

How to identify sustainable entrepreneurship collaboration while it happens

1. Introduction

Alliances, networks and partnerships that bridge sectors are more and more seen as 21st centuries answer (Prahalad 2008; Sheperd & Patzelt 2011) to rising uncertainty and complexity of global problems. Collaboration is a key to sustainable entrepreneurship and necessary for shifts towards a more sustainable global economy. But obviously, collaboration of heterogeneous, unfamiliar actors often does not lead to expected sustainable ends (Patzelt & Shepherd, 2008; Selsky & Parker, 2005). It is seen that traditional hierarchical management methods become helpless in dynamic innovation processes (Pittaway, Robertson, Munir, Denyer, & Neely, 2004), and while leadership is in lack of collaborative management methods, networked constellations increase in transnational politics as on global markets.

Public and private actors drive incubation and acceleration of technological innovation, green technologies and sustainable companies. In small regional or big transnational incubators, as in transnational private companies, flexible innovation teams are created to collaborate on a flexible temporal and often virtual base. Most often, teams start from ad hoc in experimental ways. And while all start from entrepreneurial endeavours, some fail and some succeed. Leadership would profit a lot from rapid identification and performance measurement of successful collaboration – in dynamic innovation networks (DIN): Governmental interventions in the commercialization of new technologies could be channelled into best directions; and actors in public-private consortia, transnational companies and academic incubators could identify the most successful teams. It has become common place that innovation networks bring competitive advantages (Pittaway et al., 2004; Powell & Grodal, 2005; Tatnall, 2011) but it remains difficult to identify, support and manage successful innovation processes in dynamic multi-stakeholder collaboration.

Where complex challenges and unfamiliar partners meet, challenged to respond in real time, uncertainty suddenly rises and either blocks collaboration or leads to the emergence of dynamic innovation networks. Sustainable entrepreneurship, especially, is in itself a “wicked problem” as it targets economic, social and ecologic goals (Belz & Binder 2015) in parallel. The transition to a sustainable global society needs substantial entrepreneurial activity (Hall, Daneke, & Lenox, 2010; Patzelt & Shepherd, 2011) in successful collaborative partnerships between established and new companies, administrations and non-governmental actors. In acute challenges, environmental crises or disaster management, time pressure requires real time responses without planning periods or fully

reliable information. But entrepreneurial processes often start from uncertainty about future conditions to end in new and more sustainable solutions.

This paper aims at presenting an instrument to identify and measure the performance of successful innovation collaboration. It is based on the argument that ad hoc collaboration becomes successful sustainable entrepreneurship when underlying network dynamics are followed. In cross-case studies on disaster management and start-up collaboration in the automotive industry, five patterns of dynamic innovation networks (Weber, Sailer, & Katzy, 2015) were identified. This paper derives from these patterns generic indicators to build instruments for dynamic innovation processes in both different contexts: Global disaster management and start-up incubation. The gain of such tools is rapid identification of successful collaboration. It becomes feasible not only by ex-post evaluation of prototypes or sustainable outcomes, but in the process and already in the making of sustainable entrepreneurship.

The papers' approach is based on recent articles on sustainable entrepreneurship and a research project on the evolution of dynamic innovation networks in global disaster management (Weber, Sailer, & Katzy, 2012; Weber et al., 2015). It is structured as follows: First, it depicts sustainable entrepreneurship as real time and dynamic network process. It is discussed how network performance is related to successful innovation. Second, the methods to retrace underlying network dynamics and collaboration patterns of successful entrepreneurship are briefly resumed. Third, the resulting five dynamic network principles are presented in detail. Most important, the instruments to measure dynamic innovation networks by indicator patterns are derived. The generic questions are applied to different contexts of dynamic and asymmetric collaboration: Global disaster management and start-up collaboration. It is proposed, finally, to test the instruments in future research.

2. Sustainable entrepreneurship as dynamic network process

In sustainable entrepreneurship research as in the conventional entrepreneurship literature of the last years, a growing number of publications takes a process perspective (Van de Ven, 1992; Van de Ven, 2007) on entrepreneurial activities (Shane & Venkataraman, 2000; Slotte-Kock & Coviello, 2010; Weber, Sailer, Holzmann, & Katzy, 2014; Zahra, 2007). Instead of investigating the output or the antecedent factors of sustainable entrepreneurship, studies focus on the "how" question of the entrepreneurial process (Van de Ven, 1992; Zhou, 2013). To advance knowledge on empiric processes, on actors' practices, on pitfalls and successful moments in non-linear entrepreneurial collaboration is important: It contributes to improvement of the support of entrepreneurs in their activities for a more sustainable global development (Robert, Parris, & Leiserowitz, 2005; Sachs, 2012).

From a recent systematic review, it is evident that so far, only three papers explicitly “focus their research on the entrepreneurial process of the sustainable ventures” (Binder & Belz, 2015:47). The publications of these authors (Choi & Gray, 2008; Larson, 2000; Schick, Marxen, & Freimann, 2002) present case and cross-case studies that result in valuable first typologies or test conventional entrepreneurship process models; but with regards to the considerably small number and to the standard approaches used, this initiative can only open the floor for further research.

It is observed that process studies on conventional as on sustainable entrepreneurship so far deploy linear process models. The entrepreneurial process in real start-ups, or in challenging situations of innovative reconstruction after natural disasters, in contrast, contradicts formal and linear concepts. They turn out to be much more chaotic, iterative and unpredictable in most real world settings. At times, entrepreneurial activities arise from external or internal trigger events, as from sudden demand of key stakeholders or urgent problems in the ecosystems. But ad hoc emergence of dynamic innovation networks (Weber et al., 2015) has not yet been considered in the nascent field of sustainable entrepreneurship (Belz & Binder, 2015). Between both fields of dynamic collaboration, innovative destruction of markets and innovative reconstruction after disasters (Wachtendorf, 2004), social entrepreneurship happens and first connections between the unpredictable and complex fields are made in the literature (Shepherd & Williams, 2014; Weber et al., 2012).

In digital societies with merging local and global markets, the innovation process is collaborative and involves multiple different partners and technologies. This has become topic of innovation collaboration, strategic alliances and network theory (Blomqvist & Levy, 2006; Graf, 2006; Powell & Grodal, 2005). Regional settings of biotech clusters (Powell, Koput, & Smith-Doerr, 1996), crowd-sourcing platforms or public private IT partnerships perform better in technological innovation. New consumer priorities evolve in the digital western societies as “Sharing Economy” and “New Ways of Work” (Katz, Bondar, & Mason, 2012) to open ways in post-industrial countries to more sustainable lifestyles. These trends also accelerate markets and social life, making it more fragmented and less controllable. Collaborative innovation also has its “dark side”. Networks always exclude external public and external agents. And uncertainty in partnerships makes for frustrations, too: Disappointed expectations, failed and suboptimal outcomes (Tallqvist, 2009) often lead to pullout of partnerships and wasted investments. It happens both in social and technological innovation (Zahn, Kapmeier, & Tilebein, 2006). So how do the successful cope with uncertainty in innovation collaboration?

To find answers, recent studies investigate collaborative innovation for patterns of sustainable and successful technological innovation processes. Innovation networks were examined in order to gain insights into cooperation and collaboration patterns around critical incidents. Strategies of network governance were studied, managerial and network dynamics focused to find out about “patterns, positions, ploys, plans and perspectives” (Mintzberg, 1987) that make collaboration without initial goal and central management successful. Research on NGO collaboration and disaster

management so far has less been connected to strategic networks, innovation and management approaches of the for-profit economy. This is perhaps not startling, but still unfortunate, considered that both sectors have evident interest in the question how to manage collaboration in turbulent, global environments.

In network theory, the core assumption is that any social structure consists of relations and links between units – people, groups or positions. Scientific examination of networks started in the last century in closed laboratory settings before it was opened up to investigate “real life” phenomena. With Jacob Morenos first matrixes called “sociograms” (Moreno, 1953) and the discovery of “centrality” in networks (Bavelas, 1950; Leavitt, 1951) its foundations were set. Modern network theory still relies on classic texts and concepts (Castells, 2000; Cook, Emerson, Gillmore, & Yamagishi, 1983; Granovetter, 1973) but developed into various branches. Criticized from beginning is the lack of a dynamic aspect in favour of static structures and configurations. “The most pressing need for further development of network ideas is a move away from static analysis that observe a system at one point in time and to pursue instead systematic accounts of how such systems develop and change” (Granovetter, 1983:39). A second plea for “real world” social phenomena is the modelling of homogeneous actors.

Stepping ahead from social network analysis (SNA), actor-network theory (ANT) is a dynamic approach to analyze heterogeneous, complex alliances in which human actors and technical artefacts are equally dynamic actors in evolving networks (Callon, 1986; Latour, 1999). Practices of network formation are “interessement” and “problematization”. These operations are sometimes contingent (Akrich, Callon, & Latour, 2002) as actors depend on their capability to raise attention and influence others. Successive studies have investigated unfolding network dynamics in social and technical innovation. There was evidence on a significant role of network dynamics in initial periods. From this observation, exploration zoomed in on beginning innovation processes in start-up collaboration in the automotive industry. Similar patterns were found and mutually confirmed the findings on initial patterns of successful innovation collaboration.

As a result, a switch away from strategic management routines of initial goal setting and targeting is necessary for effective management of unpredictable dynamic collaboration. A collaborative governance is derived from three central switches. In successful dynamic innovation networks, (a) managerial goal setting does not happen before, but becomes continuous task during the process, (b) goal finding means a rapid creation of a “shared vision” in early stages (c) match-making between heterogeneous partners is central part of entrepreneurial collaboration. It happens in collaboration processes, but it also starts before and outside of it. In asymmetric partnerships, it profits from use of intermediaries. In sum, co-evolution of entrepreneurial goals and network emergence is observed. Management has to back out of strict control for network governance can emerge from the beginning.

To resume, dynamic sustainable entrepreneurship processes depend on collaboration of heterogeneous partners. Under time pressure, high uncertainty and turbulent environments, the emerging network becomes a management structure complementary to traditional management methods. In successful ad hoc collaboration, dynamic innovation networks emerge.

3. Methodology to identify network patterns of successful collaboration

The methods used in resumed studies are constructivist research approaches. In cross case process studies (Van de Ven, 1992; Van de Ven, 2000), actor-networks were explored using critical incident technique, CIT, (Butterfield, Borgen, Amundson, & Maglio, 2005; Flanagan, 1954) to put time stamps on the more abstract network formation “operations” of ANT (Law & Hassard, 1999) termed “translation process” (see table 1). The basic operations in ANT network formation are “problematization”, “interessement”, “enrolment” and “mobilization”.

Table 1 ANT translation operations (adapted from Tatnall 2011 and Law 1999)

Actor-network operation	Explanation
Problematization	Definition of a problem
Interessement	Recruitment of actors
Enrolment of actors	Establishment of continuous interaction of heterogeneous actors with aligned interests
Mobilization of allies	Enrolled actors are using practices and materials to inscribe their own interests into network communication

The abstract steps build the skeleton for dynamic innovation network (DIN) formation, but afford more concrete time-stamps of the changes in the network. Identification and comparing of dynamics around CI led to shared patterns of successful collaboration in an exemplary unpredictable and dynamic environment. Rich primary (interview) and secondary data (official and informal documents) on long term collaboration was coded and analyzed. Different and heterogeneous global and local actors’ perspectives were checked and balanced. Sustainable innovation collaboration finally was coded for three dynamic innovation networks (DIN) in long term disaster management 2004 to 2010. The network emergence started in local response to a large scale disaster in India (2004) and ended in different sustainable local outcomes in 2011. The sample for the in-depth process analysis contained 3 actor-networks of N=10-13 heterogeneous socio-technical actors. The findings of code book and critical incident charts have been discussed with actors and published. The resulting core finding of the research project was the identification of five dynamic innovation patterns retraced from and confirmed in successful processes of sustainable entrepreneurship.

Figure 1 resumes the research design for this conference paper stepping from above resumed process analysis to resulting dynamic innovation network (DIN) *patterns* to the real time evaluation tools for successful innovation collaboration.

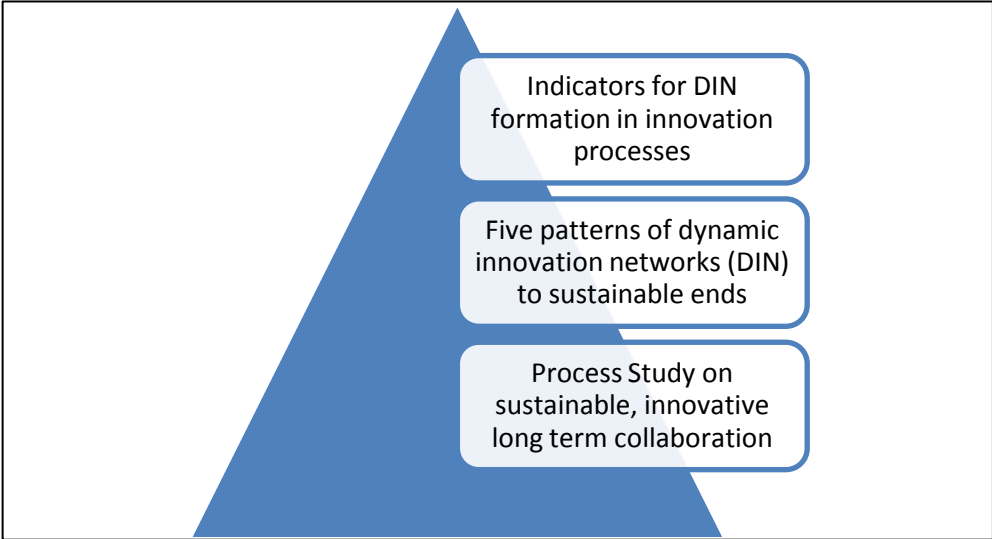


Figure 1 Methodology to gain the process indicators for successful entrepreneurship

4. Five dynamic innovation patterns

The process analyzes showed that and how management of successful real time collaboration followed underlying network dynamics. Five relevant network dynamics have been identified as success patterns in the above described sample. Some of the success patterns overlap with central actor-network operations (ANT) others indicate completely new dynamic categories.

This section is to describe the DIN patterns in detail before we take them on to practical impact as measurement tools. Global relief serves as illustrative background of ad hoc collaboration. In successful collaboration, volatile inter-organizational relief networks emerge with a potential to realize sustainable and innovative ends. Therefore, the dynamic innovation patterns are explained in this context. From here, we can transpose the generic DIN patterns as indicators into different contexts of innovation collaboration, for example in incubator settings.

The following figure 2 lists the 5 dynamic network principles related to the Ant translation operations. The figure depicts that the second pattern of successful collaboration in DIN, early development of a shared vision, is connected to all four ANT operations of network formation. It can be seen as the central element of network governance. It orients ongoing goal setting within this collaboration, ensures the long term commitment of enrolled network-actors and attracts new ones, at the same time it limits the scope of the activities and interests allowed. All the four other identified patterns rather relate to a single operation in translation according to ANT.

Table 2 DIN patterns and Actor-network formation (Tatnall 2011)

	DIN patterns of sustainable entrepreneurship	Actor-Network translation (ANT)
1	Early identification of affected heterogeneous local and global actors and interests	Problematization Interessement (OPP)
2	Early development of a shared vision	Enrolment, Mobilization, Problematization, Interessement
3	Mindful use of boundary objects	Mobilization
4	Punctual directedness and distance	Mobilization
5	Network orientation to focal actors and focal actors orientation to local ecosystem	Interessement

The headlined five DIN patterns in the left column then will be described in more detail.

1. Identification and early alignment of heterogeneous actors interests (OPP)

In heterogeneous actor-networks a common worldview is improbable. But for emergence as dynamic innovation network, for high performance and the realization of sustainable outcomes, the early alignment of heterogeneous interests is indispensable. These are *all* relevant interests that relate to an agreed problematization. There needs to be an “obligatory point of passage” (OPP), a moment of fixing commitment that is realized by all actors in the network, which can be an event, a meeting, a written document or any act that binds all actors’ interests.

Dynamic innovation networks are heterogeneous and enroll real time human and non-human elements. Artifacts also play actor roles. These need more explicit attention for their role in collaboration often remains invisible, especially in digital societies where usability and interoperability of devices and limit and force communication. A networks ability to include unusual actors enlarges its spectrum of activities in response to a situation. Heterogeneity is at the base of success. Inclusion of unusual and additional (German donor NGO) or even group-adverse actors (an established for-profit company in a charity field) increased the opportunities for improvisation and entrepreneurial outcomes in the observed cases.

2. Development of a shared vision

Goal uncertainty is a problem for strategic management and planning and often the reason *not* to start collaboration. But in longer processes of change, as yearlong rehabilitation after large scale disasters, or start-up processes, premature goal definition spoils real time improvisation and local development (Perrow, 1984; Wachtendorf, 2004) . What is decisive, instead, in the first beginning of a collaborative process is the dynamic development of a shared vision (Weber et al., 2014). It has to encompass and delimit all involved heterogeneous interests; it is directed from ad hoc into the future; and it has to work simple, directly and short, as a claim. As above depicted in table 2, multiple functions are exerted by this key element of dynamic network governance: From creation of audience and external visibility to motivation of long term commitment by enrolled actors; from direction to short time goals to impact and process evaluation.

3. Mindful use of boundary objects

Boundary objects (Briers & Chua, 2001) mediate between heterogeneous (f.ex., local and global) actors, link polar interests and help mobilizing activities of heterogeneous actors. Artifacts, events or technical items can become boundary objects, also symbolic objects as words or sounds, a shared vision or a legal convention. The fact that boundary objects transport a meaning for all does not mean that it is the *same* meaning for all. For one DIN in global relief, it was an old green bus that became the networks most powerful boundary object. It started to drive through “Tsunami villages” transporting teachers and children to a improvised compound of save teaching, eating and sheltering; it also brought them back to their families at night. For fishers in the remote villages and its semi-orphans, the green bus soon meant security, future and support. On the global donor side, it became a tangible picture for the financial investments and it confirmed the realization of the donors’ interest to help. The more differences and heterogeneity a network encompasses, the more the mindful use of boundary objects is essential.

4. Punctual directness and distance towards implementing actors

In all observed polycentric networks, initially and continuously, the directedness of contacts and communication was reciprocal. But around critical incidents this mutuality got blocked when implementing actors faced problems in realization of activities. Communication then tended to turn unidirectional, requests remained without answer, and more and more the network partners’ attention was focused on the struggling silent actor within the dynamics around critical incidents. This actor is in a position put under pressure. Only time-outs help for reinstalling distance and reciprocity. Temporal non-visibility and non-communication become punctual needs in dynamic innovation processes. The capability to perceive the situation and to cope with such moments - to keep distances to reinstall reciprocity - is an important network resource necessary for local problem-solving in conflict periods. A dynamic to balance directedness and distance in interaction is integral part of

sustainable and innovative long term collaboration. The pattern 4 is not related to distinctive actor roles (weak, regional, sector or function specific) in polycentric networks but relates to all involved in interaction. As implementation activities rotate and happen parallel in real time, all network-actors show this pattern around critical incidents.

5. Local integration and network orientation on focal actor

In real time collaboration of multiple actors, critical incidents happen parallel, iterative and cascading between local and global actors. Whatever a problem affords (distribution, income generation, growth to market or medical problem) and a shared vision claims to mobilize a dynamic innovation network, the collaboration takes place at a given local site and has to address a local ecosystem (Welsh & Krueger, 2012). That means that first, the participation of local people and local institutions, but more so, their focal actor role is a must. A two-way orientation and adaptation was retraced in successful DIN in relief: A strong local integration of the local NGO and a strategic orientation of the other network partners on the communication profile of this focal network-actor. The local integration took very different forms, each time depending on the NGO's profiles. The significant pattern was that the other heterogeneous partners respected its dominant role and adjusted activities and expectations accordingly. So DIN could profit from the innovative characteristics of the implementer. By this double orientation on focal actors as the local implementers, a network strategy unfolds to realize local opportunities for sustainable ends.

5. Instruments to measure the performance of dynamic innovation networks (DIN)

After presentation and description of identified shared DIN patterns of successful collaboration, we now use them to derive the indicator questions to measure performance of dynamic innovation processes in real time, the goal of this conference paper.

Successful rehabilitation processes are of deeply entrepreneurial nature. Innovation is inherent to sustainable reconstruction because global and local ideas and practices merge, new materials, technologies and products merge with old materials, and this process changes the former dominant socio-technical structures that were in place before. So does technological innovation as creative destruction (Schumpeter, 1934) in global and local economies.

The instruments we are going to craft now will be outlined for both societal realms of innovation collaboration, starting with disaster management. For each DIN pattern, indicator questions are derived that needs further specification in application to evaluation questions, sample and local setting. For all dynamic patterns, quantification is possible by aggregation of percentages of answers of collaborating partners. Still, in all surveys and polls applying the tools, open questions remain indispensable. The following indicator questions for evaluation of collaboration in global disaster management deliver valuable real time feedback. Public administration in affected countries, directors

of global and local NGO, or donor institutions, all wishing to evaluate *ongoing* projects, have interest in real time measurement.

Table 3 Real time evaluation tool for DIN in disaster management

Dynamic network principle	Indicator questions for DIN in disaster management
Early identification of heterogeneous actors and early alignment of heterogeneous interests (OPP)	<p>At the peak time of response, how many of the appeared NGOs have been there (percentage) from</p> <ul style="list-style-type: none"> (a) The start? (b) An important media campaign? (c) An important legal act adoption? <p>On which technical devices depends in the ongoing process?</p>
Development of a shared vision for continuous goal setting	<p>Staff Survey: What is the main goal of the organization?</p> <p>How many percent give the same answer?</p> <p>Multiple choices: The main goal of the NGI is: a), b), c), etc.</p> <p>How many percent will give the same answer?</p>
Mindful use of boundary objects	<p>Percent of people in a given region or cible group do recognize a specific "boundary objects"</p> <p>Percent of people that do relate the boundary object to the main goal of the collaboration?</p> <p>Frequency of a specific object in official documents/PR/ corporate identity/media use of a NGO</p>
Punctual directness and distance among all implementing actors	<p>Balance of information/contacts between actors</p> <p>-weighted average</p> <p>-weighted for duration, content, kind of contact or communication (One direction is +, the other -, a Zero sum would be perfect, etc.)</p>
Local integration of and network direction to the focal actor	<p>How many local contributors / local staff have the NGO?</p> <p>Quantitative sum weighted for locals, from which distances they come?</p> <p>Quantitative sum or percentage of resources and donors that the NGO uses that are local?</p> <p>Agreement and disagreements of partners in meetings and in media, in collaboration with visibility</p>

Similarities between collaborative innovation processes in relief and in start-up collaboration have been evoked. In both fields, initial goal uncertainty, competition of many unfamiliar and heterogeneous actors and time pressures due to time-to-market and due to time-to-rescue challenge all actors. In often asymmetric collaboration processes, then, actors have divergent long term objectives and different flexibility of management.

In the different contexts, the underlying generic network dynamics remain the same and impact successful innovation collaboration. The 5 generic patterns are transposable to start-up collaboration and co-incubation in public or private incubators, in flexible innovation teams in corporations and in all forms of collaborative sustainable entrepreneurship. The indicator questions however need to be adapted and specified to the compared sample and the local context of the collaboration. The indicator questions for start-up incubation in table 4 deliver benchmarks for real time feedback, for investors, stake-holders and entrepreneurs of collaborative innovation processes.

Table 4 Real time evaluation tool for DIN in collaborative ventures

Dynamic network principle	Indicator for collaboration in start-up teams
Early identification of heterogeneous actors and early alignment of different interests (OPP)	How many percent of the people which eventually lead the project, have been engaged (a) From the beginning? (b) Before an investment? On which technical infrastructure do production and service depend?
Development of a shared vision for continuous heterogeneous goals, commitment and delimitation	Staff survey: What is this start-up standing for? What is the most important thing that this start-up is able to deliver? Multiple choices... How many percent will give the same answer?
Mindful use of boundary objects	-Percent of people who know the logo/sold product/sold service of the start-up -Percent of people in a cible group/supplier group that relate the brand/specific wording/ boundary object to the start-up

Punctual directness and distance among all implementing actors	Balance could be measure instead of “heterogeneous actors” -> ”founders and staff”, “founders and established companies”, “founders and consumers” etc
Local integration of and network direction to the focal actor	How many local/foreign founders has a startup? How many percent of the customers are local? How many percent of the investors/resources a start-up uses are local? Quantitative sum weighted for how far away the local ones are Agreement and disagreement of partners in bargains, meetings, in media visibility

The outlined instruments for designing and implementing evaluation surveys not only allow for assessment of DIN from external perspectives, but also for improved process management of ongoing dynamic innovation projects or for preparedness of the own corporation for future network collaboration.

6. Conclusion

In real time collaboration of sustainable entrepreneurship, the identification of emerging high performing innovation networks is mass collaboration, alliances and partnerships is an important endeavor. The aim of the paper was to outline an innovative method for process evaluation. It was learned from but is not limited to non-linear dynamic processes in disaster management. Five dynamic network patterns provided the dimensions to identify and evaluate DIN in different social contexts. Identification and evaluation become possible *during* a collaborative innovation process. This contrasts output, ex-post and end-of-pipe oriented existing measuring tools. The process oriented tools developed here offer application before failures are irreversible. They supply real time feedback and so save investments.

Future management of for-profit and of non-profit collaboration for sustainable global development will depend on cooperation and collaboration capabilities (Prahalad & Krishnan, 2008). Therefore, better understanding of collaboration under uncertainty is important. It helps leadership engaged in “managing the unexpected” (Weick & Sutcliffe, 2007).

This paper invites future research to test the instruments in multiple settings of dynamic innovation processes. Modelling the five patterns with metric data into a DIN simulation would be the next step in the development of a robust middle range approach to identify, evaluate and support DIN for successful innovation collaboration.

7. References

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