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INVESTIGATING THE MOMENT-TO-MOMENT UNFOLDING OF INNOVATION AND LEADERSHIP WITH INNOTRACING

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Abstract: *The moment-to-moment unfolding of innovation, creativity and leadership is complex, non-linear, recursive, largely tacit and influenced by micro-level social interactions. The methodology InnoTracing enables new and further insights into the black box of such emergent, situated processes by visualizing/eliciting what participants regard as their particular “moments of significance” (MOS). By gathering, aggregating, and analyzing real-time data with the newly developed software tool InnoTrace, previously invisible innovation and leadership effects are observed and an increased understanding of collaboration processes among innovators emerges. This paper explains the software and methodology setup and presents first data results from one empirical study.*

Key Words: *Innovation, Leadership, Creativity, Management, Software*

1. INTRODUCTION

For decades researchers and practitioners have theorized and modeled group processes of creativity, innovation and the implications of management/leadership in these [2], [12], [24], [33], [47]. However, a grounded understanding of these processes, from the micro-levels of interactions up, remains a black box. Their complexity, non-linearity, unpredictability and largely tacit nature are elusive [45], [54]. In our attempts to enter this black box, we as researchers have faced a central methodological problem, the imposition of ourselves on the systems we seek to study. To the phenomena we bring our own biases and beliefs, and set out to identify and interpret what the significant moments, events, actors and interactions are [29], [54]. To more effectively, robustly and objectively investigate the ephemeral and emergent social interactions of creativity, innovation and leadership, we argue for the empowerment of research participants in generating the data themselves; participants identifying the significant moments, actors and interactions and working with us to co-create understandings of what is going on at the micro-foundations of these processes.

To this end, we discuss the InnoTrace software and InnoTracing methodology, as a means of more effectively removing the researcher from the processes and systems

under exploration by affording the systematic collection and representation of participant generated data. InnoTrace puts data gathering directly in participants' hands. It is a bespoke tool for researchers to engage participants themselves to capture the “moments of significance” (MOS) they experience in unfolding processes. The software gives participants the ability to document (through text, photos or videos) the MOS they experience and aggregates this data into individual and group cognitive maps. These maps represent a rich tapestry of “what is going on” from the perspectives of the actors most directly involved, and serves as in depth data for researchers to investigate group processes underlying creativity, innovation and how management and leadership are implicated in them.

In what follows, we first provide a brief overview of methodological changes within the study of creativity, innovation and management/leadership. Here we highlight sociological currents calling for more situated, micro-level investigations. We then move to a description of the InnoTracing method and InnoTrace web-based application, indicating how it meets these currents and calls for methodological innovation. We then overview one pilot study that focused on an international leadership and innovation conference in Germany. We conclude with reflections on the use and outcomes of the software and methodology as well as implications for practice.

2. BACKGROUND: METHODOLOGICAL INNOVATION

Over the last decade there has been a sociological turn in research on creativity, innovation and management/leadership – both separately and in combination. This turn has cast our gaze towards the micro-level, seeing creativity, innovation and management/leadership as social processes that unfold in real time from moment-to-moment in and amongst a group of individuals. As the gaze has shifted there has been a breaking of traditional phenomenological and methodological boundaries in recognition of the need to consider “on the ground” interactions of multiple participating agents who make up these processes [29], [54].

Leadership studies are exemplary within this. Traditionally based on positivist roots of seeing leadership as the inaction of top-down, hierarchically derived authority, the field has been broadening its focus from studying singular leaders and followers towards contextual relations of interacting, subjective social agents [29], [30].

Part and parcel of this shift has even been the questioning of the basic ontological (does it “really” exist) and epistemological (how do we come to know and research leadership) assumptions of leadership [[31]], [[52]], [[2]], [[3]]. This has led to a growth in social-constructivist views – that leadership is a phenomenon constructed, maintained, changed or distributed across a variety of social agents who interact within certain contexts, times, spaces developing shared and conflicting values, beliefs and meanings of leadership [[1]], [[16]], [[23]], [[33]], [[37]], [[41]], [[47]]. This “in action” view has given birth to a number of closely related new theories: distributed leadership [[9]], [[24]], [[44]], collective leadership [[18]], [[36]], shared leadership [[41]], [[42]] and relational leadership [[47]]. Often connected with more complex processes such as creativity and innovation, these theories approach leadership not as a given hierarchically derived flow of power, but as a much more complex, dynamic, and often times “messy” nexus of processes.

During this same period, research on innovation has also been shifting its focus. The innovation field has been moving from placing attention on coordination issues of specific R&D teams or departments towards collaborative efforts spanning organizational boundaries [[4]]. Key to these changes has been social software-enabled innovation methods involving communities of practitioners as well as contests [[52]], [[39]]. Today, the innovation landscape is much wider and richer than its original coordination stance. Various forms and processes – e.g. open innovation – are recognized, many of them taking the form of inter-organizational networks and crowd sourcing mechanisms.

Changes in both leadership and innovation research have amplified and challenged our understandings of the phenomena. For example, we know more about individual characteristics [[34]], [[49]], participant motivation [[38]], [[27]], [[50]], [[28]], management and organizational characteristics linked to innovation success [[13]], [[55]], [[21]], [[35]] as well as insights on outcome expectations [[20]], [[49]], [[48]]. However, we still lack an understanding of how these processes work from the micro level. We know that innovation and management/leadership emerge from individuals interacting, but we know relatively little about how these interactions play out from moment to moment. Consequently, we are often walking blind when trying to improve these processes. Issues such as constellations of actors, places of interaction, times of day/night, and the subtle implications of the subjective, sensory and emotional nature of group, organizational and inter-organizational behaviour remain hidden. What we propose is a focus on the *in situ* unfolding of creativity across a variety of actors. To do this we need to engage in 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) and how all this plays out through multiple series of moments-of-significance as perceived by the participating agents. Such subtle, sophisticated and grounded

information would lead to new insights on the actual foundations of collaborative innovation.

To engage at such levels we need to re-invent our methodological approaches, particularly in relation to data gathering methods. We need data that allows us to visualize the intangible, others may argue invisible, moment-to-moment emergence of collaborative processes and to do so by operating at the situated level of individual work and social interaction.

There are movements within our fields of interest, particularly leadership, which have increasingly called for such methodological approaches. For example, Crevani, Lindgren and Packendorff [[16]] have posited “...an analytical focus on leadership as it is practiced in daily interaction” (p. 77). In a related call, Iszatt-White has brought forward the need to consider ‘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’” [[29]] (p. 120). The ethnomethodological tact, focused on understanding how interacting agents produce the nature of their interaction and consequent groups and outcomes, “pays attention to, and seeks to make visible, the ‘ethno-methods’ [[22]] through which the social order of [a] setting is intersubjectively constructed...” [[29]] (p. 124).

As Parry [[40]] and Kempster & Parry [[30]], write Grounded Theory [[14]], [[15]] is a fertile ground for future research. “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). Others have also brought into the conversation the aesthetic nature of social processes, focusing on the felt, sensory-emotional aspects of leadership in action [[7]], [[26]], [[32]].

Central to all of these calls and approaches is recognition of the need to explore systems of human beings interacting from phenomenological angles. This requires us to study the nature of social interactions and how these processes emerge. To do this we need to balance the individual and the group, to capture and investigate the moment-to-moment experiences and perceptions of what is going on.

An exemplary study is the process philosophy approach of Wood & Ladkin [[54]]. In their work they involved a number of research participants in photographing (at that time using disposable cameras) moments that contributed to their experience of leadership in the organizations in which they worked. “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.” [[54]] (p. 15). Over a period of several months their participants, notably not the researchers themselves, took pictures of moments-of-significance that they felt were ‘leaderly’ moments. What arose surprised the researchers. These moments were not what one would have expected. They were not pictures of great speeches, or senior managers bustling over strategic plans. Rather, they were photographs of consultants helping secretaries with photocopying and cleaning staff working late at night to make sure the premises were ready for the next work day.

As insightful as Wood & Ladkin’s [54] work is, the viability of such research was limited by available technology (disposable cameras were less than optimal) and

the discontinuous nature of multiple, unconnected agents in different organizations. We have lacked a comprehensive tool and method to empower research participants to more seamlessly collect such data, and to systematically archive and visualize that data. This has limited our ability to investigate the continuously “coming into being” of human interactional phenomena. The InnoTracing project meets this methodological gap. It affords researchers and participants the ability to document and comment upon significant moments (MOS) as they relate to leadership, and innovation unfolding in real time. Through the InnoTrace software participants themselves can easily generate data on the MOS they experience – via picture, video or text notes. By doing so they generate individual and interacting cognitive process maps of those moments they, not the researchers, feel are significant and contributing to the unfolding of creativity, innovation and leadership. The InnoTracing methodology, largely based on a grounded, ethnomethodological epistemology, provides researchers with ways to then work with this data.

3. INNOTRACING: A NEW METHODOLOGY IN LEADERSHIP AND INNOVATION RESEARCH

InnoTracing¹ answers the methodological calls discussed above. It is an approach combining a bespoke data gathering and aggregating software tool – InnoTrace – with grounded, ethnomethodological methods for researchers and participants to work with the data gathered. The data, focusing on MOS of creative work, is generated directly by research participants and together with researchers opens, visualizes and helps us investigate the black box of the micro-foundations of creativity, innovation and leadership.

The InnoTrace tool, designed to be user-friendly and configurable, is software that empowers participants to document the momentary nature of ‘what’s going on’ in the work and processes they are involved with. The software, a web-based application that can be run on practically any mobile device or PC, allows individuals to take photographs, videos or make text messages on the moments they experience. As users generate data the software collects and organizes this data in a variety of ways. Each photograph, video or text message is uploaded to the individual user’s profile and archived chronologically in an ongoing process map. Each data point is a participant making “visible” what they perceive as significant (whether the significance is of something positive, negative or even mundane).

The process of InnoTracing has an anthropological lineage drawing inspiration from studies, such as the Wood & Ladkin [54] study briefly described above, in which participants have visually documented their perceptions of the world around them. In organizational studies, other examples include those by Buchanan [[11]] and Warren [[51]] in which they explored the aesthetic experiences of individual social agents and “how it feels to work here” [[51]]. Within innovation studies considering the micro-phases and participant roles within teams, both in physical and virtual settings, a variety of tracing approaches have been leveraged in which audio and video recording, screen shots, and versioning/history functions of activities on

collaboration-supporting innovation software have been gathered [[5]], [[6]]. What all of these approaches have lacked is a comprehensive, systematic means of gathering, aggregating and analysing participant-generated data. InnoTrace and InnoTracing overcome this boundary.

In what follows we describe the standard five-step process employed to leverage the web-based application for participant generated data:

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 example, a researcher may say, “We would like you to capture all those moments you experience as contributing to innovation in your organization”.
2. *MOS Tagging.* Every MOS can be given a descriptor – a tag. Within the tool, researchers can include a variety of classification options (tags) or leave tagging open to the discretion of research participants. With each data entry participants can provide their own tag, or in the case of researcher specified tags select from available tags. Additionally, in the case of open tagging, all tags that have been generated appear as a word cloud. Participants may select a tag from this cloud or create a new one. The tags briefly describe what was going on, from the participant’s perspective, in that moment such as a “leadership moment” or “idea generation” or “insight” 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 Tagging, engage in gathering data on the MOS of processes in which they are involved.
4. *MOS Aggregation and Visualization.* As research participants gather data the InnoTrace software collects and organizes this data by user, time, format and tag:
 - a) *User:* Each data element is registered 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 the data set can be viewed as a whole, or segmented to look at individual participants or groups of participants.
 - b) *Time:* Each data element is registered by when it was created. This provides indication of the frequency and quantity of data as it was generated chronologically. Through this 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.
 - c) *Format:* Each data element is registered by the type of format used (photograph, video, text). Through this 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).
 - d) *Tagging:* Tagging is the process of using a descriptor or evaluator tag for data points. This may be left to the discretion of users or specified by

¹ <http://www.innotracing.org>

researchers. Through this tagging the data set can be segmented by participant generated classifications.

As the data gathered grows it represents cognitive maps of the individuals involved as well as the whole cohort of participating agents: it is a shared or composite cognitive map [[16]], [[45]] of group processes. The perspectives of the group members are aggregated in the form of a joint context map (as opposed to a strip map) [[46]], [[19]] representing significant events captured within their respective contexts. It thereby enables a better understanding of the boundary conditions of activities [[46]].

The meanings of these events, for example as represented in open tagging, is not determined by a researcher. Researchers do not decide what moments are important or not, nor do they initially generate the meanings of those events [[10]]. The data contained in the cognitive maps is, as much as is possible, unbiased, uninfluenced, situated data collected by participating agents in the field.

In the following section we present some initial findings from a pilot study carried out at an innovation and leadership conference in Germany.

4. A PILOT STUDY

Overview:

This pilot study focused on gathering participant generated data on knowledge/information exchange and learning – central processes to creativity, innovation and leadership – amongst a group of researchers and practitioners participating in the *Leadership for Innovation* conference of the Peter Pribilla Foundation held at Technische Universität München from April 25-April 26, 2013). The conference provided a readymade temporal and spatial event in which people were engaged in presentations, formal/informal discussions and debates about innovation and leadership. As such, the pilot study was looking directly at moments of significance in knowledge, information exchange and individual and group learning – all essential to creative and innovative processes in groups, teams and organizations. For the pilot study we gathered a group of 22 conference participants who, together with the five-member research team, used InnoTrace to capture moments of significance during the two-day conference. Participants were instructed to “Trace any significant moment connected to knowledge, information exchange and learning”. Additionally, we decided to follow an open tagging process, allowing participants to decide what tags, if any, to use for the MOS they captured. Later, working from a grounded theory approach, we drew upon the participant generated data (in terms of frequency, format and content) and conversations with participants about their data and InnoTracing experiences to draw conclusions about the MOS and underlying individual and group processes happening during the conference.

Participant gathering:

Three weeks prior to the start of the *PPS Leadership for Innovation* conference, an invitation email was sent to conference participants inviting them to participate in the pilot study. Follow up invitations were sent again ten days prior to the conference. Additionally, during the opening day of the conference, any other interested parties were invited to join the process.

To incentivize participation, the project was described as a launch event and a means by which volunteers could document their conference experience and capture the moments of learning that were particularly impactful for them. We also gave each participant a unique InnoTrace cow tag, created by cyLEDGE. In addition to the 5-member InnoTrace team, we gathered 22 active volunteers who “InnoTraced” their moments of significance of the conference. Anonymity of the data gathered was assured and participation was completely voluntary. In what follows we discuss the analysis of this data and our findings.

Analysis and findings:

Data gathered through the InnoTrace application 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 [[25]]. Moreover, quasi statistics can help in estimating the centrality of issues or incongruences between different views present. While the earlier-described 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.

For the Munich study we were both interested in what participants documented and how they documented. Our analysis was not only focused upon what was captured – the pictures, videos, texts and tags – but on the experiences of the InnoTrace user. For the analysis we focused on frequency of data points – looking for particular areas of concentration and patterns in user tracing, a grounded theory approach to content analysis and finally reflections on the user experience. Below we present the findings in this format covering: i) data point frequency ii) content analysis iii) user experience.

i) Data point frequency analysis:

An important aspect of the InnoTrace software is the ability to visualize the entire data set regarding time and user activity. This provides researchers insights into when MOS occur, and where MOS occur simultaneously for multiple participants. Table 1 (below) summarizes the frequency of traces by participants from the pilot study.

Table 1: Summary of Frequencies from Peter Pribilla Conference, April 25-26, 2013

InnoTrace identity	Role in project	MOS in total	MOS day 1	MOS day 2	Photos uploaded	Videos uploaded	Audios uploaded	Other media types uploaded
test27@innotraces.com	Developer	10	0	10	0	0	0	0
test6@innotraces.com	Participant	2	2	0	0	0	0	0
test20@innotraces.com	Participant	0	0	0	0	0	0	0
Researcher 1	Researcher	29	18	11	22	4	0	0
test3@innotraces.com	Participant	9	5	4	8	0	0	0
test26@innotraces.com	Participant	0	0	0	0	0	0	0
test30@innotraces.com	Participant	0	0	0	0	0	0	0
test15@innotraces.com	Participant	16	10	6	6	0	0	0
test1@innotraces.com	Participant	11	8	3	8	0	0	0
test21@innotraces.com	Participant	1	0	1 (May 21)	0	0	0	0
test8@innotraces.com	Participant	7	6	1	1	0	0	0
Researcher 2	Researcher	53	41 (1 at April 24)	12	39	1	0	0
test4@innotraces.com	Participant	8	6	2	5	0	0	0
test12@innotraces.com	Participant	0	0	0	0	0	0	0
test25@innotraces.com	Participant	1	1	0	0	1	0	0
Researcher 3	Researcher	17	13 (2 at April 24)	4	12	0	0	0
test13@innotraces.com	Participant	3	3	0	2	0	0	0
test16@innotraces.com	Participant	0	0	0	0	0	0	0
test14@innotraces.com	Participant	3	3	0	3	0	0	0
Researcher 4	Researcher	13	2 (2 at April 24)	11	3	0	0	0
test2@innotraces.com	Participant	0	0	0	0	0	0	0
test22@innotraces.com	Participant	4	4	0	4	0	0	0
test10@innotraces.com	Participant	19	15	4	7	1	0	0
Researcher 5	Researcher	9	4	5 (1 at April 27)	9	0	0	0
test19@innotraces.com	Participant	6	6	0	0	0	0	0
test23@innotraces.com	Participant	1	1	0	1	0	0	0
test18@innotraces.com	Participant	0	0	0	0	0	0	0
test24@innotraces.com	Participant	5	5	0	4	0	0	0
Total		227	153	74	134	7	0	0

Before the conference, we registered 40 user positions. Of these 40, 33 were signed up for. Of these 33, 28 were active during the conference. Of these 28, 22 were participants, 5 were the InnoTrace team and 1 was a cyLEDGE software developer. As this was the pilot run of both the software and the methodology, we saw it as crucial that we as researchers actively participated in order to speed up our own learning curves regarding the hands-on use and functioning of InnoTrace and InnoTracing. That said, we analytically separate our data (MOS's) from the "real" participants, as summarized in table 2.

Category	No of MOS	In %
Researchers/Developers	131	57,8
Top 3 most active Participants	46	20,3 (Users 1, 10, 15)
<u>The other 19 Participants</u>	<u>50</u>	<u>22,0</u>
No of MOS total	227	

Not surprisingly, we as researchers were frenetically engaged in seeing how the things we developed worked. This explains why the activity of the five researchers and the developer constitute over half of all MOS (57,8 %). Regarding the 22 "real" participants, we can observe the early adopter pattern, in which a few technology enthusiasts keen on anything new in the tech world, make up for almost half (46 MOS of 96 MOS in total) of the activity at the conference. The average "normal user" did between 2-6 MOS during the two conference days, in summary as follows from table 3:

Table 3: Low Frequency Users vs. Heavy Users

- 7 out of 22 Participants did no MOS at all
- 6 out of 22 Participants did 1-3 MOS:s
- 3 out 22 Participants did 4-6 MOS:s
- 6 out 22 Participants did 7 or more MOS:s

We can also observe another common pattern when adopting/testing new technology/new methodology; as can be seen in table 4, the activity is considerably higher in the beginning (=day 1) and drops dramatically as time pass by (= day 2).

Day	No of MOS	In %
April 24 (Arrival Day)	5	2,2
April 25 (Event Day 1)	149	65,6
April 26 (Event Day 2)	71	31,3
April 27 (Post Event Day)	1	0,45
<u>May 2 (Ad Hoc Outlier)</u>	<u>1</u>	<u>0,45</u>
No of MOS total	227	

Partly, the dramatic drop can be explained by the fact that some participants only attended day 1, but that said, it only accounts for a minority of the reduction in amount of MOS from day 2; clearly, engagement went down during day 2, and it was an important indication to us as researchers to reflect upon how to maintain engagement over longer periods of times for the tool and for the methodology.

Table 5: Photos per Category of Users

Photos by Researchers/Developers	85
Photos by top 3 most active Participants	23 (Users 1, 3, 10)
Photos by the other 19 Participants	26

To our surprise, the 22 participants shot only 2 videos during these two days. By far, photos were the preferred format for documenting MOS. In conversations with users we followed up on this insight asking them why they took pictures more than any other data format. The responses indicated two primary reasons. Firstly, taking pictures is quick and efficient, particularly if using a mobile device such as a smart phone or tablet. Secondly, users described this as normative behavior:

"We take pictures of what's going on all the time these days. This is just a nice extension of that which also gathers those pictures all together in one place".

As for the usability of the tool, this speaks well to its design and how it relates to contemporary normative behavior with mobile devices. Indeed it has become ubiquitous to take a picture of events, notes on a white board, slides of a presentation, selfies, and more. The feedback from users indicated that InnoTrace smartly leverages this behavioural shift for data gathering.

However, the frequency and data formats do not tell us much about "what's going on". In our content analysis

we found the MOS relating to idea visualization and social interactions.

ii) Data content analysis:

Above we indicated key findings from the frequency of the MOS captured in the pilot study. Here we reflect on the significance of the content, what InnoTrace makes visible. In our initial analysis of the data we saw two interrelated findings on participants' moments of significance at the conference: i) visualizations of ideas and ii) visualizations of social interactions.

Visualization of ideas:

The primary type of MOS documented during this pilot study was 'idea captures'. As participants InnoTraced, they were most often documenting ideas that they encountered (i.e. ideas from others) or created themselves. Primarily they came in the form of screenshots with text notes, i.e. pictures of a speaker and/or presentation slide accompanied by a short text message. Though the types of ideas captured were wide ranging, they can be grouped into two categories: inspirational and practical insights.

Throughout the conference participants and presenters alike shared inspirational ideas. What we have classified as inspirational ideas are ideas that are more abstract, wide-ranging, and somehow capture the attention and imagination of participants. For example, user 'test19' traced "you have to stay curious, no matter [how] young or old!" while 'test15' traced "the limits of innovation are no longer in the technology, they are in our heads".

While many participants documented such inspirational ideas, they also captured more practical insights. For example, 'test10' traced the idea "colored screens for cellphones are overestimated" while 'test14' traced "managing public transportation by cellphone user density... Nice!".

Two important insights begin to emerge here centered around the convergence and divergence of the ideas captured. What the InnoTrace cognitive map showed was the diversity across the group in what was seen as significant. The group, as a whole, documented a wide range of ideas from the inspirational to the more practical. As a visualization of the invisible, what we saw was a rich tapestry of discreet but intersecting ideas. Of particular importance to this was the tag cloud that emerged. As discussed below, one user ('test8') noted the significance of the tag clouding providing "an idea of the thinking already out there". As an indication of what the group was doing and finding significant, what we saw was a map of the diversity. However, while there was divergence, there was also convergence – moments that multiple users captured as significant. For example, three users – within 1 minute of each other – traced the idea that innovation constraints are "in our heads":

- Test10: "The limit of innovation is our imagination"

- Test15: "The limits of innovation are no longer in the technology, they are in our minds"

- Researcher (InnoTrace team): "Leading innovation is difficult to make happen, requires looking into the fog, the real limit is imagination, we need to build systems and networks"

This visualizes not only the divergence of ideas in knowledge and information exchange but also the congruence that happens. Importantly, it also shows how

people interpret the same ideas in different ways. While 'test10' hit particularly on imagination, 'test15' and 'Researcher' also noted technology, leadership, systems and networks.

In sum, what the data indicated was the differences and similarities in perceptions of significant moments, both in terms of diverging moments captured and in terms of different perspectives on convergent moments. The cognitive map was effective as a visualization of the "messiness" of information, knowledge and social exchange occurring across the group. Next we discuss insights regarding the social interactional elements captured during the study.

Visualization of social interactions:

In addition to ideas, the social interactions at the conference were significant in the data. There were three types of social interactions captured: community celebrities; new contacts; conversations in action.

The conference involved talks and presentations by a number of "celebrities" (well known scholars and practitioners from the leadership and innovation community). Within the data, participants often documented invited talks with photos accompanied by texts about their enthusiasm for the presenter, or meeting speakers during coffee and lunch breaks. As MOS they were significant as participants met, often for the first time, individuals whose work and ideas they know and respect. They were documenting these moments of connection and networking.

There were also traces of participants meeting other new contacts. These were moments where a new connection was made with another conference participant with whom ideas were shared. In both the cases of community celebrities and new contacts, the cognitive map that developed indicated new social connections giving insights into the developing social networks of individuals involved.

In this vein, a number of InnoTracers also captured conversations in action. These were primarily pictures of fellow conference participants engaged in conversation during coffee and lunch breaks. These conversations were occurring inside and outside, around tables, on the open terrace, just about anywhere. Such MOS give an indication of the community in action through information and knowledge exchange in a variety of social areas.

In total, the InnoTrace data collected gave significant insights into the micro-level interactions of individuals and groups within the overall conference format. The cognitive map created gave us insights into the kind of moments that were perceived as significant. These were primarily around new ideas and social interactions. In terms of idea captures, the data indicated participants' divergence and convergence around the many inspirational and practical ideas that were shared. Additionally, traces of community celebrities, new contacts and conversations in action, began to visualize the social experiences and networks that underlay the ideas experienced.

Before moving to the longitudinal Mexico City case, we present some reflective findings on the user experience, and the implication of InnoTracing to individual and group processes.

User experience:

A particular area of focus for the InnoTrace project is how the user experiences the process of tracing moments of significance and how the tool becomes a mediating technology for group processes in which they are involved. Through the data, conversations with participant InnoTracers and from the experiences of the InnoTrace team, we noted 3 significant aspects of the user experience: personal diary; motivational tool; medium of interconnection.

In discussions with InnoTracers and the InnoTrace team, we found that a significant aspect of the user experience was the ability to create a personal diary of MOS. There was a clear indication that the tool was being used to document personal insights (ideas encountered or created) and social connections. Users noted the ease at which they learned to use the tool and could quickly capture MOS and have them chronologically organized by the software. Additionally, each individual was able to look back on all the MOS captured, to relive the moments. This personal diary aspect also served as a motivation, an innovative way to capture their conference experience.

A second significant finding relates to how the InnoTrace tool mediated user experience of the conference. A number of participants, as well as the InnoTrace team itself, noted that the tool heightened attention and focus. With the ability to capture MOS, individuals found that they paid more attention to what was going on around them, both in formal sessions and in the informal gathering for coffee breaks and lunch. The empowerment of being able to gather data itself motivated participants to look for data.

This indicates the influence of the InnoTrace tool on the phenomenon being studied. Any research will ultimately influence the system being researched, just by choosing to research something we influence the system. However, with the case of InnoTrace, the data gathering by participants had the added, positive effect of enhancing their experience. They felt motivated to really investigate what was going on be attuned for things of significance.

6. CONCLUSION & IMPLICATIONS

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.

Within the pilot study discussed above we found the tool to be highly effective in generating the kinds of unfiltered data – the moments of significance of individuals within group settings – with which researchers may investigate the micro level of daily interactions. This initial study clearly pointed to the fluidity of the web-based application interface, the usability of the application, and the feeling of empowerment individuals found by using the application. The visualization of the

data provided researchers unique first level insights into the cognitive maps at individual and group levels.

This was no doubt partly influenced by the newness of the tool and experience, and biased by the community of early adopters (discussed above regarding frequency). However, given that taking pictures, videos and notes of one's experiences of group activities (such as conferences) is a regular occurrence, one important factor of InnoTrace is the focusing of that kind of activity towards data gathering and the automatic aggregation of that data by the software. This in itself seems a significant motivator for participants. However, as noted above, there was a significant drop of user activity by the second day. In subsequent projects we devise ways of keeping people engaged beyond the initial enthusiasm.

As a final point of interest from the user experience perspective, we found that InnoTrace served as a powerful medium of interconnection. This happened both virtually – i.e. within the software itself, and physically – the community of InnoTracers present at the conference.

In terms of the virtual interconnectivity, users such as 'test8', noted how InnoTrace – particularly the tag cloud – provided an insight into the invisible nature of information and knowledge exchange: "I like the way the tags everyone else has used appear. Helps to give me an idea of the thinking already out there"

In this sense, the tag cloud served as a virtual means of seeing and experiencing others' experiences in real time during the conference. As the tag cloud grew, this crowd-sourcing of perceptions was mobilized by many participants who re-used existing tags, thereby connecting their experiences, thoughts and ideas to others. This developed a sense of community. The "InnoTracers" (as they became self-named) became a sub-group of the conference, notably identified by their InnoTrace cow tags. There developed camaraderie around the process of tracing MOS, an additional community of interconnection and interaction.

This initial study provided valuable insights around InnoTrace with respect to frequency of MOS, data formats used, types of MOS captured and how InnoTrace helped focus attention on the phenomena of interest.

What emerged from the case was a participant generated visualization of the moments of significance in relation to idea and social interactions. Through the data we could "see" the diversity of moments perceived as significant by participants, as well as the divergence and convergence around these moments. Additionally, the tracing of social interactions indicated how, where and when social networks were developing. This provides us with important information on what captures the attention of multiple group members and how these moments coalesce in groups to move processes forwards.

One key finding relating to the usability of the application is the drop-off rate of users. As with any new technology, early adopter enthusiasm is often followed by a drop off of intensity. For future studies, InnoTracing must become a habitual activity for users. To accomplish this we suggest 1) longer training, 2) initial test periods, and 3) and intermittent communication (e.g. emails or SMS prompts) with participants to remind them of their InnoTracing activity.

Additionally, we found that the tool itself becomes a mediating technology for peoples' experience of the world around them. InnoTrace, particularly in the opening stages of using the tool, became an intensifier of experience. It became a means of creating a personal diary as well as feeling more connected to the wider social setting – both virtually such as through tag clouds, and physically as part of an InnoTrace community. In this vein, the axiom that researchers always influence the systems they study holds true. By virtue of our decision to research something, we have already existentially influenced the phenomenon by giving it value. However, in the hands of participants, InnoTrace encouraged individuals to be more fully present, to be more aware of what was going on, and to pay attention to and document those MOS that they have. Additionally, the novelty of any such technology eventually wanes as its use becomes more habitual. We would anticipate that in long term studies, the InnoTrace application would become a normal, everyday tool for capturing daily group interactions and less of an intensifier of experience, just as our smart phones, tweeting and facebooking have become normal, everyday events in a social setting. 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.

InnoTracing affords a wealth of visual, audio-visual and textual data and insights into group processes. 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.

While there is great value and potential of InnoTracing as a means for research, there are implications for practitioner work as well. In particular, InnoTrace is proving to be highly useful in capturing and tracing the work of individuals and groups, particularly in the space of creative work. It is a means for documenting the plethora of thoughts, ideas and connections that occur as people work together and individually. In this sense it has practical applications as an archival resource to develop a repository of ideas developed which may otherwise be lost. Additionally, as InnoTracing provides insights into how a group interacts, the outcomes can be used to optimize group processes. Understanding more clearly where, when and with whom the most productivity arises is a key managerial tool for enhancing the creative, and ultimately innovation, work of a team, department or organization. Finally, as has been commented on above, the tool has the added effect of motivating people to become more focused and conscious of what is going on around them. When asked to document MOS, individuals are more attentive to the moments they are experiencing. This behavioral shift is potentially highly valuable in

enhancing individual and group work within organizations.

InnoTracing holds much promise. As a software tool and methodology we have found it a useful entrée into the micro-level moments of interaction that constitute group processes. However, the major limitation at this point is the limited use of the tool. In addition to the above-mentioned pilot, InnoTracing has been carried out in another study at a Mexico City firm. The data of this is currently under analysis. What is required at this point are additionally studies in a variety of organizational contexts.

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