

Design of Cooperative Processes of Innovation

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Abstract—This paper invites to dialogue and reflections on innovation and entrepreneurship by presenting concepts of innovation leading to the introduction of a complex theoretical framework; Cooperative Innovation (CO-IN). CO-IN is a didactic model enhancing and scaffolding processes of cooperation creating innovation drawing on a Scandinavian tradition.

CO-IN is based on a cross-sectorial and multidisciplinary approach. We introduce the concept of complementarity to help capture the validity of diversity and we suggest the concept of “the space in between” to understand the creation of identity as a collective mind. We see dialogue and the use of multi modal techniques as essential tools for conceptualizations giving possibility for clarification of the complexity and diversity leading to decision making based on knowledge as commons.

We introduce the didactic design and present our empirical findings from an innovation workshop in Argentina. In a final paragraph we reflect on the design as a support of the development of common ground, collective mind and collective action and the creation of knowledge as commons to facilitate innovation and entrepreneurship.

Keywords—CO-operative Innovation, didactic design, dialogue and ICT.

I. INTRODUCTION

THE social, environmental and economic crisis and its consequences on a global scale call for innovation with and approach of complexity and diversity. An example of this is the work of the 2009 Nobel prize winner in economic governance E. Ostrom [1]. She addresses how societies have developed diverse institutional arrangements for managing natural resources and avoiding ecosystems collapsing, especially by self-organization to manage common pool resources and devises of long-term sustainable institutions for governing these resources.

Ostrom points out the change from fitting the world into simple theoretical models to new more complex frameworks: “contemporary research on the outcomes of diverse institutional arrangements for governing common-pool resources (cPrs) and public goods at multiple scales builds on the paper draws on the EU funded EULASUR project, EU grant agreement no.: CSA CA 233467 EULASUR classical economic theory while developing new theory to explain phenomena that do not fit in a dichotomous world of “the market” and “the state” [2]. Ostrom argues, that “scholars are slowly shifting from positing simple systems to using more complex frameworks, theories, and models to understand the

diversity of puzzles and problems facing humans interacting in contemporary societies.” [1].

The research literature on innovation seems predominantly to apply a more technical view on the processes of innovation. Identification of available resources, economic indicators, and the usual business plan approach seems to lay the framework for how and what to innovate [3]-[4]. Castell [5], however, explains innovation as a function of three main factors. The first is the creation of new knowledge, in science, technology, and management. This refers to the existence of a well-developed R&D system, both private and public, enabling to supply the fundamentals of innovation. The second factor is the high availability of highly educated, self-programmable labour able to use new knowledge to increase productivity and the third factor is the existence of entrepreneurs, able and willing to take the risk to transform innovative business projects into business performance. Drawing on all resources managing innovation is central, but: *Is it possible to design and manage creative processes of innovation regardless of the cultural setting and stakeholders' diversity?* We address this by highlighting yet another empirical cornerstone; innovation as a mental process, as a change in the thought processes.

In the following we setup a complex theoretical frame for understanding cooperative innovation, also introducing the Scandinavian tradition of democratic negotiations. This chapter serves as point of departure for an introduction to innovation models leading to cooperation, and innovation in thinking. To address complexity we draw on Niels Bohr's [6] theory of complementarity. Further, we use Mueller's [7] concept of “the space-in-between” to understand the creation of identity with dialogue and communication as foundation. We use this complex theory to frame our design for an innovation workshop, which we describe in the following chapter also presenting our empirical findings. In a final reflection we return to the didactic design and innovation based on knowledge of commons viewing the possibilities for entrepreneurship and innovation conditions within the market.

II. INNOVATION

Innovation may refer to the process that “renews or changes something” that already exists, but innovation is also commonly understood as the introduction of “something new”. Joseph Schumpeter [8] was the first scholar to describe the notion of innovation; to him the economic change was embedded in innovation, entrepreneurial activities and market power. Freeman & Perez [9] view innovation from two different perspectives, from how radical they are and from which macro-economic effect they have, while Teece [10] makes his distinction between autonomy and systemic innovation, which he defines from the demands for renewability to technical development and level of readjustment. David and Eisenhardt [11] have their focus on

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the innovation performance defining it to which degree the collaborations generated mean new technologies and intellectual property that has a positive impact on product lines and company performance.

The understanding of innovation has changed tremendously over time and the global dynamics have changed and provided new conditions and challenges within environmental issues and market possibilities. A subsequence of more intensive focus and research on innovation has brought new understanding to innovation; it is perceived as a social phenomenon, a team effort [12]–[13]–[14]. The reason is that emphasis is put on the intangible role of relations, the way users, or stakeholders, interact in the process of innovation, where knowledge sharing understanding and collaboration are key factors to the capability of innovation.

The new child in the street is *collaborative innovation*, sometimes referred to as university-industry collaboration [15], but most often described as cross-sectorial [16]. Here companies, research and government units are defining collaborative innovation through the actors participating [17]. This is the case even when looking at inter firm collaboration between competing stakeholders, be it government, [18] or between SMEs [19], or when studying the shift from closed, company internal innovation to more open and collaborative forms of innovation [20]. The concepts have also been used to discuss a knowledge-based platform for collaborative innovation development of products.

Collaborative innovation may be understood both as synonymous with the constellation of the unit, the output of the process, and it also refers to the process itself. It is as such a player for all purposes with approachable basic modelling features, easy to fit and adjust to multiple conditions. Innovation is seen as unpredictable leading to emergent, or radical and revolutionary changes in organisations, products, or processes, and in thinking [21].

With the latter innovation becomes a psychological concept based on knowledge and it is understood as a change in the thought process. This understanding places focus on *the process of innovation* from the origination of an idea, its conceptualisation and its transformation into a product of any type, or a service, a plan or an idea, initiated by the people, users or producers who are the ones who shape innovation. Innovation leading to emergent or radical changes in *thinking*, places focus on the processes and the humans who create. Framing it within the Scandinavian model it opens for a new paradigm of equal, democratic and open interaction that promises a more dynamic and adoptable process framework. The question we ask is; *is it possible to develop a didactic design for the intangible role of relations by designing a scaffold for interaction and dialogue, and through the use of different media for production and expression in order to capture and develop the thought processes?*

III. CO-OPERATIVE INNOVATION (CO-IN)

Our approach to innovation and collaborative processes takes its point of departure in the democratic Scandinavian culture and tradition. At its core it is the development of

democracy over the last hundred and thirty some years. The co-operative movement was founded in the 1860s in Denmark by non-governmental organization to improve the life of farmers and poor workers. The core ideology of the cooperation was democratic independence, self-organization, equality and self-management. These principles especially framed the Scandinavian Information System (IS) approach that started unfolding a century later, and it has evolved radically for more than 30 years. Co-operative Design was the original named of the approach and the core objective is to give users a voice, and at the same time enhance the quality of the resulting system [22] through innovation.

Our model CO-IN has dialogue as underlying frame and three constituting factors; *cross-sectorial and multidisciplinary participation, regional and local focus, and the didactic model design framing the cooperation*. The didactic model constitutes, enhances and scaffolds cognitive, social, emotional and sensuous approaches to the world, hence in the cooperative process; innovation is understood as changes in thought processes. Further; CO-IN focus on regional and local sustainable market development innovation and has as pre-requisite partner participants from private sector, public sector, citizens, research and Non-Governmental Organizations (NGO) ensuring cross-sectorial and multidisciplinary participation [23].

Careful understanding of the stakeholders; the organization, the task, the client, the context; each representing a complementarity perspective is a pre-requisite. To capture this complexity, Bohr's principle of complementarity may be of help. It refers to his famous study of light; he discovered that light is both particle and wave. One cannot eliminate the other; they exist side by side, though an observer cannot study both at the same time. They are complementary perspectives which both contribute to completing a description of the phenomenon; even they may logically exclude each other. "In fact, data ... simply supplement each other and can be combined into a consistent picture of the behaviour of the object under investigation." [6]. This concept of complementary perspectives is important in a multi-cultural project, because of the diversity of participants, their perspectives, knowledge and competences requiring openness for careful reflection and investigation to allow the complementarity to unfold. In the cross-sectorial, multi-disciplinary projects the interaction needs to create space for the enhancement of the explicit and the tacit, for contradictions and paradoxes as the cooperation unfold. It is in this meeting in 'bordering spaces' that innovation may grow.

In an analysis of collaborative practices Muller [7] talks about a third space, the hybrid realm. He suggests that in the boundary region between two domains there is a region of "overlap, or hybridity that contains an unpredictable and changing combination of attributes of each of the two bordering spaces". Muller has borrowed the concept of hybridity from Bhabha's [24] work on location of culture. Bhabha's area of concern was colonization, in which natives find themselves caught between their own traditional culture and the new imposed culture of their colonizers. In their effort

to survive they continually negotiate and re-create their identities, while, at the same time creating a new hybrid, or a third culture. Building on cultural complexity, we use the concept of *the space-in-between* to understand cooperative innovation as the unfolding relation between the diversity of stakeholders resulting in the unfolding of a common ground.

A pre-requisite for interacting in the third space is communication and listening to understand the “other”. In his theory of communicative action Habermas [25], introduces the distinction between life-world and its communicative action and system-world and strategic action. The communicative action is a true dialogue between rational arguing participants in terms of comprehension, truth, rightness, and trustworthiness. In true dialogue there are, ideally, no hidden agendas, and the participants meet with open minds and with the understanding that the best argument will win. The ideal communicative action requires that the dialogue process is a learning process where participants listen to each other, hear/listen with great care, interact, communicate and negotiate meaning which may lead to rearrangement, renewal or to fundamental reorganization of their understandings and perspectives. This implies that communicative acts – the dialogues – also provide the possibility to reflect and accommodate one’s own understanding and goals in cooperation to those of the others and to reflect on one’s own understandings and worldview. Hence the dialogue is a mutual learning process enabling the development of a collective mind [28]. Within CO-IN the space-in-between is a process in the making of a hybrid identity the nature of which is that of constant changes – it is dynamic.

This theoretical frame of cultural complexity, development of common ground and collective minds, which embed the dynamic hybrid identity serve as a base for our didactic design. With this we return to the question of design and management of processes of innovation regardless of cultural settings and stakeholders diversity and we address this by turning our attention to the questions of organization, techniques and tools to ensure the unfolding of rich diversity [26].

IV. METHODOLOGY AND EMPIRICAL SETTING

The background for our research on innovation and entrepreneurship is participation in a EU funded collaborative project with Latin America.

To drive cross-sectorial and multidisciplinary collaboration and the innovation of new ideas the project has made extensive use of innovation workshops. We report on a workshop, which ran over two days, with a total number of 24 participants, a minimum number of 17, out of which 15 participated in the whole workshop. Due to participants’ other obligations the workshop was flexible, but continuity was secured by having three groups that all had a core of 3-4 members participating during the whole period of the workshop.

The participants came from the business sector, public services, university research, Ministry of Technology and

Innovation, university students and a concerned citizen.

The workshop was organized as a loosely structured program around concepts and tasks, which served as boundary objects [27] for the activities. A boundary object is an analytical concept to explain objects that are dynamic enough to adapt to individual and the groups’ interpretations and the constraints of the many parties employing them, but also robust enough to maintain a common identity across understandings.

This is essential when moving from individual work and one social world to collaborative work and different social worlds to reach common ground and develop collective minds.

The workshop was divided into two main sessions. First part was: Idea Generation, Conceptualization and Visualization.

The second part was: Reflection and Action. A schematic presentation of the didactic design is shown below.

The didactic model CO-IN contains a pedagogical frame that moves participants from individual participation to cooperation and common ground.

The advantage of the model is that it builds on dialogue and complementarity in perspectives to enhance and scaffold innovation.

This paves the way for speech acts and cognitive realization of complementary perspectives including contradictory perspectives, dilemmas and conflicts.

Dialogue is the fundamental approach to cooperation, and the use of multi modal techniques are essential tools for capturing, representing and analysing the diverse perspectives (allowing both the explicit and the implicit) enabling the unfolding of a collective mind [28] leading to creation of knowledge as commons [29] hence to innovation.

V. DATA MATERIAL AND ANALYSIS

In the qualitative study the following material was collected from each group and in the sequence listed: 1) individual list keyword, 2) list of common keywords from the group, 3) a collection of pictures illustrating each listed common keyword, 4) a digital story consisting of the picture and the common keyword transformed into a digital story, 5) a Mind Map and finally 6) a framework for the business plan. The core in the study is processes of innovation and the analysis focus on new issues introduced during the process; following new concepts, new ideas as well as changes and what is carried into the next step.

We first conducted a vertical analysis of each groups’ products following the steps of the process. From pure registration of data we moved into questioning: What did the data say, how was it related to the content of the next set of data, what changes took place, what was carried over? In the final vertical analysis we looked at the original concepts and ideas and how did they change, or got lost, during the process. We then conducted a *horizontal analysis*. Again we follow the process step by step, but this time across all three groups and again focus is on concepts, ideas, iterations of these and what is lost, what is radically new.

TABLE I
THE DIDACTIC MODEL CO-IN

Progres-sion	Point of View	Tasks	Products	Develop-ment
Individual	Personal-point-of-view	Writing	Prose	Common ground
Individual	Personal-point-of-view	Analysis writing	List of Key Words	
Pair	Different-point-of-view	Telling and listening	Communication	
Group	We-point-of-view	Enter into dialogue and cooperation	Joint list of Key Words	
Group	We-point-of-view	Maintain dialogue and cooperation	Pictures and Words	Collective mind
Group	We-point-of-view	Collaborative design	Picture-story	
Plenary	We-point-of-view	Cooperative presentation	Picture-story	
Group	We-point-of-view	Cooperation and development	Mind Map	Collective action
Plenary	We-point-of-view	Cooperative presentation	Mind Map	
Group	Collective Mind	Focusing and deciding	Project description in form	

A. From Individual to Collective Mind and Knowledge as Commons

In the following we give examples of the data and the analysis. We do not report on the horizontal analysis, but focus on a vertical analysis by presenting four steps, four tasks and the four products from one group; green group. This gives the reader a brief look into the dreams and visions of this group of people who initially were unknown to each other with no common life experience. When the workshop ended they had, together, formulated an innovation strategy for Argentina by taking a global point of departure and finishing with a local regional focus.

B. Common Ground: The Words

Initially the individual participants are asked to reduce their personal story of their interest in innovation to 3-5 keywords. In the next step they are working in a group and requested to develop a common list of 5 keywords from their individual lists. These are their keywords listed as prioritized by the group: Development, Knowledge, Environment, Linkage and Open Mind.

C. Collective Mind: The Picture Story

Due to copyrights the reader will have to create images in her mind's eye while we tell the picture story.

Title: To create innovation from where we stand and into the future - outlining a vision.

This is the story they told: *Knowledge* is the light against darkness, the foundation for a vision of a better world with equal access to education, to resources and with equal responsibility. To fight darkness knowledge must be coupled with a new economic world order to ensure the Millennium Goals for all. To care for our beautiful earth a main focus is a sustainable *environment* that will only come into being if we, all of us, hand in hand *bridge* (linkage) *development*. We must

look beyond, into the unknown with an *open mind* in pursuit of knowledge, balance and harmony.

D. Collective Action: The Mind Map and the Project Plan

Title of Mind Map: The primary national/international plan for innovation in Argentina.

The mind map contains three main topics; economy, lack of knowledge of the market situation and the threat of closing companies down. The common area of the three main topics is: the need for re-engineering. By the use of a SWOT analysis the problem areas are detected. These are: competences, sales, marked and production, which is understood as the basis for generating initiatives through multidisciplinary/cross-sectorial teamwork. The group suggests an increase of technology in society and initiatives to build up network capacities, and a support of external aid in the form of financial help, advisory and motivation.

Title of Project Plan: Draft of Needed Initiatives.

The group's initial statement is; to avoid unnecessary closing of enterprises with the consequences like; loss of jobs, resources and market opportunities. In order to progress towards development the group suggests a SWOT analysis to be made to realize which set of ideas are to be managed in order to be able to realize and face the current problems. The group also suggests to generate initiatives and to conduct realistic, actual studies.

To move forward the group advocates for a prosperous and monitoring new technology, a greater understanding of needed resources of financing and the engagement of multidisciplinary and cross-sectorial groups. Their wish is for management of the SMEs and external actors to be involved and action should be taken as soon as the needs are detected.

The way the group sees it, the overall responsibility for the action must come from the top of the organization. The group acknowledges the need for capital, external advisors and government advisory to support the changes, also in order to

avoid consequences like corporative shot downs and the suffering of multiple major resource losses.

To start a re-engineering process of the SMEs the group suggests research and development to initiate innovation, also being the basis for the solutions to the economic problems and the market instability. The group also proposes constant iteration of the work in progress from last wrongdoing to better solutions in the future. *"In times of crisis international companies pack up and leave. Local companies may go broke, but they are entrepreneurs, they start all over again. They contribute to the society". (A workshop participant, Argentina, 2010).*

VI. REFLECTION AND DISCUSSION

Theoretically the Scandinavian tradition seemed to fit like hand-in-glove with the space-in-between *cultural space and the development of hybrid identity*. But also Scandinavian tradition is embedded in a specific culture. As researchers and designers, we ourselves have limitations, we can only understand the other by standing outside looking in, and the understanding is framed by our culture, our cognitive horizon. We can never really walk in the shoes of others. Only an innovation approach that invites an inside-out perspective by giving voice to the other will adapt to other cultural settings. Surprisingly, however, our Scandinavian approach was transferable to a very different culture, as in the case of Argentina.

CO-IN has *dialogue* and mutual learning as foundation. Its structured process for introduction and contemplation invites *complementarity* in all its richness. At the same time and together with the pedagogical model, it ensures a gradual movement from an individual perspective towards multi-perspectives and *common ground*. In the final stages requiring explicit choices and collective decision making. Here the didactic design develops a third culture opening for entrepreneurial space. The cross-sectorial and multidisciplinary collaboration brings the important ability to reflect on one's own understandings and worldview when developing new practices. An interesting finding is that our participants provided idea generation when meeting in the hybrid unpredictable space and brought forward radical suggestions for innovation and market strategies.

Our LA workshop design suggests that cooperative innovation within communities is a valid approach. By pulling together the multiple sources of stakeholders in innovation the representation of various perspective and interests are evident in the progressing work for entrepreneurial ideas and support in a society. This leads to the thoughts of enabling regional cluster development, where the support of companies and regional development serve as an initiator for success, when inviting stakeholders to open innovation schemes. This is in line with Porter [30] who suggests to reach out to collaborate; "Productivity and innovation are strongly influenced by 'clusters', or geographic concentrations of firms, related businesses, suppliers, service providers, and logistical infrastructure in a particular field" as clustering for shared value in businesses. He sees the capable local suppliers foster

greater logistical efficiency and ease of collaboration by "exercising stronger, local capabilities in such areas as training, transportation services, and related industries also boosts productivity" (30) by clustering and collaboration. Our cooperative innovation model as a frame for local successful and growing economies may play, as pointed out by Porter: "a crucial role in driving productivity, innovation, and competitiveness" in the future [30].

New global techniques, like the Internet combined with new IT developments such as Big Data and Internet of Things, shared social technologies, internet business communities and the plethora of ICT innovations and rapid foreign direct investments all provide opportunities for market and society development. Emerging economies may be looking to interact within the new business networks observing global experiences evaluating with local interests. However, as pointed out by Ostrom [2] it is crucial to initiate complex frameworks, theories, and models to understand this diversity of puzzles and problems facing humans interacting in contemporary societies and here lies the future research.

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