of actors" is embedded and context specific, unformalizable actions such as improvisation, tinkering, and actors negotiations [39]. This view is well-posited where a wide variety of actors, involved in innovation processes, can construct technology and work out organizational practices in unexpected ways rather than pursing general rational pattern of behaviors. Over the actors' sense making process, their situated logic of action can deviate from pre-devised plans where actors draw upon their prior experiences, knowledge, emotion, and perception of interests [79].

5.3. The Theorization of ICT

5.3.1. The Standard Models

From this perspective, the value of ICT and the process through which its value is identified are examined independently from the specific circumstances of the actors that are involved in the implementation process. ICT is considered by and large as a means for processing information with speed, accuracy, and reliability. It is potentially capable of improving organizational efficiency [80], or rational decision making process [81, 82], and productivity [83]. The values of these technological capabilities are mostly uncontested across contexts. So the innovation processes are perceived as a series of activities that are well sequenced to exploit the potentials of new technologies [e.g., 56, 84].

In this view, "causality" describes the relationship between technology and organizational and societal structures. Particular state of social processes and structures are thought to be the "impact" of technologies due to specific properties that are embedded in a technology. Nevertheless, the field of information systems has avoided bold determinist hypotheses that associate ICT and particular types of organizational and societal structures. That is, in the established jargon of the information systems literature, ICT is considered as an "enabler" of desirable social effect, rather than a direct "cause". This means that such changes could partly depend on the organizational circumstances.

5.3.2. The Socio-technical Approach

The socio-technical approach undermines the "tool view" of ICT [2]. This expanded view of ICT suggests that ICT should not be theorized as a tool which can be readily applied for specific organizational objectives. Instead, ICT and its role can be better explained in terms of "socio-technical networks" [58]. In practice, the boundaries between what is social and what is technical blur as organizational actors in their recurrent interactions with ICT enact distinct technology-in-practices based on their cognitive schemas and the social contexts they are embedded in [31].

In the more recent socio-technical discourses on information systems, ideas drawn from social studies of science and technology challenged the widespread belief that science is the result of pure reason and disputed the view that ICT can determines social effects. Theoretical endeavors undertaken by socio-technical researchers on duality of

technology [30, 85], social constructionism [86, 87], and actor networks [88-91] have explicated the role of ICT in contemporary organizations. They essentially provides theoretical means for studying ICT innovations in interaction with the changes simultaneously being undergone or pursued by people, institutions, other socio-technical hybrids [43].

6. Conclusion

The humanistic ideals of Tavistock Institute generated promising insight on how to combine technical capabilities and social aspects of organizations to address both organizational and employees' needs. These principles were imported to the field of information systems by researchers like Mumford to guide the design of information systems. However, despite their desirable theoretical principles, they failed to appeal to information systems researchers and practitioners and subsequently lost ground to emerging best-practices like BPR in the 1990s. The decline has to do with the dramatic transformation of competitive environment and also a dearth of adoptability of the socio-technical design to accommodate rising theoretical and practical needs.

New socio-technical approaches in information systems have strived to redress shortcomings of old socio-technical principles through raising the level of abstraction and relying on theories from the social sciences. These fresh theoretical insights call for appropriate research frames that can capture the contingencies of organizational contexts and the situatedness of actions in the use of information systems. The social technical approaches therefore can complement mainstream information systems research by capturing the contextual dynamics and actors rationality, attending to relevant actors, their interests, and the logic of their negotiations [92].

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