

SOCIO-TECHNICAL CHANGE: THE EQUILIBRIUM PARADOX

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Research paper

Abstract

In the domain of change and information systems (IS), we have persisted in the assumption that a well-functioning IS exhibits a balance between the social and the technical structures such that this system rests in a state of stable equilibrium. When transformational change arises, the system falls into a state of disequilibrium, until it reaches a new state of equilibrium. This assumption no longer gives a full explanation of the complex dynamics in today's enterprise. In this paper, we explain the concept of unstable equilibrium that results from the continuous change that individuated individuals make in socio-technical structures. Our findings arise from a critical realist perspective used to interpret data from an e-group interview with 11 professionals working in platform-based organizations. We find that a generative mechanism of contradictory complementarity, denoted as individualization and socialization, now inhabits the IS and causes outcomes that are both individual-technical and socio-technical. Now change happens in the surface-structures resting in unstable equilibrium, while the deep structures remain in stable equilibrium. This equilibrium paradox in socio-technical change explains how platform-based organizations achieve change by both achieving agility from their IS while simultaneously achieving stability.

Keywords: Socio-technical change, platform-based organizations, generative mechanisms, contradictory-complementarity, individualization and socialization, equilibrium paradox

1 Introduction

The periodicity narrative is a dominant metaphor of organizational change and transformation (Lewin, 1947; Tushman and Romanelli, 1985; Gersick, 1992; Smith and Lewis, 2011). A periodicity narrative assumes such change will *complete* a cycle, a series of events, or a single action. Lewin's three-stage model of unfreeze, change and freeze is one of the most well-known periodicity narratives (Lewin, 1947). Organizational change, when it relates to the use and application of technologies has a similar explanation. In IS Research, the punctuated equilibrium model serves as a periodicity narrative (Besson and Rowe, 2012). The model explains a process of change in which the IS resides in a state of equilibrium, and when transformational change happens, the system enters a state of disequilibrium, until it reaches a new state of equilibrium (Lyytinen and Newman, 2008). The state of equilibrium covers a balance between the social- and technical subsystem manifested as the organizations' deep structures. The model demonstrates that the IS rests in long states of equilibrium and short states of disequilibrium. This equilibrium is one of the core tenets in socio-technical change theory (Lyytinen and Newman, 2006) and the objective of a well-functioning IS (Besson and Rowe, 2012).

Because of recent changes in the architecture of IS (Bygstad, 2016), we suspect that this explanation no longer gives a full account of how the present IS changes and transforms. In the current organization, many continuous and transformative socio-technical changes happen concurrently (Hanseth and Lyytinen, 2010; Bygstad, 2016). Driven by miniaturization of hardware, advancements in cloud services, internet speed, and dedicated operating systems (Faisal and Leiper, 2014) new technological

platforms and apps are being brought in by both individuals and organizations to enhance information processing capabilities and coordination (Zammuto et al., 2007; Eason, 2008; Bygstad, 2016). Some of these technologies are much more mobile and malleable than their predecessors (Richter and Riemer, 2013), while others are more rigid and prescriptive (Strong and Volkoff, 2010). A consequence is paradoxical situations where managers adopt more agile approaches to enable innovation and flexibility, while simultaneously adopting standardized platforms and strict scripts for work. These paradoxes are rarely studied (Besson and Rowe, 2012).

Eason (2008) points out that the continued development of socio-technical change theories is increasingly important in an area that is getting more and more complex. We are interested in explaining the cause of outcomes in the interactive and somewhat paradoxical relationship between individual agents, social organizational structures and technology, in - what we for the remainder of this paper call - the platform-based organization.

The concept of *the platform organization* denotes a meta-concept of an influential context that molds structures and routines, shaping them into forms, such as hierarchy, flat-archy or a mix. It is characterized by serendipity and surprises, and of members that are busy improvising and tinkering (Ciborra, 1996). Our concept of a *platform-based organisation* (PBO) pertains to the fact that usage of digital platforms and applications increasingly constitute structures and routines (Zamutto et al, 2007) and thus become an influential element of the context in the present environment.

Our research question is: How do PBOs achieve socio-technical change?

We apply a critical realist (CR) perspective to explain underlying generative mechanisms causing observable events from a qualitative exploratory study (Bhaskar, 2008). In CR, a generative mechanism (GM) is a causal structure or process that comprises the essence of a concrete system (Sayer, 1992). According to Donati (2015), GMs have the power to keep changing the structural relationship between entities in a system, predominantly because GMs hold a contradictory complementary nature. Hofkirchner (2014) defines such a GM *of contradictory complementarity* in terms of the interaction between socialization and individualization. This mechanism explains change of social systems in terms of individuated individuals. By *individuated individuals*, we mean organizational members who are social actors, but act with a self-oriented autonomy less anchored in social norms (Castells, 2014; Donati, 2015). Through social relations, these individuated individuals shape the common good, i.e. shared resources that everyone has an obligation and interest in nurturing. As an example, information and knowledge are a commons (Hess and Ostrom, 2007). The causal process proceeds like this: through action and interaction, individuals form societal relations that condition the generation and utilisation of shared resources and facilities in an integrated way. This in turn allows individuals to discriminate: the more individuals are “individualized”, the better they contribute to the common good; the better the common good is “socialised”, the more individuals can become individuated (Hofkirchner, 2014). This is the essence of a self-organizing system. The process can eventually break down; the socialization from the system and its structures can become too rigid; individuals on the other hand, can become too egoistic.

By understanding the causal power of contradictory complementary GMs that condition the routines and structures in PBOs, we can supplement prior explanations of how to achieve socio-technical change and equilibria. Ultimately, we seek to complement the theory of socio-technical change by challenging the current explanation of punctuated equilibria. Thus, the aim of this paper is to contribute to the development and to present an explanatory model of socio-technical change in PBOs. This is important for IS-scholars developing theories of the current IS, and for designers and managers, when they plan and explain expected out-comes from their socio-technical interventions in the present world of work (Mumford, 2006).

The remainder of the paper is structured as follows: In section 2, we review related literature on socio-technical change and equilibrium. In section 3, we present the methodology, the philosophical underpinning, interpretative framing, research design and data-collection strategy. In section 4, we present the findings. In section 5, we discuss our contribution to socio-technical change theory and in section 6, we conclude.

2 Related Literature

Based on a retrospective search in the AIS-Journal Library using the search terms “socio-technical” AND “change” in titles and abstracts a narrow subset of 16 articles was selected. After an extensive reading of this literature and following a snowball citation search, the final body of knowledge amounted to 32 relevant articles. These are primarily from top-journals in the IS-field accompanied by the fields of management, organization and economics¹.

The theories of organizational change and technology primarily differentiate in how they view determinism and causation. Essentially, the differences exist around what determines change and what causes change. Markus and Robey (1988) refer to three different causes that are imperative to organizational change and technology. First, the technological imperative is one in which a new technology and its possibilities are the cause of change. Second, the organizational imperative is one in which the organization sees a need for new information processing opportunities and designs a new supporting technology. Third, the emergent imperative is one in which neither technology nor the actors are causing the change while it is the complex social interaction and usage of technology that creates unpredictable outcomes. DeSanctis and Poole (1994) have a similar division and explain three different views. The first view regards the structure of a technology as superior to humans and thus enables humans to carry out certain tasks better. Thus, the introduction of any technology is an improvement in productivity, efficiency and satisfaction of individuals and organization. The opposite view is non-deterministic. It is called the institutional view in which technology is an opportunity for change, rather than a causal structure. Studies that adhere to this view focus more on the social side of structures. Such studies are interested in how people structure their institutions and do not assume that technology determines behavior. Instead, people generate social constructions of technology using resources, interpretative schemes and norms embedded in the larger institutional context (Orlikowski, 1992). The third view is the integrative view, called social technology. In this category, we find socio-technical systems theory (Mumford, 2006; Eason, 2008) and adaptive structuration theory (DeSanctis and Poole, 1994). In this view, the focus lies in the interactive relationship between technology and humans (Orlikowski and Scott, 2008). It represents soft-determinism where adoption of technology is interpreted as a process of organizational change. Orlikowski and Scott (2008) arrive at a similar division of views, thus introducing sociomateriality as a novel view of the constituent inseparable relationship of the social and the material (technology) observed as day-to-day use of technology during practices.

The aim of this paper is to look further into the view of organizational and technological change from the perspective of integration and social technology. This view, as explained above, relies in general on a causal logic that inhabits a soft-deterministic understanding of how systems change. Soft-determinism sees events occurring in accordance with causal laws that can describe how events occur; but these laws may not predict them. Thus, the remaining part of the review is centered on two important constructs from Lewin (1947): How do the different articles view the objective of socio-technical change? What are the kinds of equilibria in socio-technical change?

2.1 What is the objective of socio-technical change?

The objective of change is, according to Lewin (1947), to raise the level of a process. In the social world of organizations, the objective of a process has humanistic and economic aspects such as

¹ The retrospective search matched literature from *European Journal of Information Systems*, *Journal of Strategic Information Systems*, *MIS Quarterly*, *Journal of Information Technology*, *Information Systems Journal*, *Communication of the Association of Information Systems*, *Journal of the Association of Information Systems*. The snowball citation search led to additional outlets such as *Organization Science*, *Academy of Management Journal*, *Academy of Management Annals*, *Human Resource*, *Econometrica*, *Info systems Annuals*, *Journal of Engineering and Technology Management*, *Journal of Information technology Cases and Applications*, *Sprouts Working Papers on Information Environments, Systems and Organization*, and *the Society for Philosophy and Technology*.

productivity, efficiency and employer satisfaction. In socio-technical change theories, the objective of change varies in terms of improvements to routines, business processes, practices and structures. The change objectives in socio-technic pertains to productivity, enablement, efficiency, feasibility and humanism, etc. The theories share a common aspiration to explain change as a socio-technical arrangement that ensures an optimal balance between the technology's institutional purpose and the social system's adaptation to new ways of working. When the object of change is new routines, the literature highlights aspects of repetitiveness, invariance and regularities (Baskerville, Travis and Truex, 1992; Robey, Anderson and Raymond, 2013; Swanson 2017). However, when the object of change is new business processes, aspects of stability and integration is mentioned (Bostrom and Heinen, 1977; Bygstad, Nielsen and Munkvold, 2010; Niederman and March, 2014). Likewise, new practices inhabits emergence and usage patterns (Luna-Reyes et al, 2005; Orlikowski and Scott, 2008; Hovorka and Germonperez, 2013; Cecez-Kecmanovic, Kauts and Abrahall, 2014). Finally, when the change involves new structures, the role of technology as enabling deeper levels of structures is focal (Wand and Weber, 1995; Truex, Baskerville and Klein, 1998; Lyytinen and Newman, 2006; 2008; Silver and Markus, 2008; McLeod and Doolin, 2012). While new structures also come from the relatively stable relationship and mutual adaptation between structures and actors, jointly determining the usage-outcome (Orlikowski; 1992), DeSanctis and Poole, 1994; Griffith and Dougherty, 2002; Licker, 2004). The predominant framing of objectives denotes stability - in terms of aspects such as repetitiveness, routinizing, regularities, emergent patterns and mutual adjustment. Closely related to stability, in the socio-technical perspective, is the balanced integration between the social and the technical sub-systems in the IS.

2.2 Kinds of equilibria in socio-technic

Balance is a key underpinning of socio-technical philosophy (Ropohl, 1999). Balance is where “*the social components of an organization are combined with the technical components in an attempt to create a balanced and synergistic relationship*” (Griffith and Dougherty, 2002, p. 219). The term ‘equilibrium’ derives from Latin. “Acqui” means equal and “libra” refers to balance. We use the term to denote different kinds of equilibria in any system perspective from social, organization, IS and economic theory. The specific theories dealing with equilibrium and socio-technical change have specific underlying assumptions of equilibrium. These assumptions draw on different framings of equilibrium - from quasi-stable equilibrium, punctuated equilibrium to non-equilibrium.

In economics, the term *stable equilibrium* refers to a situation in which the equilibrium dislocates because of insignificant change. However, activated mechanisms restore the equilibrium back to its original balance (J.R. Hicks in Metzler, 1945). Lewin (1947) uses the term of *quasi-stationary equilibrium*. The word *quasi* means that a system is seemingly in full balance, but living systems have a balance that flows forward like a river, with a certain direction and a certain pace (Lewin, 1947). Swanson (2017) and Lee (2010) see the system as slowly evolving over time. Swanson (2017) interlocks with organizational theory suggesting that relatively invariant routines guide behaviours. While Lee (2010) explains the continuing and reciprocal adjustment between the organizational system and the technological system. Niederman and March (2014); Cecez-Kecmanovic, Kauts and Abrahall (2014); Hovorka and Germonperez (2013); McLeod and Doolin (2012); Bygstad, Nielsen and Munkvold (2010); Silver and Markus (2008) and Baskerville, Travis and Truex (1992) seem to mirror the perspective of quasi-stable equilibrium, though not using the term balance or equilibrium.

In economics, a *neutral equilibrium* describes the situation in which an equilibrium is displaced and forces are set in motion that settle the system in a new state of equilibrium away from its original position (J.R. Hicks in Metzler, 1945). In social theory, the theory of *punctuated equilibrium* describes this situation. The theory explains changes in complex social systems (Gersick, 1992), suggesting that most social systems exist in an extended period of convergence (resting on equilibrium). This state is punctuated by sudden shifts of radical change in which the social system enters a state of non-equilibrium (Tushman and Romanelli, 1985). Lyytinen and Newman (2008) refer to long periods of equilibrium in which a socio-technical system balances due to its deep structures. For Lyytinen and

Newman (2008), a punctuated equilibrium rests on four important notions: 1) Socio-technical systems have deep structures 2), these deep structures give them long periods of stability 3) then something radical happens that makes the system unstable, 4) such a punctuated equilibrium can happen at any level. Wand and Weber (1995) describe the deep structure of an IS as comprising those properties that manifest the meaning of the real-world system. It is this real-world system that the IS is intended to model. Deep structures are highly stable for two reasons: “1) *The trail of choices made by a system rules many options out, at the same time as it rules mutually contingent options.* 2) *The activity patterns of a system’s deep structure reinforce the system through mutual feedback loops.*” (Gersick, 1992, p. 17). Users interact with these deep structures through what Truex, Baskerville and Klein (1998) denote as a *surface structure*, a phenomenon encompassing the facilities that are made available in the IS allowing the users to interact with the system. These surface structures depend on the *deep structure scripts* that provide a representation of the system (Wand and Weber, 1995). Orlikowski (1992); DeSanctis and Poole (1994); Luna-Reyes et al, (2005) and Robey, Anderson and Raymond (2013) seem to reflect changes that occur as punctuated states of equilibrium, though not using the term.

The third framing of equilibrium is non-equilibrium. Licker (2004) suggests that an IS is never in balance. Actually, it is inherently unstable, always lacking balance. These systems cannot be known, controlled or predicted like those in a state of equilibrium, they are always in a critical state, where small things affect in unpredicted ways (Licker, 2004). In economics, the framing of non-equilibrium is unstable equilibrium. An *unstable equilibrium* describes a fragile state of equilibrium in which, when disturbed, the system tends to move further and further away from its original position due to self-enforcing mechanisms (Hicks in Metzler, 1945).

In summary, the assumptions underlying the body of literature are that systems rest in quasi-equilibrium *either* as a continuous state or punctuated in terms of a short period of dis-equilibrium. Only one paper (Licker, 2005) mentions non-equilibrium.

2.3 What are the difficulties with these explanations?

We have focused on articles that belong to the social technology view with change objectives such as practices, routines, business processes and structures. The theories predominantly inhabit a soft-deterministic assumption and a linear logic. The main objective of a socio-technical change is quasi-stability based on deeper structures. This stability influences the surface structures made available through the deep structures. As such, it is assumed that socio-technical systems exists in long periods of quasi-equilibrium that can turn into disequilibrium, thus shifting episodically between the states while always settling in a new quasi-stable equilibrium.

Much of the research associates change and punctuated equilibrium with deep structures. There is much less research that considers surface structures as a component of change and punctuated equilibrium. Instead, some research has suggested that the dyadic between deep and surface structures overlooks other kinds of structures. For example, Strong and Volkoff (2010) suggested that there is a third world of structures; latent structures (such as culture and organizational translations) that proceed from the changes in surface and deep structures. In PBOs, the necessary organizational features that enable agility must necessarily be embedded in changes to surface structures.

Much of the research on equilibrium refers to long periods of quasi-stable equilibrium. There is much less research that considers unstable equilibria as a component of change, in which a system moves further and further away from its original position due to self-enforcing mechanisms (J.R. Hicks, in Merckel 1947).

As mentioned in the introduction, we question whether the theories *per se* acknowledge the complexity of change in PBOs. We view the PBO as inhabiting an influential digital context consisting of deep and surface structures. As a consequence of individual improvisation, PBOs reshape into new forms of organizing. This serves as a good setting for further scrutiny of socio-technical change. Donati’s (2015) view on GMs as contradictory complementary can act as an unlocking device, explaining the impact from the individuated individuals who act with less and less influence from the system (Cas-

tells, 2014; Benkler, 2006). Instead, they increasingly act on the fads (Donati, 2015) presented to them at the surface level. Castells (2014) explains this as the process of *individuation*, as the construction of autonomy by social actors who become subjects in a process of defining their specific projects in interaction with, but not submission to, the institutions.

Based on our literature review, we suggest that socio-technical change theory must now extend to new issues such as generativity and the influences of different structures. These new issues both challenge and renew the assumptions about quasi-stable equilibria and punctuated equilibria. This extension is important if a socio-technical change theory it is to make sense in PBOs.

3 Research Methodology

In this section, we describe how we approach this exploratory research from the philosophical perspective of critical realism (CR). We then explain the interpretative framing. Finally, we proceed to research design and data-collection strategy.

3.1 Philosophical underpinning

By applying a critical realist understanding of the world, we can explain mechanisms, their properties and interplay between constituent levels of reality that depend on external as well as internal relationality. CR according to Roy Bhaskar (2008) separates reality in two dimensions. The transitive dimension consists of theories, technologies and social practices. The intransitive dimension is the opposite: an external reality that exists independently of human consciousness, which consists of structures and mechanisms of the natural world (Bhaskar, 2008). In CR, the underlying structures and mechanisms enable and cause the phenomenon that appears before us in the transitive dimension. A core tenet in CR is to understand social reality as an open layered system of objects with causal powers. It divides social reality into an actor- and structure level. Structures are important for the social actor, but do not constitute the actor. It gives certain possibilities and constraints, while leaving something for the actor herself (Bhaskar, 2008). We employ Donati's conceptualization of non-mechanical GMs as causal processes that entails the dynamics of a social structure, with first- and second order feedback (Donati, 2015). First-order feedback can be positive and negative on individual actions and second order feedback can be positive and negative on social relations. An example is the relational process of *individualization and socialization* explained in the introduction. For the remainder of this paper we adopt the concept of GMs that exhibits this internal relational configuration. At the empirical level, a GM shows properties such as resilience, elasticity, instability and an interplay between the levels of reality that depend on their external relationality. The (re)forming of structures and routines in PBO's is an example of the interplay of individual actions and social relations. The relational logic is a combinatory logic that is different from linear logic that inhabits prior theories. The logic is based upon interaction and contradictory complementarity between two opposite realities and the acceptance of the paradox, without conflating them. The relationship between the two opposites consists simultaneously of a related exclusion and inclusion. As an example, individualization and socializations happen simultaneously. They are not oppositional/conflicting, however enabling each other. According to Donati (2015), GMs enter and influence the system, observable through downward causation. We look for GMs with contradictory complementarity that exert *downward causation* in the PBO. Downward causation is closely related to the concept of supervenience and is used in studies of complex systems that exhibit a kind of self-organization and emergence of visible structures when the systems are far from equilibrium conditions. Occurrences at the micro-level can directly influence occurrences at macro-level. This influence means that we cannot really understand social relations without knowing something about individual actions. In our study, we separate the empirical level in three layers: first, the individual actions labelled outcomes from the individual-technological relationship (the micro-level); second, the social relations labelled as socio-technical outcomes (macro-level); and third, the societal layer, the conditioning context of the PBO.

3.2 Descriptive and interpretative framing

Critical realists recognize that there is always a descriptive part and an interpretative part in studying phenomena and the mechanisms that produce these phenomena. Markus and Silver (2008) recommend a hermeneutical approach as suitable for CR. We use hermeneutics to understand phenomena through the meanings that people assign to them (Klein and Myers, 1999). Any hermeneutic study starts with a pre-understanding of the context in question and a pre-supposition of what is deemed significant. We study individuated individuals in PBOs and focus on how socio-technical changes unfold. These individuals have a large amount of autonomy and are free to decide how, where and when they work. For them to carry out work, they apply a wide range of mobile devices, communication, information and collaborative apps in combination with enterprise platform-technology. Most of their communicative and collaborative activities are mediated either in an asynchronous or synchronous fashion. Our pre-supposition is that in the PBO setting socio-technical changes unfold differently than explained in prior theories. The hermeneutic circle is central to our approach. The cyclic process of understanding a social phenomenon can only be reached by a dialectic process of narrowing the scope of generic concepts concerning it, and identifying within the 'whole' the hierarchy of topics and subordinate topics that constitute the whole (Butler, 1998). We apply Donati's understanding of an open system to identify the hierarchy of topics. According to Donati (2015), GMs enter a social structure (the PBO-setting) that generates a tendency in outcomes (individual-technical and social-technical). This structure is relational. The outcomes have a type of regularity (between individual actions and social relations). The type of regularity will depend on the relationality peculiar to its structure. In the PBO, the individual populates the micro-level, whereas the social relations are located at the macro-level. The macro-level outcomes emerge from the micro-level. The relations on the macro-level exert downward causation from actors on the micro-level (Donati, 2015). In applying a hermeneutic cyclic interpretation, while preserving analytical dualism between the individual, the social, and the technical, we introduce three steps of interpretation to answer the RQ. Step 1: We interpret observable outcomes at the individual-technical (micro) level and at the socio-technical (macro) level and interpret the tendencies. Step 2: We interpret the regularities in the system. These regularities depend on the relationality that is distinct to the structure of PBOs. Step 3: We interpret the GMs that cause these outcomes, tendencies and regularities. These steps will eventually lead us to a final interpretation of how socio-technical change is obtained in PBOs.

3.3 Study design and data-collection

We have designed an exploratory exercise to gain knowledge of individuated individuals in the work-setting of PBOs. Frey and Fontana (1991) promote group interviews, when studying work-environments. We will bring together a group of knowledgeable people who are familiar with the situation and setting, moderating a discussion that can revise or solidify our pre-supposition of reality in this setting. Group interviews add a dimension to the knowledge of everyday life that we might overlook or miss if the data collection method had been limited to one-on-one interviews. It adds intersubjectivity, i.e. agreement of meaning and shared ordinary descriptions of reality. We choose e-group discussions to conduct the research in context (Yin, 2004). Collecting data in e-groups serves many purposes as opposed to off-line group data collection. First, it gives access to participants who are difficult to recruit; second, participation is convenient and easy; third, participation is more balanced in terms of the number of comments made by the members (Murgado-Armenteros, Torres-Ruiz and Zamora, 2012). We chose a critical case sampling technique particularly useful in exploratory research, where a small sampling can be decisive enough to explain the phenomenon of interest. This technique can help make logical generalisations; however, we will make them with caution. We sought individuals from different enterprises, sharing the social-setting of a PBO and made a convenience sampling by posting a request on one of the author's LinkedIn page (with +1200 contacts) in June 2017. We asked for participation in research from people interested in the phenomenon *new ways of working*, a commonly used label of digital work-settings (+182,000 matches in Google) and a broad enough theme to attract as many as possible. +30 people responded and careful screening of participants be-

gan. Our first inclusion criteria was working in PBOs i.e. performing work primarily via digital supports and with a positive attitude towards exploring and improvising with technology for work-related issues. Then we asked into industry, gender, educational level, size of enterprise, role and age. We chose the group in table 1, representing a variety of PBO settings, sharing the same conditioning meta-context, interest and attitude towards tinkering.

#	Industry	Gender	Edu.	Company (year founded/# of employees)	Role	Age
1	Fintech	F	Master	One-man (2014/1)	Advisor	27
2	Education	F	Master	Start-up (2015/+9)	Consultant	47
3	Telecom	M	Master	Enterprise (1889/+7000)	Director	32
4	Recruitment	M	Master	Start-up (2017/+8)	CEO	40
5	Art. Intelligence	M	Master	Start-up (2016/+35)	Manager	47
6	Software	M	Master	Enterprise (1985/+120.000)	Manager	53
7	Food	M	Bach.	Enterprise (1866/+330.000)	Director	42
8	SW-Infra-struct.	M	Master	Enterprise (1989/+ +8000)	Consultant	45
9	Architecture	M	Master	Enterprise (2005/+400)	Consultant	31
10	Cloud service	M	Bach	Start-up (2016/+9)	CEO	42
11	Online Shop	F	Bach.	One-man (2013/1)	Advisor	46

Table 1. *Participants*

We gathered all respondents in a closed group on Facebook. The first post was a warm welcome from the facilitator (one of the authors), explaining the basic ground rules of the group interview. The respondents identified themselves with names and used their regular profile portrait. This contributed to an informal atmosphere. In advance, we had created a semi-structured qualitative guide of six broad questions using practical focus group questioning techniques (open-ended questions starting with an engagement question followed by exploration questions). To counter misunderstandings, the basic structure of each question was the specific question, some background explanation, and an instruction in how to answer (i.e. *First, address xx, then, include xx and finally, reflect on xx*). Follow up questions came along the lines of: *Is this ideal? Is this your preferred way?* A great variety of length/language/personal opinions and perspectives flourished. We asked the following questions: 1. Describe the last time you made a technology related change to your work, and for what purpose. 2. Think back: what has changed the most during the last three years in how you carry out work? 3. Reflect on the influence of culture, technology and the structure of work in terms of organizational influence and individual influence – give small examples? 4. What in your opinion kills productivity the most? 5. In what type of organization do you work (hierarchy, flat-archy or a mix) and how does technology support this type? 6. We then used a minor poll to exit and sum up the session. We ended the e-group after two weeks and copied all the text from each question into a word document amounting to 20 text pages. We conducted the first round of interpretation using directed coding. We looked for experiences related to technology of all types (apps/platforms/devices), and aspects pertaining to individual behaviour. These aspects included shared behaviour; choices; coping with/balancing actions; tinkering/improvisation; influence from/on routines, processes, practices and structures; changes; improvements; productivity; and orientation towards individual interest and social commitment. The codes were used in combinations of two and three. Example: re-programmed e-mail (technology) notification in my in-box (individual) for productivity issues (productivity); Then we proceeded with the three interpretation steps from section 3.2.

4 Findings

In table 2, we confirm outcomes from the individual-technical relationship at the micro-level and the outcomes from the socio-technical relationship at the macro-level. We complete step 1 by describing the tendencies on each level in table 3. In table 4, we report the findings of regularities in the system,

ending step 2. Step 3 is covered, when we interpret if GMs from the societal-level and external environment have entered the system and exerted downward causation. Finally, we can answer how socio-technical change is achieved in the setting of PBOs.

We identified four outcomes from the individual-technical (I-T) relationship and three outcomes from the socio-technical (S-T), see table 2.

<p>I-T: Individuals digitize information and digitalize routines: People explore on their own and test new apps and devices that support digitization and digitalization of work. With these apps, they make big and small improvements, to enhance productivity. #6: <i>"I made the switch to digital and take most of my notes in One-Note. Main motivation was to enable sharing of the notes"</i>. #11: <i>Installed a new travel document app so every document for travels are accessible. Works like a charm"</i>. #10: <i>"data synchronization has changed the way I work. I'm a sucker for technology and I have an enormous amount of devices. I have exactly the same access to everything across all platforms. I can work from everywhere with the same efficiency."</i></p>
<p>I-T: Individuals seek instant knowledge sharing through informal channels, in smaller groups. Constant improvement of fast and easy access to information from knowledgeable people are essential. It also serves as a way to lessen the burden from e-mails and misunderstandings. #3: <i>"I introduced Slack ...wanted a common place where [my team] was able to follow questions/answers to increase knowledge sharing across organizational and geographical boundaries [this has] limited the amount of emails and made the discussions less formal"</i>. #4: <i>"I spend more time communicating with colleagues through Trello and Slack, which both result in performance increase and clarity when it comes to execution (who does what, when?)"</i></p>
<p>I-T: Individuals store personal data in the cloud to centralize for easy access and for sharing with others. Much more mobility, from having access to personal and organizational data in one place enhance productivity. #7: <i>"Now we work 99% with-out paper and all is stored in the cloud [...] This change give me the opportunity to follow and monitor trends in a snapshot of time"</i>. #8: <i>"[I'm more] mobile in my work style. I am able to access my files and needed tools from anywhere. I can work from anywhere [...] can still get access to all the needed apps from any device as they are all in the cloud"</i>.</p>
<p>I-T: Individuals individualize communication routines and take full responsibility of own productivity. They experiment with new practices to get things done smarter and faster. #1: <i>"Today my communication is more spread out: I get work-related messages on LinkedIn, Facebook, e-mail, private, Slack, Skype, My work is more effective: [...] I don't check e-mail (and other communication platforms) too much and I don't HAVE to answer an email right away. It can wait so I can get my work done."</i> #3: <i>"[I have control over] installing applications that is fit for my tasks. The Slack-application is on my own and is use with the team"</i>. #5: <i>I have reprogrammed my e-mail in-box to update three times a day, this saves me a lot of time to concentrate.</i></p>
<p>S-T: Transparency comes from cloud solutions that centralize data and change information-structures. The accessibility and interest in up-to-date data happen between an alignment of data and technology. #10: <i>"All employees and investors have installed the Geckboard app on their iPhones which give us all live data and statistics... transparency and focus on the most important KPI's, so everybody in our organization is aligned when we are talking about numbers, targets etc."</i></p>
<p>S-T: Standardizing workflows in enterprise-wide-platforms are necessary for optimizing work and increasing speed. #4: <i>"In order to be aligned and to structure project/product development we are forced to use the same software...in order to work optimal everybody needs to use it in exactly the same way, this [...] limits the misunderstandings and powers up the speed"</i>. #8: <i>"The organization defines which IT solutions to use (CRM, Mail, Office SW, Computer, FileSharing) and how we should use the systems - especially CRM.."</i></p>
<p>S-T: When working together, technology-usage requires a shared understanding of how and what to use. #1: <i>I can freely use the tools I want for myself, but I have to use the tools of others, when I help them out ...this could be them using Slack to communicate...Facebook/LinkedIn - I have to be there to get their messages. So the technology does have some control of me.</i> #2: <i>"there should be some structure ... the bigger and more professional the more, the organization need to tighten the grip on knowledge sharing and security etc. otherwise it would make it difficult to work together"</i>.</p>

Table 2. Individual-Technical (I-T) and Socio-technical (S-T) out-comes in the setting of PBO

We define tendencies as the inclination toward a particular type of behaviour. When we interpret tendencies, we seek to infer the *current in the river* as an underlying sequence of events at each level. Table 3 explains the interpreted tendencies from out-comes.

Tendency at the micro-level of outcomes from the individual-technical interaction
Digitizing personal information and digitalizing routines leads to individualization. Individuals speed up collaboration with informal Q/A applications and instant knowledge sharing routines through face-time, notes, apps etc. Cloud-access and storage are essential to access and share personal information. The individual constantly improvises with technology and introduces apps into personal routines (i.e., appify) to become even more productive through a think-cloud and fast-access mind-set.
Tendency at the macro-level from the out-comes at the social-technical interaction
Centralization of data is important. This implies alignment of IT-enterprise system and workflows. Standardized input is required. This creates transparency and gives instant and always access for everybody. Decisions become data-driven. The data and platform driven approach institutionalizes work through platforms. The organization platformize processes to become even more efficient through a think-cloud and data-control mind-set.

Table 3. *Tendencies at the micro and macro level of PBOs*

In summary, individual innovation happens at the individual-technical level in terms of choosing how to engage with data and stay productive. The objective of change is routines and practices; this in turn influences structures relating to communication and coordination activities. We find that the surface level inhabits agility, based on a mind-set denoted as think-cloud and fast-access of data. At the macro-level, more and more rigidity is required due to standard workflows from enterprise-wide platforms. The change objectives are business processes and structures. We find that strictness now inhabits the deep level in the system, based in the mind-set denoted as think-cloud and control of data.

In table 4, we show the regularities found in the data as *a rhythm*. The interpretation covers how the individual-social-technical relationship advance meaningfully between two realities interacting on the surface and the deep level, uncovered in the prior steps of interpretation. Constant balancing constitutes the rhythm in the system. This rhythm supervenes according to the way that the relational structuring of the system advances. It is a *both/and*, simultaneously actualized between the social and the individual level. We found four regularities that constitute the rhythm. R1: Technological-strictness *and* technological-autonomy. R2: Effectiveness through platform processes *and* creativity from individual actions. R3: Standardization of data-input workflows *and* free flow of personal data. R4: Company control *and* individual freedom. In some instances (R2 and R4) people “drop-off” this rhythm and decide to “unplug”. The rhythm supervenes from the contradictory-complementary dynamic of increased instability from surface structures and increased stability in the deep level structures.

R1: Balance between technological-strictness and technological-autonomy. #7: “ <i>Within the system we are free make amendments to the usage of the tools available. All programs or downloads [...] need to be from the [company name] cloud store</i> ”. This makes testing new ways of work difficult. We are free to combine existing [cloud services] to improve WOW like what’s app, Skype, chatter, video conference [...] to experiment.”
R2: Balance between effectiveness from platforms and creative individual actions. #1: “ <i>Technology makes many processes more effective, but also enables many distractions and people expecting me to react asap, which has forced me to delete apps such as Instagram, Snapchat and Facebook on my phone</i> ” #8: “ <i>I enjoy the sales processes if they work, but they don’t work for me. And I would like to have much more autonomy over my tools, techniques and teams. But I get a totally different balance when I start on my own the 1 Oct</i> ”.
R3: Balance between standardization and free flow of data. #5: “ <i>We have adopted BOYD, and all our data is in the cloud. We have adopted and standardized several tools and services. We will work hard to keep that “balance” as we want to remain innovative and creative - and this, in my mind, means that an enterprise should dictate at little as possible, and keep an open mind</i> ”. #6: “ <i>With respect to tech setup and freedom [...] we [have] lots of freedom but a few things are fiercely enforced</i> ”.
R4: Balance between control and freedom. #7: “ <i>The ideal split would be to have control and at the same time empower the individual to take responsibility for [exploration] and development of processes and WOW (ways of working)</i> ” #9: “ <i>We are provided phones, computer, programs, means of communication (Skype, GoToMeeting, Outlook etc), project controlling applications. We have structures and naming convention for files. At the same time we have full administrative rights to install and use programs such as Wunderlist, Evernote etc</i> ”.

Table 4. *Regularities*

Based on the regularities uncovered, we find that the contradictory complementary GM of socialization and individualization has *entered the system*. In a socio-technical change-perspective *socialization* is the social adoption of technologies into shared ways of doing things and the understanding thereof. Socialization supervenes from the institutionalizing power of platform-technology as deep structures. *Individualization* (in this context) is the act of autonomous actions relating to designing individual interaction at the surface level. We observe experimentation with technologies that loosens the influence from the deep structure. Downward causation from the GM is likewise observable. Individualization supervenes from socialization when the platform-technology establishes deep structures. Then the individuals explore, tweak and innovate routines on the surface structures; Personal apps and devices enable such individualization.

The findings suggest that an *equilibrium paradox* exists in a system that has surface structures that are approaching a state of disequilibrium (unstable equilibrium) while the deep structures simultaneously approach a state of equilibrium (quasi-equilibrium). The findings suggest that such a paradox is now characteristic of PBOs. The equilibrium paradox is the outcome of a contradictory complementarity mechanism of individualization and socialization that now inhabits the socio-technical system. One example of what causes an equilibrium paradox is the increase in cloud-based data. Cloud-based data is accessible from anywhere, anytime, from any device. Organizational data-driven decisions require platforms that dictate input formats and workflows. The platforms thus structure the work processes. This in turn improves the individuated individual's mobility and flexibility. Changes to individual routines and practices increase. In summary, the individuated individual increasingly *appifies* (introduce apps into) routines and practices i.e. individualization, while the organization *platformizes* processes and structures i.e. socialization.

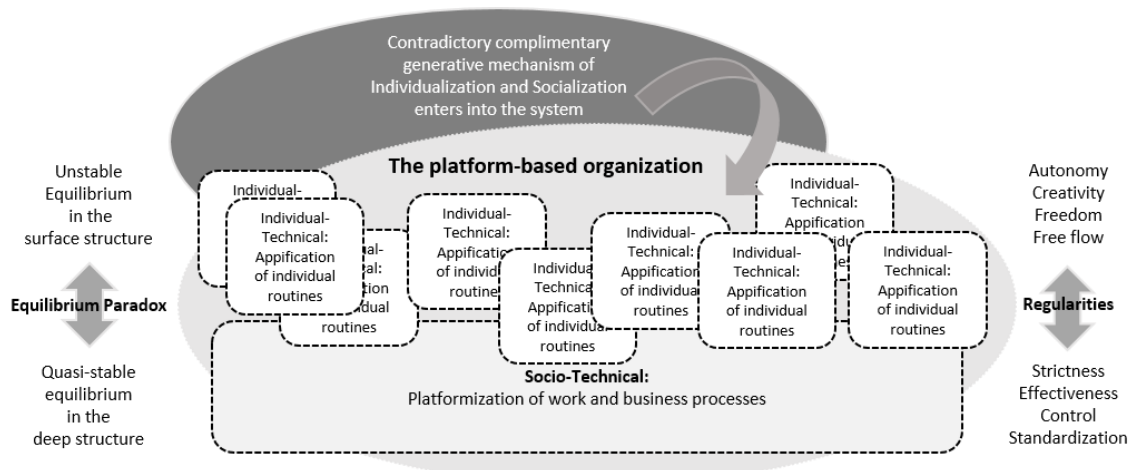


Figure 1. Socio-technical change: the equilibrium paradox

Figure 1 is an explanatory model of how socio-technical change is achieved in PBOs. The influence from the GM is illustrated with the grey curved arrow. Change is achieved through the deep structures that inhabit a (set of) platform (s) at the socio-technical level. Agility inhabits the surface structures due to the array of platform interfaces that permit interoperability with a wide variety of "plug-in" technologies at the individual-technical level. Innovation occurs only at the individual-technical surface structures. Surface equilibrium in the individual-technical relationship becomes unstable, based on individual preferences – "plug-in" also means "plug-off", i.e., breakdown. The instability arises from individual actions that sometimes include unplugging from the socio-technical level. The IS social deep structures are mirrored in the platform, fostering a shared way of thinking and working. At both levels, the mind frame becomes *think-cloud and access-to-data*. The social adapts to the platform and individualization arise within socialization in the choice of surface technologies. As a result, the surface equilibrium of the social is unstable. This scenario yields an equilibrium paradox between the quasi-stable equilibrium in the deep structures that inhabit the platform and the unstable equilibrium

that inhabits the surface structures. The quasi-stable equilibrium at the deeper level sets up the conditions for an unstable equilibrium at the surface level.

5 Discussion

Although the current study is based on a small sample of participants, the findings suggest several contributions to the IS literature. Primarily, we found that the concept of the equilibrium paradox helps explain how socio-technical change is unfolding in today's PBOs. The equilibrium paradox is an original contribution with roots in previous research into punctuated equilibria (Lyytinen and Newman, 2008; Tushman and Romanelli, 1985). This idea also has roots in the work on the fragility of an equilibrium as leading inevitably to an unstable equilibrium situation (J.R. Hicks in Metzler, 1946). Aside from making an original contribution on its own, the equilibrium paradox also extends prior literature on change, particularly in elaborating the conceptualization of contradictory complementarity as a social dimension of an unstable equilibrium. This aspect of the paradox extends previous research by offering a more elaborate explanation of events at the surface level in relation to events at the deep structure level (e.g., Gersick, 1992; Lyytinen and Newman, 2008; Besson and Rowe, 2012).

We also provide a fresh perspective on the role of surface and deep structures in relation to change in platform-based organizations today. Change in surface structures is assumed in much research to be dependent on change in deep structures (Wand and Weber 1995; Volkoff and Strong 2010, Lyytinen and Newman, 2006;2008). We challenge assumptions that the periodicity of disequilibrium is a matter of disruptions in the deep structures. Such assumptions unnecessarily inhabit the punctuated equilibrium model. We offer an elaboration path for the punctuated equilibrium model that considers surface structures as the center of emergence in PBO's. We extend the fundamental work on surface structures and deep structures in suggesting that, for PBO's, instability in the surface structures can drive change in those surface structures to a more independent degree from the quasi-stable equilibrium of deep structures. This independence is one enabler of the equilibrium paradox. Thus, we provide another perspective of the quasi-stable equilibrium than Swanson (2017) and Lee (2010).

We also contribute an updated theory of the PBO. Some of the original work on platform organizations described these as being capable of generating different organizational forms that were appropriate for momentary situations (Ciborra, 1996). We extend this theory to incorporate technological platforms, such as ERP systems or cloud systems that both shape and constrain the ability to generate agility. The notion of PBOs elaborates the concept of platform organizations in recognizing the dominant technological basis of platforms today (Zammuto et al, 2007). As a result, our research suggests that obtaining socio-technical change in PBOs is now anchored to our understanding of the relationship between the technological, individual and social aspects of surface and deep structures.

Finally, we provide several advances on other, more fundamental, research. We confirm assumptions of analytical dualism to explain complex socio-technical changes that appear more elastic, unstable and resilient (Donati, 2015). We have also added evidence of a new GM that has entered the world of work. This GM, denoted as individualization and socialization, can explain how different states of equilibrium can simultaneously inhabit different levels of reality (Gersick, 1992).

We contribute new explanations for how organizations are emerging by applying the socio-technical perspective - identified by Mumford (2006) and Eason (2008) - by challenging the inherently linear logic in previous socio-technical research. This challenge suggests a new causal logic for emergence.

Despite the small sample, we make the logical generalization that PBOs inhabit possibilities of enforcing organizational data regimes, while simultaneously catering to the individuated individual's autonomy. In the data-driven future, we suspect that enterprises will look for leadership models that can deliver on this *both/and* agenda of simultaneous stability and agility. This involves more knowledge of how to trigger the GM of socialization and individualization properly without causing breakdowns (Hofkirchner, 2014). This eventually involves further examination of the concept of data and information conceptualized as a commons (Hess and Ostrom, 2007) i.e. as a common good (Hofkirchner, 2014) and the mutual relation to individualization (Castells, 2014).

The limitations that characterize our research open opportunities for future work. For example, we have only considered a limited number of individuals in PBO settings. More research is needed to investigate whether the equilibrium paradox inhabits specific kinds of organizational forms. Future quantitative research is required to investigate if the equilibrium paradox can be detected within larger, normal, and more random datasets. The discussions were conducted as online group sessions with written responses. Future research should investigate whether this interpretation will hold for an intense qualitative investigation using single interviews and observations. Finally, we did not analyze the contingencies of socio-economic data.

6 Conclusion

Despite its exploratory nature, this study offers insight into socio-technical change in PBOs. We explain socio-technical change based on GMs that create paradoxes and regularities that are essentially contradictory complementary. Notwithstanding the limitations, the study questions not only the assumptions that the ideal IS will exhibit a balance between its social and the technical structures, but also questions whether such an ideal system endures with some degree of periodicity in its state as a stable equilibrium. These assumptions no longer provide a full explanation of the complex dynamics in today's enterprises. These dynamics incorporate an unstable equilibrium that arises in the continuous change that individuals make in socio-technical structures. We explain how a mechanism of contradictory complementarity, denoted as individualization and socialization, now inhabits the organizational system and causes events that are both individual-technical and socio-technical. This mechanism drives changes at the surface level of organizational structures, a level in which structures exist in an unstable equilibrium. Rather than driving the surface structures, the deep structures instead remain in a quasi-stable equilibrium. This equilibrium paradox in socio-technical change explains how PBOs achieve change by achieving agility from their IS while simultaneously embracing quasi-immutable platforms.

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