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InnoTracing – Methodological Underpinnings

Contents

Introduction:

The phenomena of leadership and innovation in groups are complex, non-linear, recursive, unpredictable and largely tacit. Despite decades of study, theorization and modeling, the moment-to-moment unfolding of these processes remains an unexplored black box. The software tool InnoTrace and the methodological approach of InnoTracing are means of exploring that black box. They provide researchers a systematic way of gathering, aggregating and analysing participant generated data on leadership and innovation as unfolding processes in real time.

Calls for methodological innovation:

In recent years researchers working on leadership and innovation have been moving beyond their traditional phenomenological and methodological boundaries. There is increasing attention placed on the micro-level, to the situated interactions of participating agents and how – in real time from moment-to-moment – leadership and innovation emerge.

Within leadership studies there has been a turn away from the traditional positivist stance that typified twentieth century approaches. As an academic discipline that has relied heavily upon psychological and social-psychological methods, leadership scholars worldwide have been making calls for a change, to broaden the focus from studying singular leaders and followers towards contextual relations of interacting, subjective social agents.

At the heart of this shift has been a questioning of the basic ontological and epistemological assumptions of leadership and its study. As scholars such as Kort (2008), Washbush (2005) and Alvesson & Sveningsson (2003a; 2003b) have questioned the very nature and study of leadership (even if "it" exists) there has been a movement towards social-constructivist views of leadership; that as a phenomenon, leadership is constructed, maintained, changed or dispersed at the micro level of interactions between a variety of social agents acting within contextualized times and spaces (Alvesson 1996; Crevani, Lindgren & Packendorff, 2010; Grint, 2005; Ladkin 2010; Meindl, 1995; Pearce & Conger, 2003; Uhl-Bien, 2006). As a result a number of closely related theories have arisen from this more sociological, emergent and "in action" view of leadership. These include: distributed leadership (Bolden, 2011; Gronn, 2000; Spillane, 2006), collective leadership (Denis, Lamother & Langley, 2001; Lumby, 2009), shared leadership (Pearce & Conger, 2003; Pearce, Conger & Locke, 2008) and relational leadership (Uhl-Bien, 2006). Such theories treat leadership as a more complex, dynamic and "messy" process than the leader-centric or follower-centric theories that have proliferated the literature over the last century.

In a similar vein, innovation research is moving from studying coordination issues of research and development activities within particular departments towards an increased interest in collaborative research efforts which cross organizational boundaries (Baldwin & Von Hippel, 2011). This change has taken on speed due to the development of social software-enabled innovation methods such as communities and contests (West & Lakhani, 2008; Neyer, Bullinger, & Moeslein, 2009). Scholars nowadays recognize various forms of collaborative (open) innovation; be it in the form of inter-organizational innovation networks, or be it based on crowd sourcing mechanisms.

Although this research has produced a variety of studies on individual characteristics (Lakhani & Von Hippel, 2003; von Hippel, 1994) and motivators (Morrison, Roberts, & Von Hippel, 2000; Harhoff, Henkel, & Von Hippel, 2003; Von Hippel & Von Krogh, 2006; Hau & Kim, 2011) of participants, on success-relevant management capabilities and organizational characteristics (Cohen & Levinthal, 1994; Zahra & George, 2002; Frey & Lüthje, 2011; Laursen & Salter, 2006) as well as on expected outcomes (Foxall, Murphy, & Tierney, 1985; Von Hippel, 1994; Veryzer & Borja de Mozota, 2005), the micro-foundations of collaboration among innovators have to date remained a black box. In particular studying the *in situ* unfolding of creativity on the group level, such as by tracing the actual process of identifying and spanning of boundaries, or the self-reporting about direct group-level effects of self-rewarding activities (e.g. group flow), would lead to new insights on the actual foundations of collaborative innovation.

Yet, ultimately these concepts and theories encounter a methodological brick wall as researchers face the difficulty of getting to the *in situ*, socially constructed dynamics of leadership and innovation unfolding in real time. What is missing is the ability to visualise the seemingly invisible, moment-to-moment emergence of such collaborative processes at the situated level of individual and group action as people interact in space and time.

In leadership research in particular, there have been a number of new methodological calls resulting from the desire to explore the level of situated and subjective social action. Crevani, Lindgren and Packendorff (2010) have posited "…an analytical focus on leadership as it is practiced in daily interaction" (p. 77). Iszatt-White has engaged an ethnomethodological approach of 'mutual elaboration' – " …the idea that an action only makes sense, has meaning, in the specific setting in which it is enacted – to explore leadership practices as irreducibly 'events in a social order'" (2011, p. 120)[1]. This approach "pays attention to, and seeks to make visible, the 'ethno-methods' (Garfinkel, 1967) through which the social order of [a] setting is inter-subjectively constructed…" (Iszatt-White, 2011, p. 124).

[1] Iszatt-White here works with concepts from Sharrock and Anderson (1986) and Sharrock and Button (1991).

Parry (1998) and Kempster & Parry (2011), have been advocating for a Grounded Theory (see Corbin & Strauss 1990; 2008) approach to studying leadership as methodological means to moving beyond the ontological and epistemological assumptions that chained leadership to its singular or dyadic focus upon leaders and followers. They have noted "Leadership research has begun to embrace the necessity of incorporating context and process into an understanding of the manifestation of the leadership phenomenon" (p. 106). With its focus on generating contextually relevant theoretical explanations for experienced phenomena based on the subjective actions and perceptions of agents within a given context, grounded theory matches the contemporary directions of leadership and innovation inquiry. Still others have proceeded with inquiry into the aesthetics of leadership, focusing on the felt, sensory-emotional aspects of leadership in action (Bathurst, Jackson & Statler, 2010; Hansen, Ropo & Sauer, 2007; Ladkin, 2008).

At the basis of these sociological approaches towards leadership and innovation – that they are phenomena emerging from social interactions, irreducible to the actions of single individuals – is a call to look at the moment-to-moment experiences and perceptions of emerging processes. Working from a process philosophy standpoint, Wood & Ladkin (2008) argue that "Rather than focusing primarily on the individual leader, or even the dyadic relationship between leaders and followers, the lens of process philosophy frames leadership as an unfolding, emerging process; a continuous coming into being." (p. 15). Yet, here we find a methodological quagmire. The ability to investigate the continuously "coming into being" of human interactional phenomena is trying to make the invisible of highly complex interactions visible. There are no methodological tools ready made for this task. While we may seek to investigate it through ethnography, and conceptualise it as an ethnomethodological process (such as argued by Iszatt-White, 2011), we run up against problems of observer influence and interpretation. Similarly, we often find ourselves in the realm of *ex post facto* research and analysis when what we really desire is to, as Wood & Ladkin (2008) have suggested, focus on the level of participating actors' perceptions of the moments of the phenomena.

What is required is a methodological approach that empowers participating agents to document and comment upon significant moments as they relate to leadership, and innovation – what InnoTracing refers to as "moments of significance" (MOS) – as they unfold in real time. This is the core of the InnoTracing project, to provide participants and researchers insights into these seemingly invisible moments when "something" seems to be happening. The InnoTrace tool allows participants to capture – via picture, video, text or voice notes – moments which feel significant in the unfolding, emergent processes of leadership and innovation, *as they happen*. The resulting methodology seeks to provide a methodological tool to aid researchers in working with the gathered data.

InnoTracing: a new methodology in leadership and innovation research

InnoTracing is a methodological development that combines a unique data gathering and aggregating software tool – InnoTrace – with social science methods to help researchers and participants open, visualize and investigate the moments of significance (MOS) of leadership and innovation. The InnoTrace tool is designed as user-friendly and user-configurable software affording participants the ability to capture and trace the moment-to-moment messy, tacit and intangible elements of leadership and innovation. The tool empowers participants to document these moments as they *feel* them occur in real time (through photos, videos, text files or sound messages), while the web-based software collects and organizes this data in a variety of ways.

InnoTracing method: basic process

At a basic level, with each use of the InnoTrace software, participants document unfolding processes by photographing, video recording, or creating text or voice notes of the MOS of an unfolding process. The underpinning concept is to empower participants to make "visible" what they perceive as significant (whether the significance is of something positive, negative or even mundane) in the unfolding processes of which they are a part.

This type of participant centered data gathering methodology has anthropological roots where participants have been engaged to visually document their perceptions of the world around them (e.g. Belova, 2006; Pink, 2007). In organizational studies precedence has been set in studies by Buchanan (2001) and Warren (2002) where they have investigated the aesthetic experiences of individual social agents, asking them to photograph elements of their daily experience to make visible "how it feels to work here" (Warren 2002). Within leadership research Wood & Ladkin (2008) involved participant managers and organizational consultants in photographing "…those usually hidden elements, which they perceived as contributing to the experience of leadership in their workplaces" (p. 15). In studies on the micro-phases and participant roles in innovation groups, both in physical and virtual settings, researchers have used a variety of tracing approaches including audio and video recording, screen shots, and versioning/history functions of activities on collaboration-supporting innovation software (Bansemir & Neyer, 2009; Bansemir, 2013). Despite the valuable insights that have resulted from these research initiatives, a systematic means of gathering, aggregating and analysing participant-generated data is still lacking.

As a researcher-configurable tool InnoTrace provides a unique opportunity for gathering participant generated data, prescribing the parameters of data, and analyzing that data in a variety of quantitative and qualitative social science methods.

The standard five-step process is as follows:

1) *Phenomena of interest*. With each project the researcher(s) indicate to the participants the phenomena of interest around which they would like to gather MOS. For Wood & Ladkin (2008) this was "hidden elements" which contributed to the experience of leadership. For Warren (2002) it was the visualization of "how it feels to work here". With regards to leadership and innovation processes it may be tipping points when things coalesce or take new directions.
2) *MOS Classification Prompt*. Within the tool, researchers can include a variety of classification options. These are prompt boxes that cue participants to select from a variety of options the type of moment they have captured. These may be descriptors such as "Leadership moment" or "Idea generation" and/or they may be evaluative elements that classify the importance of a moment (e.g. a star rating indicating relative level of importance or impact of a moment).
3) *Participant Generated MOS*: The tool is made available to research participants who, following the *Phenomena of Interest* outline and using *MOS Classification Prompts*, engage in gathering data on the MOS of processes in which they are involved.
4) *MOS Aggregation and Visualisation*. As research participants gather data the InnoTrace software collects and organizes this data by Author Tag, Time Tag, Format Tag and Classification Tag:
    a. *Author Tag*: Each data element is tagged as generated by a unique author. This provides indication of who generated the data as well as frequency and quantity analyses of the overall data set by individual author. Through this tagging the data set can be viewed as a whole, or segmented to look at individual participants or groups of participants.
    b. *Time Tag*: Each data element is tagged by when it was created. This provides indication of the frequency and quantity of data as it was generated chronologically. Through this tagging the data set can be viewed as a whole (providing a distribution view of MOS over time) or segmented to look at specific time periods (e.g. clusters of heavy MOS documentation).
    c. *Format Tag*: Each data element is tagged by the type of format used (photograph, video, text note or voice note). Through this tagging the data can be viewed as a whole indicating the overall types of formats used, or segmented to look at one format type at a time (e.g. to look at all photographic data generated).
    d. *Classification Tag*: In cases where researchers have built in a classification (descriptive and/or evaluative) each data element will include the classification tag itself. Through this tagging the data set can be segmented by participant generated classifications.
5) *MOS Analysis*: The InnoTrace tool is designed to not only collect and organize data but to also use that data for: a) quantitative analysis of quantity, frequency, format and classification of MOS b) means of visualizing, structuring and

organizing MOS for later quantitative and/or qualitative analysis by researchers. The data will be exportable in a variety of formats including:

a. Document formats: doc, docx, xls, xlsx, pdf, rtf
b. Audio and video formats: mp3, wav, avi, wmv, mpeg
c. Graphic formats: jpeg, png, gif

In total, the gathered data represents a cognitive map of the happenings in the group. More precisely, it is a shared or composite cognitive map (Daft & Weick, 1984; Tegarden & Sheetz, 2003) of group processes. It aggregates the perspectives of the group members in the form of a joint context map (as opposed to a strip map) (Tolman, 1948; Eden, 1992) comprising decisive events along with their respective contexts. It thereby enables a better understanding of the boundary conditions of activities (Tolman, 1948).

The meanings assigned to the uploaded representations of MOS represent *labels* (Bougon, 1992) whose creation – in contrast to traditional cognitive maps – is not exposed to any researcher's interpretation. As a result, anything gathered by the InnoTrace software can be seen as unbiased (uninfluenced) situated data collected by *self-reflective participants* in the moment. A related form of self-reflected creation of cognitive maps has been described as "Self-Q-Technique" by Bougon & Morgan (1983) and Bougon (1986). As a main difference, InnoTracing splits the self-reflection in two parts. The first part motivates in situ data generation. It is driven by the inspiration of the participants in the moment and the use of unobtrusive data gathering technology (InnoTrace software). Joint sense making in the team, completion of relevant aspects and guided reflection about what actually happened in the collected MOS is part of a second step – the subsequent discursive analysis guided by the researcher. This methodological approach goes back to the work of Colin Eden who used cognitive maps as sources of inspiration in top management team discussions (Sims et al., 1981; Eden, 1992). As a consequence, the researcher becomes an uninvolved observer during the in situ-creation of cognitive process maps but a moderator of subsequent insightful reflection, based on the initial cognitive map.

The collected data can be used for most forms of qualitative analysis as well as for quasi- and descriptive statistics. The data is open to all the forms of analysis that have been developed for participant generated data including cognitive maps such as the creation of sub-maps, e.g., identity maps, cause maps, categorization maps, social system maps, hierarchic maps, and cybernetic maps (Habicht, 2009). Moreover, quasi statistics can help in estimating the centrality of issues or incongruences between different views present.

As the MOS data are exportable in multiple formats, researchers may use data sets within existing analysis software platforms such as NVivo 10, Atlas.Ti 7, MAXQDA 11 and WinRelan (GABEK analysis).

While the above described five-step process is the essential methodological approach offered by InnoTracing, it is purposefully open-ended, particularly regarding analysis. InnoTracing is itself a researcher-configurable methodology. Using this basic structure, researchers may approach the data gathering and analyzing methods in ways best suited to their research questions and goals. As an example a detailed description of InnoTracing as a Grounded Ethnomethodology approach is provided in appendix 1.

Summary:

Responding to calls for methodological innovations in leadership and innovation studies, InnoTracing is a means of focusing on the micro-level, situated action of participating agents in real time. It does so by empowering participants to generate data in the form of the MOS of unfolding leadership and innovation processes. This provides researchers with a powerful entrée into the black box of emergent, situated processes.

Fundamentally, InnoTracing is a unique, systematic, user-friendly and configurable tool to capture the complex, non-linear, recursive, unpredictable and largely tacit phenomena of leadership and innovation. It does so by bringing together researchers and empowered participants in a process of gathering, aggregating and analyzing data that visualizes the invisible of leadership and innovation. The software and methodology combination offers researchers the ability to work with participants to capture the subjective messiness of these processes by documenting moments of significance as they are perceived in real time by involved participants.

Following the basic process of i) identifying *phenomena of interest* ii) creating *MOS classification prompts* iii) providing InnoTrace to informants for *participant generating MOS data* iv) using the software for *MOS aggregation and visualisation* and v) engaging in *MOS analysis* through a variety of methods, InnoTracing affords a wealth of visual, auditory and textual data and insights into leadership and innovation in action. By empowering individual participants it gives a more intimate and multi-perspectival view to the individual and group experiences and interactions of the moments constituting leadership and innovation.

Appendix 1

InnoTracing as Grounded Ethnomethodology

Working from a social constructivist ontology, the Grounded Ethnomethodology approach combines a grounded theory process of theory formation with an ethnomethodological focus on the data gathered through a series of reflection conversations between researchers and participants.

The Grounded Ethnomethodology approach to InnoTracing is one operating from an inductive, iterative relationship with participant generated data through a series of reflection conversations between researchers and participants following the overall process of grounded theory (as developed by Corbin & Strauss, 1990; 2008).

InnoTracing Grounded Ethnomethodology Stages:

Stage 1: Establishing the Phenomena of Interest

Within the first stage, researchers identify the phenomena of interest for which they seek MOS data. At this stage the phenomena of interest is structured in the form of a research question(s) and a clear protocol for participants is designed. The protocol includes:

1) Consent form for participation
2) Instructions for use of the InnoTrace tool
3) Clear description of the phenomena of interest
4) Timeline for the project

During this stage researchers also decide whether they will employ an MOS Classification Prompt system for participants to classify, by descriptor and/or evaluator, each data element generated.

Stage 2: Data Gathering

While engaged in innovation projects, participants are encouraged to document (InnoTrace) moments which they perceive as significant with respect to the instructed phenomena, e.g. acts of leadership, creative turns which trigger a deeper understanding, lead to a new solution, or rule out alternatives. These “snapshots” can be represented by pictures taken with a smartphone of participating actors or documents created, by short videos that capture actual team activities, etc. All data is uploaded and organized by the web-based InnoTrace software. Through this a joint chronology of the project’s MOS is created. It contains the contents that represent multiple MOS as perceived by participants, the meanings which are assigned to them by

these participants, a time-stamp, and the originators of the material. Hence, the resulting data is a chronological stream of leadership and/or innovation *in situ*.

Stage 3: Data Aggregation

Within the second stage, researchers begin to work with the data gathered. Through the InnoTrace software researchers will have quantitative summaries of the number of data elements gathered, the authorship of the data elements as well as the frequency and chronological ordering of the data. Through the software, researchers will be able to visualize this data through a variety of means via the tags attached to the various data elements (author tags, time tags, format tags, classification tags).

During this stage, researchers select data to be used in researcher-participant reflection conversations. In some cases, researchers may want to use all data gathered. However, in situations where data quantity is prohibitive, researchers may select segments of the data to work with.

Stage 4: Reflection Conversation

During stage 3, researchers engage in conversations with the participants about the data gathered. During these conversations, researchers seek open conversation with participants about the characteristics, meanings and significance of the MOS they have gathered. These conversations are recorded (audio and/or video) and transcribed for later analysis.

Two distinct types of reflection conversations may be employed:

a) One-to-one conversation: In this format researchers engage with individual participants to gather their reflections on the MOS they individually gathered. Additionally, researchers may wish to cross-examine certain MOS by asking participants to reflect on the MOS generated by others.
b) Roundtable conversation: In this format researchers engage participants in a focus group setting (either a whole group of participants or a part of the group). Here researchers present the data gathered and facilitate conversation with multiple participants simultaneously about the characteristics, meanings and significance of the MOS gathered. These conversations are recorded (audio and/or video) and transcribed for later analysis.

This split method of initial participant-based data gathering and subsequent guided discussion based on cognitive maps has been established in management research mainly by researchers around Colin Eden (Eden, Jones, Sims, & Smithin, 1981; Eden & Sims, 1981; Sims, Eden, & Jones, 1981; Eden, 1988, 1992;). We employ this approach mainly because it is able to produce a thorough understanding of concepts as concealed as perceived organizational identities or mental models of corporate strategies (Eden,

1992; Hodgkinson, 1994; Rodhain, 1999; Roberts, Dutton, Heaphy, & Quinn, 2005). InnoTracing expands this methodology by enabling participants to quickly and unobtrusively collect triggers for subsequent discursive self- and group-reflection.

Stage 5: Analysis I – Open Coding

During stage 4, researchers begin to work with the data gathered from the reflection conversations. Using transcripts and recordings of these conversations researchers start the process of selecting and naming categories. The focus is on initial descriptions of the overall features of the phenomena emerging from the data, outlining properties of potential categories and developing a system of labels for categories organized in an outline form.

Optional Reflection Conversation: Following the completion of open coding, researchers may seek to validate the developing categories by engaging participants in another round of reflection conversations.

Stage 6: Analysis II – Axial Coding

During stage 5, researchers work with the reflection conversation data and developed categories to understand potential relationships between the categories created in the open coding stage. The focus is upon identifying connections between categories as well as points of differentiation. During this stage a code paradigm is developed which indicates explicit connections or differentiating factors that characterize relationships between categories (including possible sub-categories).

Optional Reflection Conversation: Following the completion of axial coding, researchers may seek to validate the categories by engaging participants in another round of reflection conversations.

Stage 7: Analysis III – Selective Coding

During stage 6, researchers move towards integrating the categories into a grounded theory. This involves identifying one or more core categories that have emerged, and been validated, from the coding sessions. Essential here is the clarification of, and robust description of, the overall narrative of the phenomena studied, validating the relationship of categories via the code paradigm and how well they explain the data gathered on the phenomena of interest.

Optional Reflection Conversation: Following the completion of selective coding, researchers may seek to validate the core category(ies) by engaging participants in a final round of reflection conversations.

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