Fostering Collaborative Project Emergence Through Divergence of Opinion

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Abstract

In the context of the emergence of collaborative innovation projects between competitiveness clusters, the animation of creative sessions permits to identify new opportunities. The number of ideas generated is a lot more important than the number of collaborative innovation projects implemented subsequently. To improve this ratio, we verify that group discussions could be facilitated by improving the ideation and evaluation phases of ideas during innovation process. Especially, in this article, we test many hypotheses in order to show that divergence of opinions can foster collaborative project emergence.

Keywords: Creativity, Evaluation, Innovation, Collaborative design, Cluster

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1 INTRODUCTION

Clusters are composed of different stakeholders belonging to a specific industry and located in a defined geographic area. These actors with heterogeneous profiles: companies, university, laboratories and local community are in a dual state of cooperation and competition called coopetition (Porter, 1998) that promotes the emergence of collaborative innovation projects. One new approach to foster innovation is to harvest the diversity from the full cluster ecosystem by using an interclustering strategy (Cusin et al., 2015). In particular, projects can emerge from the crossing of two or more clusters from different business sectors. Cross-fertilization can be considered in the context of mature high-tech clusters, as a necessary phase to maintain a continuous flow of innovation (Ambrosino et al., 2016a). This strategy requires the use and adaptation of new creative tools to tackle the heterogeneity in terms of knowledge and profiles. Following the hypothesis that the quantity of ideas breeds the ideas quality (Osborn, 1953), many methods and creativity support tools have been designed to improve idea generation process. Nevertheless, they have neglected idea selection time (Rietzschel et al., 2006) in which the major problem is not the number of ideas generated but the non-optimal set of ideas accepted during selection process (Sie et al., 2009).

Our hypothesis is based on the case of a group composed of heterogeneous profiles, stimulating individual evaluation and judgment during the session could increase the number of quality ideas that could lead to collaborative innovation projects.

Indeed, some participants holding key information that can unlock technological barriers, customs or market are inhibited by social pressure from the rest of the group (Kaptein et al., 2010). Thus, our approach focus on the evaluation phase (Section 2.1) by helping the facilitator to detect in live some divergences of opinion on the quality of proposals. Then, theses divergences can be used to enrich exchanges (Section 2.2). For that matter, we present an experimental animation design supported by the integration of a digital tool, in order to improve the assessment and the efficiency of creative sessions (Section 3). In this way, it will be possible to detect the most interesting ideas and understand the links with ratings.

Results from the animation of creative session between two clusters, destined to emerge paths of innovative collaborations indicates that the interesting ideas can be linked to the divergence of opinions, the ratings on the ideas quality and the time when the idea is evaluated (Section 4).

2 A CREATIVE SESSION PROCESS DESIGNED FOR PARTICIPANTS AND FACILITATOR DURING INTERCLUSTERING

Creative processes stimulate the emergence of new ideas or opportunities (Amabile, 1997; Carrier et al., 2010), but the diversity of heterogeneous profiles and highly time-constrained nature of the interclustering creative session requires a structured process that can easily be followed by the group. At the same time, the facilitator should maintain a participatory and flexible approach (Collins et al., 1964) that offers the possibility for the participants from different background to explore their differences of opinion (Islei et al., 1991) by building the articulation and confrontation of their disciplinary perspectives (Vinck, 2003). Due to the heterogeneous profiles and their knowledges (Orlikowski, 2002), the facilitator needs to uncompartmentalize professions and Lorino (1996) advises people to speak with specific languages highly structured, as for instance, the language of quality.

The STAR animation methodology (Structured and sTructuring Animation methodology for emeRgence, see Figure 1), dedicated to the interclustering project emergence (Ambrosino et al., 2016b). STAR follows the classical theoretical model of ideation by Wallas (1926) combined to the decision making model (Mintzberg et al., 1976).

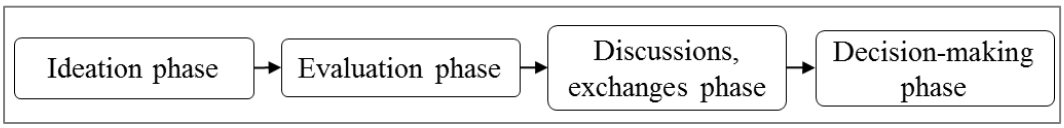

Figure 1. Creative session process used in the STAR methodology

During the ideation phase, the facilitator helps participants which are coming from different sectors without having a sufficient common language, to exchange and create by hybridizing methods or tools

to tailor to his/her needs for the event. In the evaluation phase, participants review and assess personally every idea they deem relevant. Then, in the discussion phase, they discuss and share their point of view about the most relevant ideas for the group. Finally, the last phase allows each participant to give his/her own final viewpoint about the idea. The facilitator identifies ideas which are considered as interesting by the group. The methodology is supported by the creativity support tool IdeaValuation (Ambrosino et al., 2016c). This is a dedicated digital tool used for ideation and evaluation during creative session, which contributes to support the facilitator's animation. Following this overview of the STAR methodology, we develop the evaluation and discussion phases.

2.1 Evaluation phase: useful metrics for a critical step

The common principle consists to identify the best ideas by searching the idea with the best quality but it is not necessary the best one (Zeithaml, 1988), because people are not very good to distinguish the best ideas (Simonton, 2003). Nevertheless, the evaluation phase is a critical activity (Messerle et al., 2012; Roussel et al., 2012; Stevanović et al., 2012) of the innovation process. Actually, the innovation processs can produce the highest valued ideas (Koen et al., 2001). Firstly, ideas are screened to drop the non-important ideas (Snelson et al., 1991). Then the relevant ideas are assessed using objective and subjective criteria (Ferioli, 2010). Many metrics for measuring ideation effectiveness have been devised (Dean et al., 2006; Gillet et al., 2012; Roussel et al., 2012; Verhaegen et al., 2012) have structured them in Figure 2.

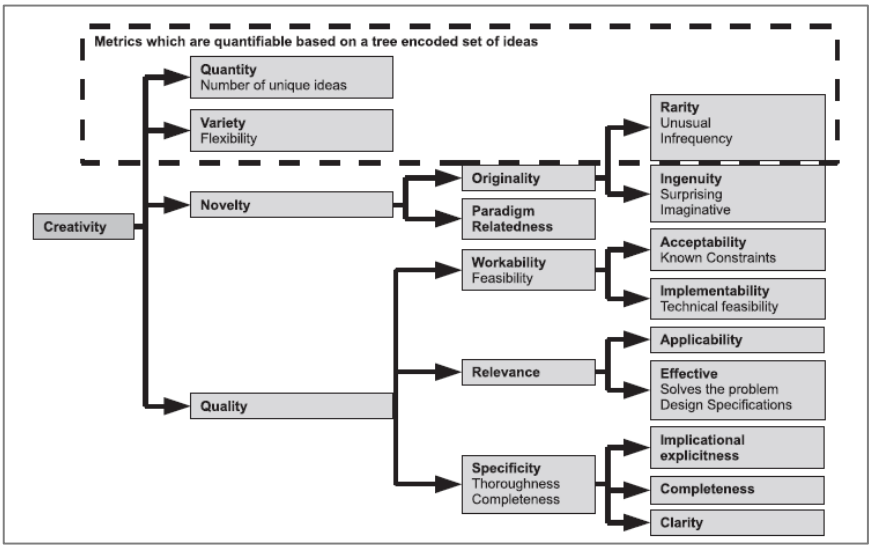

Figure 2. Overview of ideation effectiveness metrics

The use of evaluation criterion permits to structure the information about the idea quality perceived by the participants. Considering that no creativity criteria can exist without the presence of judges who feel the idea values according to their expectations (Karni et al., 2004), the evaluation is as important as the participant who evaluates it.

In order to evaluate ideas, we retain four criteria in the IdeaValuation tool which correspond to the majority of companies which use between 4 and 7 criteria to evaluate new projects (Balachandra et al., 1996):

- Originality: An original idea must be distinguished from the existing, due out of the ordinary, be extraordinary.
- Feasibility: A feasible idea is achievable, feasible from a technical and economic point of view with simple and existing resources.
- Potentiality: A proposal with a high potential stands for contingency markets where you feel that it can be positioned.
- Interest: When the idea seems interest you, you want to be informed of any action undertaken after the session: working group proposal for example.

This last criterion is a main indicator because that engages the participant and his/her structure: they are ready to develop and spend more time on this idea with other participants. This pre-consortium can lead new collaborative innovation projects.

2.2 Discussions, exchanges phase: main characteristics included in STAR methodology

During the discussion phase, the role of the facilitator consists in choosing ideas in a way to discuss and help the participant to share their opinion. Here, seven main characteristics for an efficient discussion have been highlighted by (Hess, 2004):

1. Focusing on an interpretable text, a problem, an idea, etc.
2. Facilitator and participants are thoroughly prepared.
3. Most of exchanges have to come from the participants (and not from the facilitator).
4. Time has to spent on a particular idea, in order to investigate it thoroughly.
5. Participants have to feel comfortable, even if a significant debate is occurring.
6. Many people speak.
7. Participants and facilitator are asking honest questions which refer to previous points of the discussion.

The STAR methodology - driven by the facilitator and IdeaValuation tool - includes most of these characteristics. Participants have been prepared by sharing information and by using icebreaker exercises (**2**), thanks to the tool, the facilitator has a direct access to the participants written ideas (**1**) and ratings. S/he can choose to involve participants on the best-rated ideas on a specific criterion, or to select ideas that have the least consensus to create a debate (**5**) and bring out the differences of knowledge and opinion from each other (**6**). The facilitator leads the participants through the matrix (**3**). Most importantly, having access to participants' evaluation during the session, allows the facilitator to make informed decisions to focus the session on a subset of ideas. Actually, that allows in very time constrained sessions to get enough time of relevant ideas (**4**).

3 EXPERIMENTAL DESIGN

As part of the implementation of new collaborations between the Institute of Technological Research cluster and the Aerospace Valley competitiveness cluster, a creative session entitled "Workshop Innovative Collaborations" was set up and involved 9 participants.

The half-day creative session took place in the morning and was organized as follows in Figure 3:

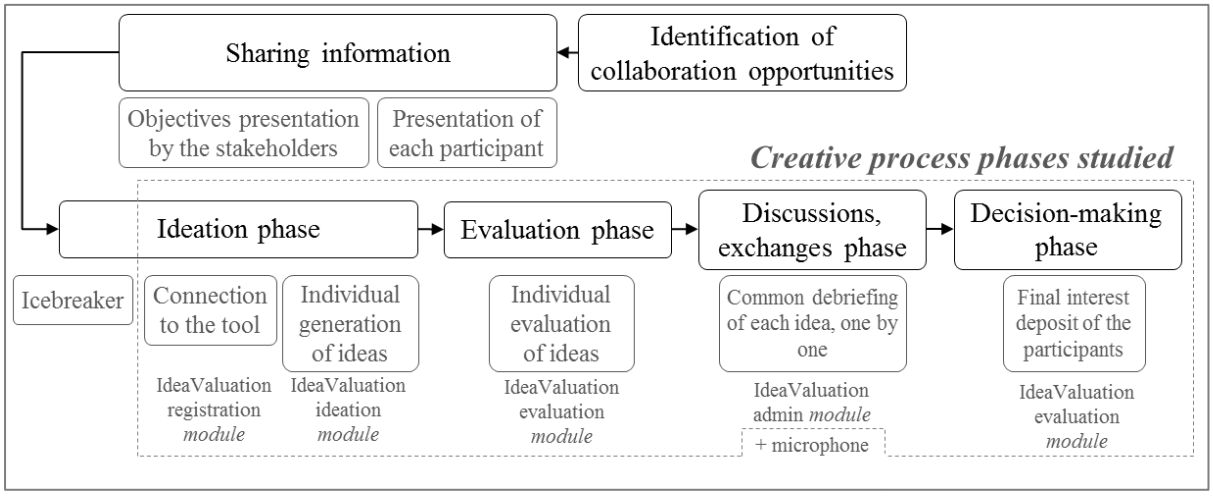

Figure 3. Procedure of the creative session

Every participant sits in the same room with a personal laptop connected to internet by an Ethernet cable. The session starts with a global sharing of activities of each one and reminds the objectives of the session. Then, the facilitator uses an icebreaker in order to relax participants for starting the ideation phase in a good state of mind (Osborn, 1959; Carrier et al., 2010). The facilitator briefs participants about the Six Thinking Hats (De Bono, 1985) and the four basic rules of brainstorming (Clark, 1962), by projecting some slides on the common large screen of the room. These explanations permit to set up easily the creative session principles to the participants.

Participants access to the IdeaValuation tool through their web browser.

3.1 Ideation phase: Individual generation of ideas

In order to generate ideas, we choose to use the discovering matrix tool (Moles, 1954), which guaranties the several advantages of the bissociative thinking (Ko et al., 2002) whose the ability to manage or manipulate various matrices of information and combine them to bring out new ideas (Smith et al., 2002). In complex ecosystems, this tool can be hybridized with another tool like the 9 screens tool (Ambrosino et al., 2016d). These choices are made because these techniques can maintain the dominant paradigm (McFadzean, 1999), although they can cause a smaller ideas level of originality than other techniques based for example on the game: here, associations performed are free and thus preserve the feeling of comfort of participants.

Figure 4.IdeaValuation's view into evaluation phase

From the IdeaValuation tool, participants access to the ideation module with a discovery matrix. The facilitator explains how to use it: each attendee can suggest a short text which corresponds to an idea solution between the intersection of a row (needs) and a column (beneficiaries), in Figure 4. During 20 minutes, each participant individually promotes ideas by entering them in the discovery matrix. Other users do not see the content of the others ideas and do not know how many ideas were proposed. At the end of the time, a break is offered to the participants to allow them to switch in a short time, from the divergence to the convergence phase of the creativity process.

3.2 Evaluation phase: Individual evaluation of ideas

Returning from the break, the facilitator informs participants that they will start the individual evaluation phase of ideas: if they find the idea enough important, every idea should be evaluated by the participants, in order to respect the principle of screening phase. The facilitator explains each of the evaluation criteria: Originality, Feasibility, Potentiality and Interest and shares indications to establish a common rating scale. The facilitator choose the first idea positioned on the top left of the matrix, and the person who proposed it - the bearer - has to explain the idea in few words and all the participants evaluate the idea. The facilitator moves to another idea in the matrix and process it in a same way. Each participant sees only his own evaluation, as shown in Figure 4.

3.3 Discussion, exchange phase: common debriefing of each idea

Once each individual idea evaluation, participants are invited to add some comments, in order to create some interaction between them and engage a discussion specifically about the idea. The discussions can be recorded for post-processed later in the goal of getting each variable (Hess, 2004). The most relevant

ideas should be discussed efficiently and the facilitator is in charge of boosting it by encouraging the association between ideas for example. The facilitator accesses to the IdeaValuation admin module which presents the repartition of the evaluations made by the participants: the best ones according the criteria used, the most divergent propositions, etc. The facilitator can used it in order to detect some specific ideas.

3.4 Decision making phase: Final interest deposit of the participants

After the evaluations and discussions, new viewpoints can be expressed and the interest of the participants for the ideas could change. This last phase allows them to notify their final interest of the topics. The facilitator states that participants will receive minutes of the meeting with all the ideas generated represented with a mind map (Buzan, 1974), thanks to the email addresses entered.

4 STATISTICAL ANALYSIS AND RESULTS

In order to optimize the creativity session effectiveness, we wish to provide to the stakeholders the opportunity to discuss sufficiently about all ideas in session in order to reduce the chances of missing a "nugget". This statistical analysis and results part show interesting things in order to help the facilitator by advising him in the identification of collaborative innovation project ideas. For all analyses, we assume an alpha risk of 5%.

4.1 Idea production

The participants proposed in 20 minutes a total of 76 ideas. Among these 76 ideas, we identify during the short presentation three times the same ideas so we do not deal with 3 of them with the participant's mutual consent. So, during the session, we identify 73 different ideas for this session. We notice a decreasing of idea production during idea generation as presented in Figure 5. We can observe this "death valley" during idea generation phase.

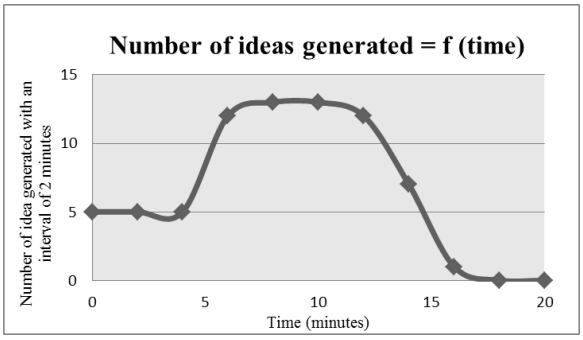

Figure 5. Number of ideas generated during the ideation phase

Unfortunately, among the 73 different ideas, the facilitator was able to deal with the participants only 47 ideas during the session for evaluate and discuss them.

4.2 Relations and differences between quality's ratings

H1 There is correlation between the criteria.

In order to compare the 3 criteria of ratings, we look for correlations between them and we test their difference. We have a sample of n=272 evaluations and we are in a within approach (3 criteria paired). Also, the measured variables are ordinal. For the measurement of linear correlation, we use the Spearman's rank correlation coefficient.

Table 1. Measurement of linear correlation of hypothesis 1

p-value / Spearman r	Originality	Feasibility	Potentiality
Originality		p=0,015	p=8,156E-9
Feasibility	r=0,148		p=5,164E-8
Potentiality	**r=0,341**	**r=0,323**	

We obtain significant results for the correlation between all of the criteria (see Table 3). All p values are less than 0.05. Unfortunately the correlations are not very high. We observe correlations between Potentiality and Originality with 34.1% of variability and between Potentiality and Feasibility with a variability of 32.3%.

H2. There is significant difference between the criteria.

Then, we test the difference between the criteria. We use the Friedman test for statistical analysis because the answers are ranks and we have 3 within groups: 3 criteria. The results are significant. We obtain Friedman statistic=41.61 (with n=272) and p-value< 0.001. So, we perform a post-hoc analysis: Wilcoxon signed-rank test pairwise comparison (as N=30>20, we consider the W-value).

[Feasibility] vs. [Originality]: W= 13790 and p<0.001

[Potentiality] vs. [Originality]: W= 9913 and p<0.001

[Potentiality] vs. [Feasibility]: W= -6935 and p=0.0003

The results of these tests show a significant difference between the three criteria with Potentiality's median = 70, Feasibility's median = 77 and Originality's median = 55.5. In light of these results we retain that the three evaluation criteria are different and therefore necessary but also that the criterion "Potentiality" is central. Indeed, we show that there is a trend between this criterion and the other two.

4.3 Relations and differences between interest, ratings and time

H3 There is significant difference of ratings expressed by the participants between the solutions perceived like interesting ones and those not interesting.

Here, we have 2 samples n[interest]= 124 and n[no-interest]= 148. For each of the three criteria, taking independently, we take two independent group [interesting ideas] vs [non interesting ideas]. For each of the criteria, the variable is qualitative ordinal. So, we use a Mann Whitney test.

[originality with interest] vs. [originality without interest]: U= 8176 and p<0.001

[feasibility with interest] vs. [feasibility without interest]: U= 10688 and p<0.001

[potentiality with interest] vs. [potentiality without interest]: U= 8615 and p<0.001

We observe a significant difference of evaluation between the ideas with and without interest. Indeed, less interesting solutions reveal lower scores on the three evaluation criteria (Figure 6).

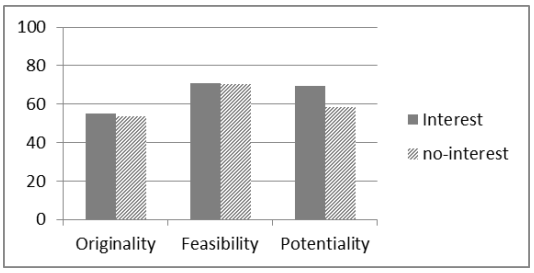

Figure 6. Median of the three criteria according to the ideas with interest and without interest

H4 There is relation between the ratings of each solution according to the three criteria.

The size of the sample is n= 47 (number of idea evaluated). We have 3 paired groups (i.e. 3 evaluation criteria) and the variable is quantitative. We use the Pearson product-moment correlation coefficient (R) and the coefficient of determination (R2). Moreover, we use the value of t associated with the calculated value of R, along with the corresponding p value to assess the significance of any particular instance of R. The results indicate a correlation between Potentiality and Feasibility with r=0.56 (p<0.001) and a weaker correlation between Potentiality and Originality with r=0.46 (p=0.001). Once again, the criterion "Potentiality" seems central to the evaluation of ideas.

Table 2. Measurement of linear correlation of hypothesis 4

p-value / Pearson r	idea_originality	idea_feasibility	idea_potentiality
idea_originality		p=0,182	p=0,001
idea_feasibility	R=0,198		p=4.207E-5
idea_potentiality	**R=0,462**	**R=0,56**	

H5 There is relation between the solution ratings and the interest.
The size of the sample is still n= 47 (number of idea evaluated). We have 2 quantitative variables: each criterion and the number of interest for each idea evaluated. Then, we realized a Pearson correlation.

Table 3. Measurement of linear correlation of hypothesis 5

Pearson r	number of interest vs. idea_originality	number of interest vs. idea_feasibility	number of interest vs. idea_potentiality
r	**0,3468**	0,183	0,1984
R squared	0,1203	0,03348	0,03937
P (two-tailed)	0,0169	0,2183	0,1812

The results in Table 3 indicate a correlation between originality and interest with a variability of 12% (approximately). This is a weak link, from which we cannot infer strong conclusions.
H6 There is relation between the rating divergence of each solution and the interest.
The size of the sample is still n= 47 (number of idea evaluated). We have 2 quantitative variables: rating divergence (for the 3 criteria) and the interest for each idea evaluated. Then, we realized a Pearson correlation. Here, divergence is quantified by standard deviation.

Table 4. Measurement of linear correlation of hypothesis 6

Pearson r	number of interest vs. idea_originality divergence	number of interest vs. idea_feasibility divergence	number of interest vs. idea_potentiality divergence
r	**0,4964**	**0,3285**	**0,4611**
R squared	0,2464	0,1079	0,2126
P (two-tailed)	0,0004	0,0242	0,0011

All the results are significant. We observe that there are correlations between the number of interest for ideas and the divergence of notations. In other words, the more an idea receives very divergent ratings the more the idea arouses the participants' interest.
H7 There is significant difference in the moment of rating between the solutions perceived as "interesting" and those perceived as "not interesting".
Here we have 2 independent groups: ideas with interest (n = 124) and ideas with no-interest (n = 148) and there is a quantitative variable: time to measure in seconds. We apply a t-test to verify a difference between time, i.e. the time for the ideas evaluation which had been perceived as interesting and the time for the ideas evaluations which bad been perceived as no-interesting.
We obtain t = 4.54, df = 270 with p <0.001. Thus the results are significant: there is a significant difference between the two measures, as shown in Figure 7.
Thus, we can conclude that the more time passes the more the evaluated solutions are perceived as interesting.

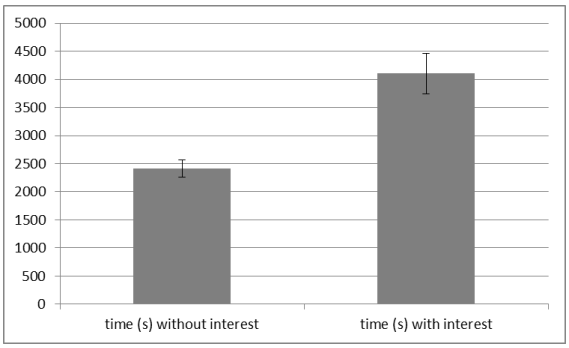

Figure 7. Mean time with standard deviation

5 SYNTHESIS RESULTS AND CONCLUSION

During the ideation time, we notice that participants' ideas production drops sharply after 12 minutes, so in order to stimulate idea production during all the allocated time, the facilitator could stimulate the ideation by proposing to focus on the emptiest cells. The correlations observed between the criteria are low (H1), and there are significant different between them (H2), so we can think that **there are no repetitive criteria among the three selected**. Comparing median of the three criteria according to the ideas with interest and without interest (H3), it seems that **the ratings** about idea quality according the three criteria **are higher** when **the idea is considering as interesting**, especially for potentiality criterion. We can believe that a higher level of idea ratings should alert the facilitator of the interesting potential of the ideas. Correlations of idea ratings show relations (H4) between potentiality and the two others criteria. When **a rating is realized for potentiality criterion, participants tend to realize the same rate for feasibility and originality** (especially with feasibility). For each idea, **the numbers of interest correlate with the average idea originality** of this idea. However, this correlation is low (H5). We can note that a trend but rather weak, a signal which we can try to understand better. In this article and with the use of this creative session process, we believe that divergence of opinions can lead interesting ideas and those ones can contribute to collaborative innovation projects. We test it (H6), and **we observed the more an idea receives very divergent ratings the more the idea arouses the participants' interest.** Even if, we cannot conclude on a difference, the results are significant when comparing at what time, ideas are evaluated with higher ratings (H7). The results show, **the more time passes, the more the ideas are perceived as interesting**. We can make a lot of conjecture from this fact: Do the most interesting ideas be generated at the bottom down of the discovering matrix? Why participant evaluation change during creative session?

Until now, we facilitate at least a dozen of creative sessions by using the IdeaValuation tool. From the facilitator point of view, the tool should be a way to help him by giving information during creative session in order to be more efficient to detect the most promising and interesting ideas, the best ones according the ratings, etc. For the participants, the tool is a way to express freely their ideas before evaluating the other ones. Our research can open pathways of reflexion about the way which we evaluate idea propositions in complex systems.

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