Kindai Management Review Vol. 7, 2019 (ISSN: 2186-6961)

Mapping Creativity and Design within the Entrepreneurship Ecosystem

Viviana Molina

Business and Economics Department, Universidad Autónoma de Manizales, Colombia

Widman Valbuena

Universidad de Caldas, Colombia

Abstract

Are entrepreneurship ecosystems examples of systemic design? And, in reality, how creative is the entrepreneurial process? It has been argued that creativity is not generated in the minds of people, but in the dynamic relations between the thoughts and the sociocultural context of those people (Csikszentmihalyi, 1996, 1998; Amabile, Hennessey, Grossman & Barbara, 1986; Amabile & Pillemer, 2012). For a long time, entrepreneurship was studied as a series of personal traits, exploring them with the help of psychology. Recently effectuation (Sarasvathy, 2008), and some action centered theories, have taken the study of entrepreneurship under the lens sociology, and network science (Memon, 2016); this path is somehow similar to the one transited by creativity research (Sawyer, 2006). In this paper, we are taking the design approach, following an intuition about crossing points between creativity, design and entrepreneurship, our intention is to understand if the entrepreneurial ecosystems are designed or if it behaves similar to a design process in its different phases development process, and how creativity is expressed during that process.

We Observed "Manizales Más", a public-private-academic alliance that developed the entrepreneurship ecosystem in the city of Manizales, Colombia. There we identified, the academic committee as a key agent for design purposes, so we applied an instrument looking to establish for the design phases as well as the creativity factors present in the development of different projects within the entrepreneurial ecosystem. In the paper we will show the results as sociograms (Wasserman & Faust, 1994) that represent the creativity relations between the academic committee members and the value of their creative contributions in the different design phases, leaving us with a map of creativity and design within entrepreneurship on the Academic dimension of Manizales' entrepreneurial Ecosystem.

The results reveal that an entrepreneurship ecosystem can be studied as a complex adaptive system (Holland, 2012, 2014). This can be mapped using the social systemic design approach (Jones, 2014a, 2014b, 2014c) where creativity manifests itself in each design phase with different intensities depending on the creative self-organization of the social system (Csikszentmihalyi, 2014, Amabile & Pillemer, 2012), It is important to detect in each design phase if the creative qualities of the entrepreneurship social system, can contribute to the organizational self-management of the system, revealing these intrinsic property of complex adaptive systems -CAS-.

To return about our initial questions, we can say that an entrepreneurial ecosystem can be

constituted by design matrices—as the academic committee of Manizales Más—that when they are coupled, they shape a complex systemic design artifact, where each subsystem goes through different stages of creative evolution.

Keywords: *Creativity, Entrepreneurship, Complex Adaptive Systems, Co-design, Entrepreneurship Ecosystems.*

INTRODUCTION

How much design do you find in entrepreneurship? In reality, how creative is this process? Those initial questions led us to formulate the next inquiry: What design phases and socio-cultural creative systems components, are found on the collaborative work of the Manizales Más Academic Committee? It has been argued that creativity is not generated in the minds of people, but in the dynamic relations between the thoughts and the sociocultural context of those people (Csikszentmihalyi, 1996). For a long time, entrepreneurship was studied as a series of personal traits, exploring them with the help of psychology. Recently effectuation (Sarasvathy, 2008) and some action-centered theories, have taken the study of entrepreneurship under the lens of neuroscience (Brännback, M., & Carsrud, A. 2009) and sociology (Carroll, G. R., & Khessina, O. M. 2005). In this paper, we are taking the participatory design—Codesign-approach (Sanders & Stapper, 2008, 2014a, 2014b), following an intuition about the similarities between this and entrepreneurship. Our intention is to tell if the entrepreneurial experience is designed or has the same the Codesign process moments.

We analyze "Manizales Más", a public-private-academic alliance that promotes the entrepreneurship ecosystem in the city of Manizales, Colombia. There we identified, the academic committee as a key agent for design purposes, because of their role in the proposal and development of Manizales Más programs. So, we applied an instrument looking to detect for the design phases as well as the creativity factors present in the development of different projects within the entrepreneurial ecosystem. In the paper we will show the results as sociograms that represent the relations between the agents, their creative contributions and the design stages, leaving us with a map of design and creativity within the entrepreneurial Ecosystem of Manizales.

Our main conclusion after analyzing the results is that entrepreneurship as a process of prefiguring and configuring an idea, can be mapped using the social systemic design approach (Jones, 2014), and Codesign (Sanders and Stappers, 2008, 2014), along with the sociocultural approach to creativity (Csikszentmihalyi, 2014, Amabille & Pillemer, 2012). To detect the creative qualities of the entrepreneurship social system in each design phase can contribute to the organizational self-management of the system and develop an entrepreneurship idea from the generative design standpoint (Sanders and Stappers, 2014, 2016; Cortes and Cruz, 2015).

Understanding entrepreneurship ecosystems beyond economic indicators has been a challenge. An alternative path is to understand them as design fields, from an eco-systemic approach with overlapping and interwoven domains (Molina, 2017, Quintana, Vargas & Valbuena, 2017), which allows us to understand that entrepreneurship ecosystems do not only have dimensions or theoretical components, but also the agents, the people who participate in it and the relationships that are generated, transform the ecosystem, intuiting these relationships sustain the existence of the ecosystem.

OBJECTIVES

Analyzing the entrepreneurial processes developed by the academic committee of the Manizales, this study seeks to map the social relationships that occurred on the emerging creative systems in each design phase based on: First, identify which phases of collaborative design (Sanders & Stapper, 2008, 2014, 2016) operate in the processes of entrepreneurship and, second, characterize in social entrepreneurship practices the dynamics of social systems of creativity (Csikszentmihalyi, 1998, 2014)

by mapping relationships and intrinsic or extrinsic motivations (Amabile, 1986; Amabile & Palmier, 2012) that emerge in each phase of the process.

In the findings section we will show the design phases that are present on the development of an entrepreneurial ecosystem; so, we can understand and detect in each design phase if the creative qualities of the entrepreneurship social system, can contribute to the organizational self-management of the system.

LITERATURE REVIEW

Creativity without innovation generates just another idea. Innovation without a potentially useful and novel idea supporting it will likely be unsustainable and creates no value, and thus, it has little or no usefulness unless a market need or problem is identified and solved. Like the chicken and the egg, in practice, creativity, innovation, and entrepreneurship need each other. It may be that Schumpeter (1934), in his later years and certainly when he wrote Capitalism, Socialism and Democracy, underestimated the key role of entrepreneurship as a conduit for the spillover of knowledge from the organization investing in and creating that knowledge to the new organization actually generating innovation.

The primary mission of design-oriented disciplines, such as architecture, design and engineering, is the creation of preferred futures, driven by search for solutions to real-world problems and sense making (Manzini 2015) some of them complex and ill defined. In a similar vein, a design-science approach to entrepreneurship would focus on the effort to envision and generate products, services, ventures, firms and other artifacts that do not yet exist, oriented towards the fulfillment of specific purposes. The consideration of purpose is key since the question of how things ought to be can be raised only in reference to that purpose (Simon, 1969/1996). In this sense, the design-science approach considered by (Dimov, 2016) is situated in a broader realm of 'worldmaking' (Sarasvathy, 2012), but is anchored by purpose that makes some futures preferred to others and oriented towards informing and being informed by specific actions.

Finding solutions for ill-defined societal challenges requires the integration of different knowledge fields. As Max-Neef (2005) concluded: none of this century's main problems, such as water, poverty, environmental crises, violence, terrorism and destruction of social fabric can be adequately tackled from the sphere of specific individualist disciplines. This poses a problem, since education systems are mostly monodisciplinary, resulting in experts in rather narrow fields. Although it is frequently attempted, the situation cannot be solved by creating teams of specialists in different areas around a given problem (Collins, 2015). This team approach only leads to an accumulation of visions emerging from the participating disciplines. It is co-creation or better yet, co-design, what allow us to tackle the complex problems in more appropriate ways. By creating an ecosystem that is driven by design, manufacturing and entrepreneurship key economic outcomes will be generated; a regional area will be more resilient to economic uncertainty and ultimately a cohort of innovative thinkers that will generate value for their community.

To create such entrepreneurial ecosystems, it is vital to understand how the people do they make decisions, what drives the motivation of different agents and how to promote the collective creation (Sanders and Stappers, 2014, 2016; Csikszentmihalyi, 2014; Amabille & Pillemer, 2012), into implementation of new initiatives that allow the expansion of it.

RESEARCH FORM AND METHODS

This study of descriptive-interpretative scope uses as a central method Social Network Analysis -SNA- (Wasserman & Faust, 1994) supported by open coding (Strauss & Corbin, 2002) with the purpose of mapping the creative social relationships that come off of motivation intrinsic (Amabile, 1993; Amabile, Hennessey, & Grossman, 1986; Amabile & Pillemer, 2012) for addressing an entrepreneurial problem as a design process.

Initially, the analysis unit was proposed by developing a matrix of categories to analyze the entrepreneurial actions of the academic committee of the Manizales Más program (See table 1). These categories form a matrix that crosses the phases of standard design, problematization, ideation, con-

Table 1. Analysis Unit

Matrix of conceptual categories			Design				
			Design principles (problematization)	Ideation	Concept	Prototype	Product
Creativity	Context	Domain	Entrpreneurship (entrepreneurship programs within the framework of the "Manizales Más" project)				
		Field	Social relations to evaluate the ideas that contribute to entrepreneurship in the design process				
	Creative Person	intrinsic Motivation	Genuine interest in the search and structuring of entrepreneurship problems	Genuine interest in generating ideas to structure entrepreneurship programs	Genuine interest in debugging ideas to visualize entrepreneurship programs through models	Genuine interest in the sophisticated elaboration of entrepreneurship programs	Genuine interest in the implementation and evaluation of entrepreneurship programs
		Domain skills	Set of conceptual and technical skills to develop design problems about the entrepreneurship programs for the Manizales Más project	Set of conceptual and technical skills to generate ideas of entrepreneurship programs for the Manizales Más project	Set of conceptual and technical skills to prefigure models of entrepreneurship programs for the Manizales Más project	Set of conceptual and technical skills to develop entrepreneurship programs for the Manizales Más project	Set of conceptual and technical skills to implement and evaluate entrepreneurship programs for the Manizales Más project
		Relevant creative skills	The ability to structure and address diversity of heuristic problems of entrepreneurship	The ability to propose a diversity of responses to heuristic problems of entrepreneurship	It must not act on this part of the process	It must not act on this part of the process	Ability to implement entrepreneurship programs in different contexts and dimensions.

Source: Own elaboration

ceptualization, prototyping and product (Sanders & Stappers, 2008, 2014), with the systemic components of creativity from a socio-cultural approach, between the context-domain, context-field, person-intrinsic motivation, person-domain and person skills-relevant creative skills (Csikszentmihalyi, 1988, 1996, Sawyer, 2010, Simonton, 2012, Amabile, 1993, Amabile & Pillemer, 2012).

Afterwards, the instrument to collect information was designed and validated incorporating these categories. This instrument is segmented into design phases to be applied in the target population. The instruments are applied through random sampling to guarantee that all the people who have taken part of the committee would answer at least one instrument in one of the design phases. All the members on the academic committee participated on the survey answering questions about their motivations to participate in the project and the development of the programs, they also mention the interactions they had with each other, and this allowed us to map those interactions

In order to do the Social Network Analysis (Wasserman & Faust, 1994) that allowed visualization of the emergent creative structures of design processes in entrepreneurship, five instruments were designed and applied for information collection, one for each design phase (Problem, ideation, conceptualization, prototyping and product, Figure 1)[1)]. Each instrument is structured so you can find the components of the creative models proposed by Csikszentmihalyi (1998, 2014) and Amabile et. al (1986, 2012). Each questionnaire is structured like this:

a) Participant identification data—creative person category
b) Participation in program design—domain category
c) Identification of ways in which entrepreneurship ideas are communicated—domain category
d) Identification of the people who originally presented the ideas—creative person category
e) Description of the way in which other people

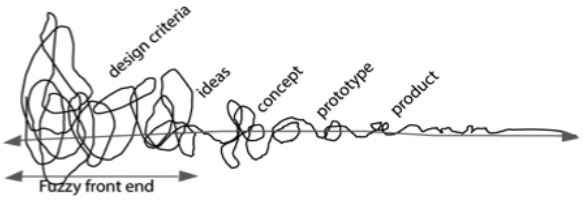

Figure 1: Standard Design Process

Source: Sanders & Stappers, 2008

respond to the shared ideas—field category, creative social relations

f) Identification of motivating factors—motivation categories, intrinsic and extrinsic
g) Assessment of the conceptual contribution of each person who participated—category skills of the domain
h) Assessment of the degree of flexibility of each participant to accept diversity of positions category creative abilities

With the collected information, the systematization and analysis process were initiated, for which the Gephi Network Analysis software was used. Each design phase was analyzed independently generating a sociogram that represents the social relationships of creativity from the entrepreneurship team.

With this tool it is possible to visualize the relations between the agents and each agent is a node and each colored line represents a different kind of creative relation, The software also allows us to calculate the sociogram density. That measures how close the network is to being complete, that is, "the density of a graph is the average proportion of lines incident with nodes in the graph [...] expresses the proportion of ties that are present among a subset of the actors in a network" (Wasserman & Faust, 1994), a graph complete have as density equal to 1, This measure is used to know the cohesion of collaborative work groups. On the contrary, if the density of the network is far from the value 1 (L = 0), means that there are fewer relationships between the nodes of the network. In this case a closer value to 1 means that collaboration is greater between the creative agents (L = g(g- 1)/2, Figure 3). The density of a graph is calculated taking 2L, where L is the number of possible edges without taking the loops, and g is the number of nodes, the equation is:

$$\Delta = \frac{L}{g(g-1)/2} = \frac{2L}{g\,(g-1)}$$

Figure 2: Density graph

Source: Wasserman & Faust, 1994

In parallel, the CAQDAS Atlas.ti 8 was used to process 143 articles that thematically linked creativity and design in entrepreneurship seeking to respond to how design and creativity in entrepreneurship has been understood and studied. The search was performed in different search engines, including: Web of Science, SCOPUS, JStor, Proquest and Elsevier. We used Boolean operators to structure the equations concentrating the search in the title and subject/descriptor; then using the logic operators like "AND" to tell the database that ALL search terms must be present in the resulting records. "NEAR" to ensure that the document contains both terms, and that they are located near each other within a certain number of words. And also using other tips like truncation so the database would return results that include any ending of that root word. By the end of the exploration we were trying to find surveys, reviews or frameworks that may have a comprehensive approach to the subjects we wanted to analyze, so it became an inclusion factor, we added all the ones that have the three subjects (design – creativity and entrepreneurship) within title or descriptor, Other Inclusion factors for the documents selected included the publishing year, favoring the most recently published but including the most recognized authors of each field to minimize selection bias. The results of this analysis allowed to triangulate the Social Network Analysis findings to establish how people organize themselves in creative systems around the problems of entrepreneurship from a design approach.

FINDINGS

From the Isenberg & Onyemah (2016) perspective "Manizales Más" has evolved through roughly four phases that he labeled as follows: (1) activating the

Table 2. Comparison of Isenberg's Phases and Design Phases

Isenberg's	Design Phases	Manizales Más evolution per phase
Activating the stakeholders	Empathize	Luker Foundation wants to start an entrepreneurship program and starts looking for partners in the city
Aligning the leaders	Define	with the mayor's office and the Universities they propose a plan to promote entrepreneurship in Manizales
	Ideate	Babson proposes to start the ecosystem with a High Potential Ventures Program
Establishing execution platform and proof-of-concept programs	Prototype	The local universities propose programs for different audiences and run a pilot on each.
Systematizing and expanding programs and local capacity	Product	Manizales Más launches Startup Mas, AddVenture Más and Entrepreneurship Route

Source: Own Elaboration

stakeholders, (2) aligning the leaders, (3) establishing an execution platform and proof-of-concept programs, and (4) systematizing and expanding programs and local capacity. Daniel Isenberg & Onyemah (2016). This phase that Isenberg recognizes is what we are translating into the stages used by design thinking and design ways of knowing: Empathize, Define Ideate, Prototype, and Product Test. (Brown,2009, Cross, 2011). Table 2 shows a comparison we did of Isenberg's phases and the design process that happened in Manizales Más. This leads to another part of our thesis that sustains this Entrepreneurial Ecosystems are designed for a particular place and conditions and then evolve according to the agents and contextual changes. Isenberg description of Manizales Más phases is imprecise and reflects a view from abroad of the process we had in the city. The following table summarizes Isenberg's view, design phases and Manizales Más evolution per phase, more details can be found in the description of the following figures 3 to 7.

Creativity as a phenomenon has been understood in different ways, according to Keith Sawyer (2006) and one can trace its approaches in psychology since the 50's with the first studies that attribute this phenomenon to certain personality traits of only some people; almost two decades later the cognitive psychology rethinks this approach to make way for the understanding of creativity not as a distinctive feature of personality, but as a result of complex combinations of mental abilities. This approach is very current as is the biological and the computational individualistic approach to creativity. Only until 1983 with the first works on social psychology of creativity (Amabile, 1986) the individualist approach of studies in creativity is reviewed, to start what is known as the sociocultural historical approach.

From this sociocultural approach to creativity, it is understood that creativity is a systemic phenomenon. It highlights two lines: One proposed by Mihaly Csikszentmihalyi (1996), who asked not so much what creativity is, but where is it, where it resides and develops, and suggests that creativity flows through a system composed of three components, a domain (cultural component), a field (component social), and people (creative agents). For Csikszentmihalyi "creativity does not occur within the heads of people, but in the interaction between a person's thoughts and a socio-cultural context" (p.41). This leads to an understanding that creativity is the result of the interaction of three components: a person who makes contributions to a specific domain, a symbolic universe known as a domain that contains the symbolic rules, and a social system, or articulated set of people, which constitute the field, and are those belonging to the domain that recognize the creative value of the contributions that people make to be incorporated into their set of rules, thereby materializing the innovating in their own field.

The other systemic approach within the sociocultural approach comes from Teresa Amabile's work (1986, 1993, 2012). She models a componential system closer to the subject with the purpose of understanding the creative development in organizations. This model is constituted by a) skills rele-

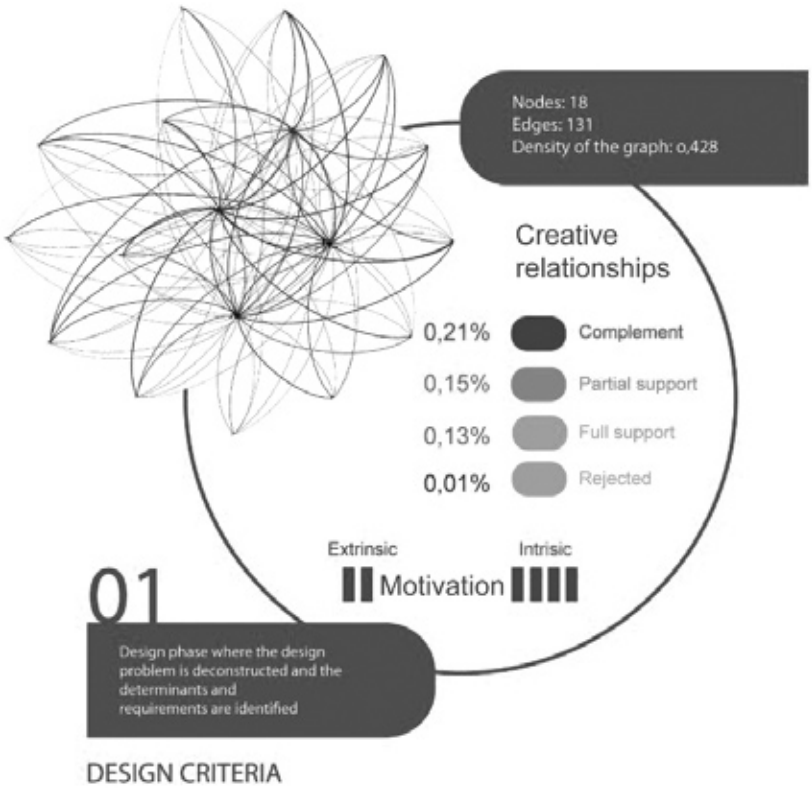

Figure 3: Creativity—problematization—entrepreneurship

Source: own elaboration

vant to the domain (expertise), b) creative-relevant processes (creative thinking), c) intrinsic motivation in the work, and d) the social environment. Thus, expertise, creative thinking and intrinsic motivation are located within the subject; those are intra-individual, which Amabile (1996, 2012) also explains that expertise and creative thinking can be amplified and qualified if intrinsic motivation is activated by factors located in the social environment that are channeled towards interest in the task itself.

In each graph there is information about the network development, the percentage of creative relations present and the measure of density, which is understood as the measure of how close the network is to be complete, that is, it considers the number of relationships between all the nodes, the complete network has as measure 1.

Creativity—problematization—entrepreneurship

All standard design processes are developed in five iterative stages (Sanders & Stappers, 2008). In the first phase of the design the problem is posed and defined, current, understanding that the type of problems that the design addresses are wicked problems (Fallman, 2008; Sevalson, 2010; Buchanan, 1992).

The results reveal that in this first phase creativity is structured consistently between most nodes (people) configuring a social network that shapes the problems of entrepreneurship, although with a relatively medium density (0.428), where the leadership is distributed evenly among four participants who in turn receive feedback about the ideas they expose to others (Figure 4).

Creative social relationships have high intrinsic

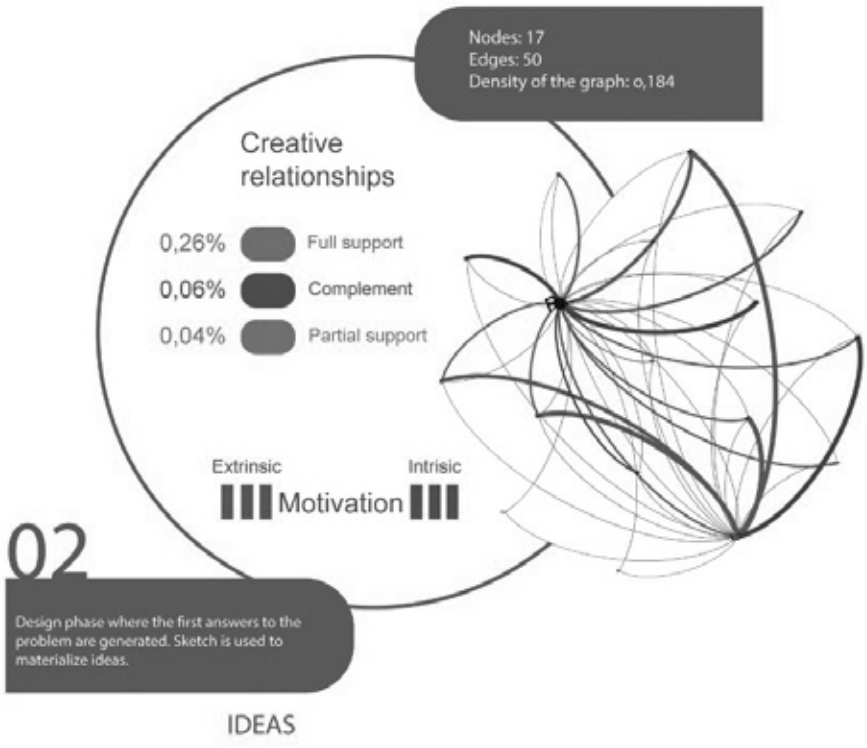

Figure 4: Creativity—ideation—entrepreneurship

Source: own elaboration

motivation, such as interest and pleasure in work and, to a lesser degree, extrinsic motivation factors such as the pressure to deliver a resilient response soon (Amabile, 1993; Amabile & Pillemer, 2012), indicating the existence of factors that promote the interest on the part of the participants in the deconstruction and later update of the problems of entrepreneurship, which is ratified in the density and in the diversity of relationships that constitute the sociogram of creative relationships (figure 3). The analysis shows evidence of all the creative relationships analyzed, so they complement each other, partially accept, accept totally or reject some of the ideas presented in the form of entrepreneurship problems.

This first stage occurred when the academic committee discussed what kind of programs Manizales Más should have, each agent gave ideas about possible projects to pursue and some of the first discussions about the importance of the collaborative work between the universities happened. At that point the members were deciding if they wanted to develop new programs or better adapt some of the programs that were conducted at Babson College. Most of the participants on the academic committee where there because of a personal interest in the project, they felt the work environment was productive and positive, so intrinsic motivation was higher than extrinsic motivation.

Creativity—ideation—entrepreneurship

The state of creativity in the process of generating ideas contrasts with the previous phase; in the first place, fewer people lead the process, that is, the socialization of ideas that aim to respond to the problem of entrepreneurship is much less, the low density of the sociogram (0,184) shows less participation in the development of ideas (figure 4).

In this phase the extrinsic motivation increases with respect to the previous phase, which indicates an increase in external factors on the entrepreneurship team, diverting attention from the work involved in the elaboration of ideas. Another element that shows a decline in the creative process is

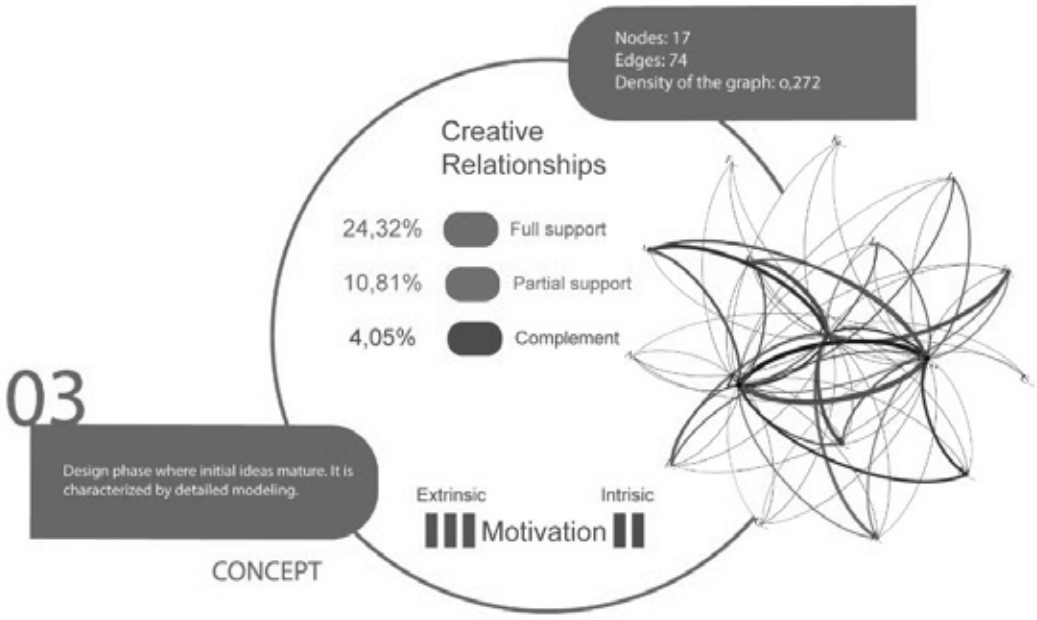

Figure 5: Creativity—conceptualization—entrepreneurship

Source: own elaboration

the lower diversity of social relationships that constitute the sociocultural system of creativity (Csikszentmihalyi, 1988, 1996, Sawyer, 2010, Simonton, 2012), where the total approval is also the relationship with greater strength, which may indicate little development of the ideas within the working group since the total approval may inhibit initiatives to propose alternative ways to the problems raised in the first phase.

At this point the academic committee was certain about the ideas they wanted to pursue, so they began to structure three different programs: Startup Mas, Adventure Más and High Potential Professors. Each one had a clear leader to develop the initiative and the sociogram shows a concentration on the relations so the other members could help the leader to develop the program. One of the reasons given to the elevated extrinsic motivation had to do with deadlines to deliver the proposals.

Creativity—conceptualization—entrepreneurship

Regarding the previous state, the refining of ideas is a little more striking in terms of the density and strength of creative social relations, although the diversity of these is maintained in the same range. It can be affirmed that at this moment the work team regains its cohesion, in spite of decreasing even more the intrinsic motivation of the participants, which indicates that the factors that motivate these relationships do not settle in the genuine interest to develop the ideas, but they continue to operate external factors that are likely to exert pressure to do the work collaboratively (figure 5).

The sociogram of the conceptualization phase shows dynamic equilibrium between several nodes of the creative system although, as in the previous phase, the total acceptance is the type of relationship with greater presence, followed by partial acceptance, this may be hinting that high extrinsic motivation that is presented in this phase makes people question even less the ideas that have been proposed as an answer to the problem and want to move to more specific phases of the process, which coincides with the most representative extrinsic motivation factor, pressure to deliver a result.

By the time the members of the academic committee started with the conceptualization phase they had a detailed description on what they should do on each program, it was the moment to set a schedule and launch the pilot program on each

initiative. Here the extrinsic motivation is higher due to performance measurement and some of the team members are not so happy working on someone else's idea. The intrinsic motivation decreases and even when they mentioned the positive work environment was maintained, most of them were working on the designed program because it was duty they agreed on.

Just to understand a little better the context of the academic committee work, here you can find a brief description of each program they were working at that time:

Startup Más, is the place for idea exploration and business model construction. It was created with the students and graduates in mind, many of which went to entrepreneurial units asking for help with their ideas. This early stage is the perfect moment to prototype and iterate ideas before launching anything.

Addventure Más, is an eight-week business accelerator. In this case, new companies take the time to plan and rethink the business model. For two months around fifteen companies work together in a living lab, getting to know what they do, how they do it, and most importantly, what they should try to overcome the obstacles they are facing to earn more, have better employees, and sale better products.

High Potential Professors, was created to promote a new mindset on professors so they can be the catalyst of change in the university. This is one of the most interactive experiences because educators are both learning and teaching in different moments. Sometimes on the learning side, they are with another faculty member, sharing experiences, accompanying mentorships, or attending workshops. And when they are conducting sessions they lead the audience, whether students or companies to use the resources they have to create new things, evolve, and transform the ecosystem.

Entrepreneurship Route with its six courses has become the space for experiential learning. Students are encouraged to create new companies, propose new products, and the most important part, to build a functioning prototype to test their ideas. The students have learned by doing and have had to face an audience to convince them of the importance of the proposal and explain how they solve a problem or have found a more innovative way to do things

Creativity—prototyping—entrepreneurship

Going from the abstract or ideal to the concrete, or in other words, materializing the ideas into products or services is the purpose of the prototyping phase, this is when an idea begins to take shape and form.

In terms of how creativity manifests itself in entrepreneurship in this phase, it is important to highlight the dramatic evolution that shows the configuration of the social system. The self-organization of the system around prototyping is much more compact than any of the previous phases, which can be seen in the increase in the density of the graph (0.691), which indicates greater social support for the ideas, accompanied by an increase in intrinsic motivation, found some sketches of the probable direct correlation between the factors of motivation associated with the interest in the work of entrepreneurship and social relations of a creative nature, especially accentuates the complement of ideas as the type of relationship with greater presence in this phase (figure 6).

This phase is also characterized by the evident balance between intrinsic and extrinsic motivation factors, which coincides with the most recent development approach to creativity in organizations suggested by Amabile and Pillemer (2012), where unlike their own previous approach (Amabile et al., 1986), it is accepted that the combination of external and internal mechanisms that operate on motivation is favorable for creative development.

At this point members of the academic committee were pilot testing the programs, most of the members were involved in more than one of the initiatives, so they had to communicate more and they complemented the other programs, it was mentioned that the pleasure of working on the initiatives was reactivated because early results were visible, so the intrinsic motivation raised up again.

Creativity—product—entrepreneurship

In entrepreneurship you can understand this design phase as implementation, for this particular case it refers to the implementation of some of the entre-

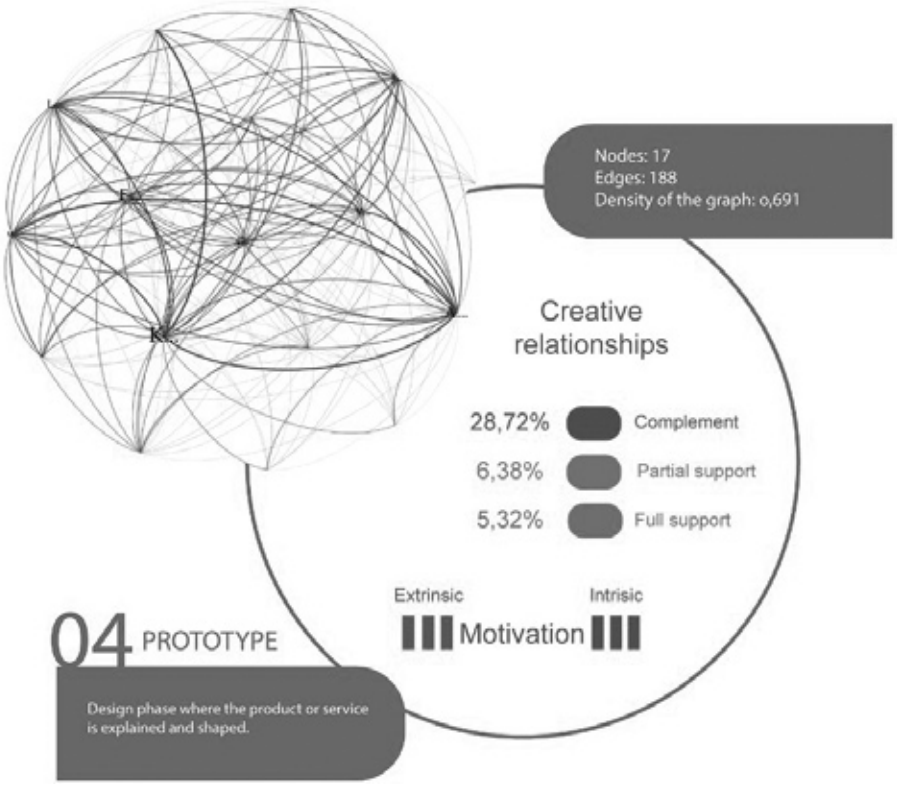

Figure 6: Creativity—prototyping—entrepreneurship

Source: own elaboration

preneurship programs that constitute Manizales Más, this is the design phase that materializes the innovation, since the initial ideas have matured and are now part of a social context (figure 7).

The ARS analysis shows that for this moment the community of practice of entrepreneurship (Wenger, 2011) has consolidated its social relations in terms of creative processes, in particular we highlight the combination of relationships that partially or totally support ideas, in connection with those directed towards the collaborative elaboration of entrepreneurship products, as well as the high density of these relationships (0, 941), being the highest in the entire design process, thus configuring, for the task of entrepreneurship, co-creation processes (Sanders & Stappers, 2008; 2014). As for the levels of intrinsic and extrinsic motivation in this stage of the process, they have stabilized showing a balance between factors such as taste and interest in entrepreneurship work, a healthy and productive work environment, as well as commitment or pressure for time of delivery, which helps to consider that for the creative system to develop a balance between these types of factors is convenient.

At this point all members of the academic committee had responsibilities on the different programs, so they had to communicate more and help with the day to day operation of all the initiatives. Both the intrinsic and extrinsic motivation where at its peak because performance measurement was as important as the satisfaction they obtained from doing the job. Most of the members mentioned the learning process as iterative and evolving, so it maintained the support and complement relations very active among the agents.

In this same sense, the density of the sociogram in the product phase reinforces the idea of the configuration of a creative sociocultural system (Csikszentmihalyi, 1988, 1996, Sawyer, 2010, Simonton, 2012), in contrast to other initial phases of design where the self-organization of the system is incipi-

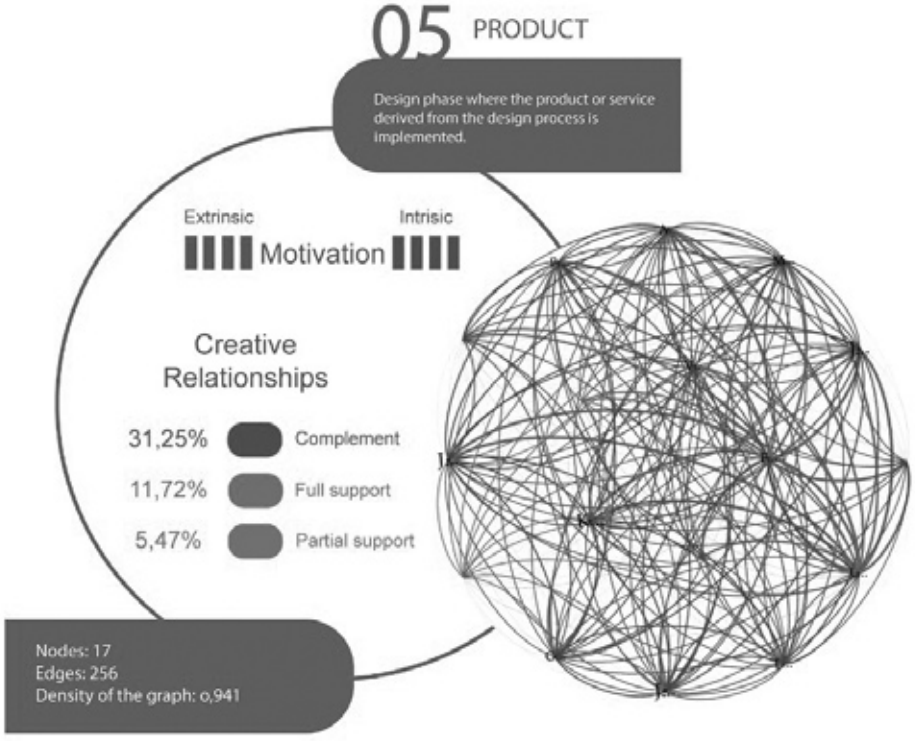

Figure 7: Creativity—product—entrepreneurship

Source: own elaboration

ent. What suggests that the socio-cultural system of creativity in entrepreneurship is matured and amplified in the final phases of the design process, is this usual for any entrepreneurial process? Does entrepreneurship have something special that enhances creative processes in the mature phases of design? Does entrepreneurship require greater management of the creative system in phases such as ideation and conceptualization? We don't have the answer to this questions on this paper, but we hope some of these can be addressed on the PhD dissertations we are working on and that will be available in the near future.

DISCUSSION

In recent years there is an increasing amount of literature on entrepreneurship and innovation, but there is also a growing interest in understanding the relationship between entrepreneurship and design, some even consider the two share methods and ways of doing, only using different names for each step. Creativity, design and innovation are closely interrelated concepts since the innovation process is supported by design, which in turn, is supported by creativity. We believe that entrepreneurship makes part of this process as well because entrepreneurship urges innovation and because entrepreneurship involves designing, in a tacit or explicit manner, the products, services and the different elements necessary to launch and run a business.

> The next quote summarizes the joint playground in a simple way:
>
> "Creativity without innovation generates just another idea. Innovation without a potentially useful and novel idea supporting it will likely be unsustainable and creates no value (has little or no usefulness) unless a market need or problem is identified and solved. Like the chicken and the egg, in practice, creativity, innovation, and entrepreneurship need each other (Dino, 2015)"

Perhaps the time has come for researchers to stop viewing these as separate domains but rather subdomains in a larger value-adding ecosystem. With every new dimension of the entrepreneurship ecosystem studied, we find that multidisciplinary approaches help to obtain better results. For further work having a clear definition and characterization of the common ground between these subjects sets the foundations of which elements are going to be taken into consideration for describing the system required to design an entrepreneurial ecosystem.

If we observe the evolution of the sociograms, we can identify the dynamics on the five stages, beginning with the fuzzy front end where nothing is clear and some main ideas are chosen, to the last phase where the programs are running and each agent understand what the particular value is they are adding to the implementation and maintenance of the entrepreneurial initiative. This leads us to think if the entrepreneur Is aware that his work is a complex and creative design process? Or, in other words, is the entrepreneur self-recognized as a creative designer?

We believe that it is important to bear in mind these findings and reflections to rethink the entrepreneurship and training of new entrepreneurs from a participatory and generative design approach with awareness of the emergency of complex creative social systems in the work of entrepreneurship.

IMPLICATIONS

The results of this study have a direct impact on the teaching and learning practices of entrepreneurship and its connections with design, as well as in collaborative networks providing techniques to manage creativity in study and work groups interested in the innovation, creativity, design and entrepreneurship.

On the other hand, it is expected that these results contribute to the strengthening of the already existing research policies oriented towards collaboration and the interdisciplinary nature of the fields articulated here, especially design studies, the social psychology of creativity and entrepreneurship.

All of the above will be able to irrigate innovation in the ways in which the design and entrepreneurship teams are currently managed, transforming these practices into more creative processes; having greater clarity of how the social context of the work teams contributes or not to the establishment of creative social relations in function of the resolution of the problems of entrepreneurship and participatory design.

CONCLUDING OBSERVATIONS

We can identify all collaborative design phases operating in the academic subsystem of the Manizales Más entrepreneurship ecosystem, it was interesting to find an evolution on the motivations and relations types on each phase.

In Manizales Universities entrepreneurship is now becoming a philosophy or lifestyle, is a collective bet on entrepreneurs becoming the XXI century face of innovation. The multidisciplinary nature of entrepreneurship has enriched its knowledge base. Most of new popular products and services come from multidisciplinary collaboration; entrepreneurs have taken advantage of engineering, design and biology advances to create new companies and markets. We suppose the behavior of the ecosystem is quite similar to what we have found on the academic committee.

For future studies, it is recommended that the data collection should be done closer to the experience of the participants in the design and entrepreneurship processes. Better data could be collected involving motivational factors associated with the emotions present in people during these collaborative processes. And, it is also important to involve factors associated with cultural diversity and interculturality or cross-culturality that may be present in participatory design and co-creation, and which can potentially affect or favor the processes of generating creative social systems.

Finally, we find that understanding how creative social relationships are woven into entrepreneurial microsystems through collaborative design processes can contribute to the self-management of entrepreneurship ecosystems, so that they are the very agents of the system who guide their development.

ACKNOWLEDGEMENTS

This paper shows an intersection between two doctoral theses. One questions about how to develop inter-culturality from creativity with a sociocultural approach and the participatory design. The other one discusses the entrepreneurial ecosystems as a systemic design result. Both of them use Social Network Analysis, Complex Adaptive systems and systemic design as a base to study and understand their particular study cases. This collaboration allowed both of the researchers to test their instruments and understand some similarities between their postulates; This has promoted interdisciplinary relations and constant conversation between different research lines on creativity, design, knowledge management and entrepreneurship. We would like to thank Manizales Más and all the academic committee members that participated in the sample; the study was possible because of your answers.

NOTES

1) The instruments for Analysis can be consulted at: https://drive.google.com/open?id=1uj6jmJ9qysnQ6E8b8p63PWywIrbYR7_5

REFERENCES

Amabile, T. M., Hennessey, B., & Grossman, B. S. (1986). Social influences on creativity: The effects of contracted-for reward. *Journal of Personality and Social Psychology*, 50(1), 14–23. https://doi.org/10.1037//0022-3514.50.1.14

Amabile, T. M., & Pillemer, J. (2012). Perspectives on the Social Psychology of Creativity. *Journal of Creative Behaviour*, 46(12), 1–25. https://doi.org/10.1002/jocb.001

Brännback M., Carsrud A. (2009) Cognitive Maps in Entrepreneurship: Researching Sense Making and Action. In: Carsrud A., Brännback M. (eds) *Understanding the Entrepreneurial Mind. International Studies in Entrepreneurship*, Vol 24. Springer, New York, NY

Brown, T., & Kātz, B. (2009). *Change by design: How design thinking transforms organizations and inspires innovation*. Harper Collins

Buchanan, R. (1992). Wicked Problems in Design Thinking. *Design Issues*, 8(2), 5. https://doi.org/10.2307/1511637

Carroll G.R., Khessina O.M. (2005) The Ecology of Entrepreneurship. In: Alvarez S.A., Agarwal R., Sorenson O. (Eds) *Handbook of Entrepreneurship Research. International Handbook Series on Entrepreneurship*, Vol 2. Springer, Boston, MA

Collins, P. K. (2015). Building a local design and entrepreneurship ecosystem. *Procedia Technology*, 20, 258-262.

Cortés, E., & Cruz, A. (2015). Generative Design as Tool for Social Innovation: A Methodological Approach. In Back to the Future [icdhs 10th + 1 Conference] Proceedings Book (pp. 44–48).

Cross, N. (2011). *Designerly ways of knowing*. Bloomsbury London.

Csikszentmihalyi, M. (2014). *The systems model of creativity: The collected works of Mihaly Csikszentmihalyi*. Springer, New York, NY

Csikszentmihalyi, M. (1996). Creatividad. El fluir y la psicología del descubrimiento y la invención. (J. P. Tosaus, Trans.). Barcelona. Buenos Aires. México: Paidos. https://doi.org/10.1007/s13398-014-0173-7.2

Den Ouden, E. (2011). *Innovation design: Creating value for people, organizations and society*. Springer Science & Business Media, London.

Dimov, D. (2016). Toward a design science of entrepreneurship. In Jerome A. Katz , Andrew C. Corbett (Ed.) *Models of start-up thinking and action: Theoretical, empirical and pedagogical approaches* (pp. 1-31). Emerald Group Publishing Limited.

Dino, R. N. (2015). Crossing boundaries: Toward integrating creativity, innovation, and entrepreneurship research through practice. *Psychology of Aesthetics, Creativity, and the Arts*, 9(2), 139.

Fallman, D. (2008). The Interaction Design Research Triangle of Design Practice, Design Studies, and Design Exploration. *Design Issues*, 24(3), 4–18. https://doi.org/10.1162/desi.2008.24.3.4

Holland, J. H. (2006). Studying complex adaptive systems. *Journal of Systems Science and Complexity*, 19(1), 1–8. Springer.

Holland, J. (2014). *Signal and Boundaries: Builing Blocks for Complex Adaptive Systems*. MIT Press, Cambridge MA.

Jones, P. (2014a). *Design Research Methods in Systemic Design*. Institute for 21st Century Agoras, 2014.

Jones, P. H. (2014b). Systemic design principles for complex social systems. *Social systems and design* (pp. 91–128). Springer.

Jones, P. (2014c). Relating Systems Thinking and Design II. Theoretical Evolution in Systemic Design. *FORMakademisk-research journal for design and design education*, 7(4).

Manzini, E. (2015). *Design, When Everybody Designs: An Introduction to Design for Social Innovation.* (K. Friedman & E. Stolterman, Eds.). Massachusetts: MIT Press.

Memon, N. (2016). Entrepreneurship in the Eyes of Network Science. *Procedia Computer Science*, 91, 935–943. Elsevier.

Max-Neef, M. A. (2005). Foundations of transdisciplinarity. *Ecological economics*, 53(1), 5-16.

Quintana, M., Vargas, S., & Valbuena, W. S. (2017). La creatividad en el diseño: componentes sistémicos ¿Más codiseño, menos enseñanza? *Arte, Individuo y Sociedad*, 29(3), 445–462. https://doi.org/10.5209/ARIS.55261

Sanders, E., & Stappers, P. (2008). Co-creation and the new landscapes of design. *CoDesign: International Journal of CoCreation in Design and the Arts Publication*, 4(1), 5–18. https://doi.org/10.1080/15710880701875068

Sanders, E., & Stappers, P. (2014). Probes, toolkits and prototypes: three approaches to making in codesigning. *CoDesign*, 10(1), 5–14. https://doi.org/10.1080/15710882.2014.888183

Sanders, E., & Stappers, P. (2016). *Convivial toolbox. Generative research for the front end of design*. Ohio: BIS Publisher.

Sarasvathy, S. D. (2008). *Effectuation: Elements of entrepreneurial expertise*. Edward Elgar Publishing.

Sawyer, K. R. (2006). *Explaining Creativity - The Science if Human Innovation*. Oxford: Oxford University Press. https://doi.org/10.1016/0140-1750(88)90050-4

Schumpeter, J. A. (1934). *The Theory of Economic Development* (translation of second German edition by Redvers Opie). Cambridge, MA, Harvard University.

Sevaldson, B. (2010). Discussions & Movements in Design Research. A Systems Approach to Practice Research in Design. *Form Akademisk*, 3(1), 8–35.

Simonton, D. K. (2012). Fields, domains, and individuals. In M. D. Mumford (Ed.), *Handbook of Organizational Creativity* (pp. 67–86). Davis, California: Elsevier Inc. https://doi.org/10.1016/B978-0-12-374714-3.00004-5

Wasserman, S., & Faust, K. (1994). *Social Network Analysis: Methods and Applications* (Vol. 8). New York: Cambridge University Press.

Wenger, E. (2001). *Comunidades de práctica: aprendizaje, significado e identidad*. Barcelona, Buenos Aires, México: Paidós.

Viviana Molina Osorio is Professor in the Business and Economics department, Universidad Autónoma de Manizales – Colombia. Email: vmolinao@autonoma.edu.co
Widman Said Valbuena Buitrago Oka, Consultores Académicos Estratégicos, Colombia. Email: insight@okaconsultores.com