PAIRS IN INNOVATION: HOW WORKING IN PAIRS HELPS ORGANIZATIONS TO MOVE INTO A NEW SHARED DIRECTION

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ABSTRACT

Innovation is a collaborative act. Thus, a lot of attention has been paid to teamwork as the prevalent approach for innovation in companies. However, teams also present limits, due to conflicts and compromises when converging. This study, which focuses on the development of innovative directions, explores the nature of collaboration by looking at the purest unit of collaboration: the pair. We isolate the case of pair collaboration and investigate, through empirical investigations, the sensemaking process people accomplish and how it is affected by those tensions that affect teams when innovating. We observe how innovation unfolds when people move from creating individually, in pair and finally in team. Findings suggest that the pair creates an intimate environment where innovative thinking, alignment and engagement flourish and that it is a good intermediate step towards teamwork. This article acknowledges an underestimated dynamic of innovation, pair collaboration, which has real potential to address one of organizations' most problematic challenges: people engagement and convergence towards an innovative direction.

INTRODUCTION

Innovation is the result of collaboration; even if ideas are framed in an individual's mind, they need social interaction to grow and become reality (Cox et al., 2003; Leonard & Sensiper, 1998; Perry-Smith & Manucci, 2017). Collaboration can take place in different contexts of innovation. We focus here on a context where collaboration has major importance: the development of an innovative and shared direction. This is indeed a major organizational challenge in the current landscape overcrowded by ideas where convergence towards a shared direction is more problematic than divergence (Verganti, 2017).

Pair collaboration appears to be an effective way to get there (Hunter et al., 2012). The power of pair relationship has been indeed recognized in several entrepreneurial cases (Hunter et al., 2017; Alvarez et al., 2007). Classic examples are the collaborations between Jobs and Wozniak for Apple, Page and Brin for Google and Spiegel and Murphy for Snapchat. Pair collaboration has however been poorly explored with regard to innovation processes among consolidated companies. As stated in Hunter et al. (2012), "researchers have not identified a set pattern with respect to how dyads operate" when innovating.

The purpose of this paper is to investigate how pair dynamics can unfold innovative and shared directions by focusing on the collaborative sensemaking process people pass through to shape it.

To assess the dynamics of pairs, we consider a context where an organization is conducting a complex strategic project to radically innovate a business or a product line. At the outset of such projects, organizations typically set up an initial phase to define the project direction or vision. In this phase, organizations often pool people into teams which are required to imagine ideas for where to go (diverge) and simultaneously align towards a new shared direction (converge) (Stam et al., 2013). This interplay between divergence and convergence is a form of collective sensemaking through which the team converges into a new shared direction (Berger & Luckman, 1966; Bruner, 1986; Goodman, 1978). Ideally, this new collectively envisioned direction should be more meaningful than

what the individual team members would have envisioned alone. Indeed, a pool of people incorporates a variety of competences, creativity and perspectives. Yet, the tensions between divergence and convergence pose significant challenges; they often imply conflicts and compromises that undermine the vision's meaningfulness for the individual team members (Jehn, 1997). The innovativeness of the direction may therefore be diluted and/or people may not feel engaged to move forward.

Focusing on the pair as the smallest unit of collaboration, we wonder how these tensions impact the collaborative sensemaking process and if a more gradual process, in which people work in pairs and only later in teams, can be an effective way to counter this problem.

Thus, through numerous empirical tests, we explore three main hypotheses. First, we postulate that working in pairs creates an intimate environment in which innovative thinking, alignment and engagement are likely to flourish (Farrel, 2003; Hunter et al., 2017). Second, we postulate that the collaborative sensemaking process benefits in passing from pairs to teams, i.e., working in pairs has a positive influence on what happens next in the innovation process. Third, we postulate that in the path towards creative convergence, the first step (from individuals to pairs) has a higher impact on meaningfulness than the second step (from pairs to team), building on existing theory that claims that team size negatively impacts the individual's perception of self-efficacy (Kerr, 1989).

The results of the empirical evaluation show that working in pairs significantly influences the capability of individuals to develop innovative and shared vision.

BACKGROUND

Shared Vision

Innovation is characterized by scholars as a collective and social act (Fleming et al., 2007). Indeed, it benefits from the individual's interactions, which not only refine the individual's ideas but also influence the emergence of new ones (Leonard & Sensiper, 1998; Schulze & Hoegl, 2008). Therefore, significant attention has been paid to team-based structures as the prevalent approach for companies to innovate in recent years (Cox et al., 2003; Pearce & Sims, 2002).

In particular, scholars highlight how team collaboration and interaction among individuals provide various benefits: it helps combine different perspectives (de Dreu, et al 2008; Ilgen 1999) and competences (Khurana & Rosenthal, 1998), integrate thoughts and ideas through interaction (Stroebe & Diehl, 1994) and foster individual motivation to higher performance through competition (Paulus & Brown, 2010; Beersma & de Dreu, 2005). Still, team collaboration in innovation is not free of limitations. Indeed, conflicts and compromises can cause a progressive watering down of innovation in search of an average solution (Stam et al., 2013; Jehn, 1997)

In such a context, we specifically focus on how collaboration evolves when defining a novel vision. Scholars from the field of organizational behavior define shared vision as "a common mental model of the future state of the team or its task that provide the basis for action" (Pearce & Ensley, 2004). They highlight how the development of a shared vision is positively related to the ability of organizations, and the people within these organizations, to innovate (Liao, 2006; Ng, 2004) and enables the connection between the development and implementation of ideas (Carroll & Edmondson, 2002).

In the field of innovation, the concept of shared vision deals with opportunity identification (Eling & Herstatt, 2017), vision development (O'Connor & Veryzer 2001) or direction development (Verganti, 2017). What all they have in common is that they refer to the more strategic and long-term oriented part of innovation and rely on the development of a shared understanding about "where to go" when developing innovation (Andriopoulos et al, 2018). In terms of phases, this is what typically happens at the outset of an innovation journey or the Front End of innovation (Khurana & Rosenthal, 1998),

although the development and refinement of a project vision may occur along the entire journey (MacCormack et al., 2001).

For the purposes of this paper, we will refer to it as the development of a shared direction. The reason for this focus is twofold. First, several studies have shown that setting direction plays a significant part on the final outcome of the innovation process (Bhattacharya et al., 1998)

Second, from the perspective of decision making, setting a direction entails an intense activity of problem setting rather than problem solving. This implies that team interaction is less driven by technical heuristics (in search of a well-defined and clear technical solution) and more driven by perspectives, culture, purpose and mental frames (Schön, 1983). In fact, scholars describe the development of an innovative direction as a collective cognitive process where people mutually develop and create shared understanding and shared values (Cox et al., 2003). In other words, setting direction is a process of collaborative sensemaking (Weick, 1995; Andriopoulos et al., 2018), which makes convergence significantly more complicated. Therefore, the interest in investigating pair work in one of the most relevant and at the same time challenging settings for collaboration in innovation: the development of innovative direction. To pursue this goal, the study relies on the theoretical framework provided by the sensemaking theories.

Collaborative Sensemaking and Team Dynamics

Sensemaking is defined as a cognitive and emotional "process" that enables a person to understand what happens around them, and it is embedded in the environment, contest and culture that a person refers to (Drath & Palus, 1994; Dell'Era, Verganti 2007; Weick et al., 2005). All these factors represent cues that the individual connects to make sense of what happens when a discontinuity in the state of the art occurs. Furthermore, scholars explain how sensemaking "involves the retrospective development of plausible meanings that rationalize what people are doing" (Fellows & Liu, 2016) and how this enables people to make sense of disruptive changes by defining a new "landscape" of meaning (Weick et al., 2005). Sensemaking is even more effective when people create meaning socially by building their experiences jointly, bringing their personal visions of the world and converging on a common interpretation (Berger & Luckman, 1966; Bruner, 2009; Goodman, 1978); it is a collaborative sensemaking process (Stigliani, Ravasi, 2012).

Scholars define the sensemaking process as future oriented (Weick et al., 2005; Weick, 1995). In particular, ambiguous and new situations require individuals to abductively "structure the future by imagining some desirable state" (Paul, et al. 1996). This explains why sensemaking is adopted to explain innovation. During the innovation process, ambiguities, uncertainties and discontinuities abound and sensemaking is vitally important to the individuals involved. Indeed, when individuals converge, shared meanings are synthesized into a single generic meaning, which represents the essence of the innovative direction that both facilitates and constrains future action (Coopey et al., 1997). When dealing with innovation, there are two kinds of collaborative sensemaking: "intersubjective sensemaking" and "generically subjective sensemaking" (Weick, 1995). The first involves exchange of tacit knowledge (Nonaka, 1994) and enables people to unveil new depth areas and create fresh connections among ideas. The second is enabled by and embedded in roles, routines and action patterns. When searching for a new direction, "intersubjective sensemaking" plays a major role. In fact, the search for a new direction can hardly rely on existing routines and action patterns, which, instead, are at stake. Interactions, when setting direction, moves on a more open space.

Scholars highlight how intersubjective sensemaking process is not a process free of tensions; it is a spiraling process that juxtaposes different enactments and cycles of strategic change with a general strategy (Weick & Westley, 1999). By seeing across these enactments, individuals are able to envision a possible new strategic direction (Dougherty et al., 2000). Scholars also explored how these tensions could compromise the collaborative sensemaking process itself; in the interplay between divergence and convergence dynamics that negatively impact team collaboration can occur (Pearce & Ensley, 2004).

In particular, given our interest on pair working, we focus here on the dynamics that are related to the team size (Albanese & Van Fleet, 1985; Gooding & Wagner, 1985; Levine & Moreland, 1990), such as social loafing (Schanke, 1991) and intragroup conflicts (Jehn, 1997).

Scholars studying social loafing explain how it takes longer to align individuals in a large team and, as a consequence they may experience decreased motivation (Staats et al., 2012). Thus, in larger teams the value of the outcomes, which depends on the meaningfulness of a task for individual team members, is negatively related to social loafing, and this effect is amplified when teams deal with strategic consideration (Karau & Williams, 1993), such as the development of an innovative shared direction.

Even conflicts can negatively affect the output of collaborative sensemaking. As Tuckman highlights in his model (Tuckman, 1965, 1977), conflicts are generated after the preliminary phase of forming and before the final phase of performing when the team passes through a phase of storming and norming. Scholars explain how conflicts negatively impact an individual's performance and motivation to stay within the group and can be both emotional or task related (Jehn, 1997;1995). Depending on their nature, conflicts can have different impacts on creativity. While task conflicts may have a positive impact as content-specific tensions may enable the development of innovative directions (de Dreu, Weingart, 2003), emotional conflicts may impair team creativity (Chen, 2006), watering down the resulting direction.

While the negative effect of conflicts and social loafing on the collaborative sensemaking is clear, it is unclear how these factors affect collaborative sensemaking along the process when team size progressively increases (Dougherty et al., 2000). A deeper understanding of the dynamics through which people progressively engage with sensemaking in innovation would help facilitate collaboration when developing breakthrough directions. To this effect, we focus on the purest unit of collaboration where onboarding and convergence is possible: the pair.

Pairs in Innovation

The relevance of dyadic collaboration in innovation has already been explored in entrepreneurship. Indeed, many of the innovations that changed our world have been developed by pairs of individuals: Jobs and Wozniak for Apple, Page and Brin for Google and Spiegel and Murphy for Snapchat to name just a few of the co-founders who led some of the greatest innovations of our days (Hunter et al., 2012).

The pair is recognized by scholars as the smallest and the simplest form of a team (Pearce & Conger, 2002). The pair embodies all the benefits and limitations of a team but on a more intimate scale.

On the side of benefits, the pair benefits from complementarity of perspectives and capabilities, analogous to what happens in larger teams (Hunter et al., 2017; Shenk, 2014; Farrell, 2003). A partnership may provide resources that each person cannot master individually (Hunter et al., 2012): complementary perspectives, specialized skills and even additional economic and physical resources. Dual-leadership also provides psychological support; it may alleviate many of the stresses and strains that a leader normally faces in an innovation project (Hunter et al., 2017) and provide emotional encouragement crucial for facing the hurdles of innovation (Farrell, 2003). Indeed, scholars highlight how the pair seems to provide an intimate and protected environment where a person feels free to share ideas, listen and focus on critical feedback from one trusted peer, and therefore reframe their vision (Verganti, 2017; Farrell, 2003).

On the side of limitations, pairs, as do larger teams, face conflicts, both emotional and task related. However, some peculiarities exist due to their smaller size. Indeed, scholars explained how emotional conflicts can be harsher in a pair than in a larger team and even lead to abdication, while task-related conflicts are usually easily retained (Reid & Karambayya, 2009). This is related to the fact that individuals are set up to interact more openly and personally with an individual rather than with a

group where production blocking (Diehl, Stroebe, 1987) and the concern of being negatively judged are higher (Shenk, 2014; Camacho & Paulus, 1995).

Taking this perspective, the study of dyads seems a good opportunity to understand the basis of collaboration in the development of innovative direction and the achievement of a shared understanding: how do those benefits and limitations play together when specifically focusing on pairs?

Research Hypothesis

The present study is based on the theoretical framework of sensemaking. In particular, leveraging on what presented in the previous sections of this paper about the "intersubjective collaborative sensemaking" (Weick, 1995), we postulate that when it comes to pair working the benefits of the collaboration significantly outweigh the limitations, and therefore pairs facilitate the spiraling process (Dougherty et al., 2000) that leads to a shared innovative direction. This postulation is corroborated by two considerations. First, pair working provides the intimate context where a person feels free to share personal ideas, listen and focus on critical feedback from one trusted peer, which therefore enables them to critically reframe one's person interpretative lens (Verganti, 2017; Farrell, 2003). Second, sensemaking requires continued redrafting of an emerging story so that it becomes more comprehensive and robust (Weick, 1995). Therefore, working in pair enhances not only the meaningfulness of the vision developed but also the alignment and convergence of both the individuals around it. All these considerations enable us to formulate our first hypothesis:

Hypothesis 1: Working in pairs enhances the individual's meaningfulness perception of the shared direction.

It is worth considering if pair working also leads to a more aligned perception of progress in the collaborative sensemaking process among the two individuals or if it is unbalanced among the two. In the sensemaking process, the individuals bump into tensions that can lead to conflicts (Pearce & Ensley, 2004; Jehn, 1997), due to the discrepancy between the individuals' orientation and the one to be developed in the pair. Pair intimacy favors a balanced behavior in which task discrepancies are more easily spotted (Reid & Karambayya, 2009), and therefore sudden accelerations of a peer at the expense of the other are more unlikely to occur. Hence, we assume that the two individuals perceive a similar potentiality in terms of the meaningfulness of the jointly developed vision. Hence, we postulate that the following:

Hypothesis 1b: After working in pairs, individuals tend to have a similar perception of meaningfulness between them.

Once we have verified the potentiality of pairs, we want to investigate what happens next in an innovation journey when dyads join larger teams in the development of an innovative direction. Indeed, our interest in pairs is not from the perspective that a dyad is the locus of innovation. Obviously, breakthrough innovation cannot be completed by two people. Our focus on pairs instead is from the perspective of looking at the dynamics through which people progressively come together in an innovation journey and understanding which intermediate steps are potentially effective towards working in large innovation teams. The focus on gradual growth of teams is not new in organization studies. Organization scholars already demonstrate that the progressive growth of teams enhances coordination by reducing conflicts among team members (Weber, 2006; Charness & Yang, 2014; Frey & Goldstone, 2016). Does the same hold true in innovation as well? And, specifically, when this gradual growth passes through pair working? Early hints of the benefits of moving from individual, to pairs, to larger teams are reported by Verganti (2017). He illustrates cases (such as the development of the Microsoft Xbox or the Nest smart thermostat) where pairs happened to be the central intimate moment of critical reflection and engagement of emerging ideas before exposing them to an extended team. Working in a pair enables each individual to subject his/her vision to the criticism of a trusted peer with the aim of embracing a more robust and common interpretation before facing harsher

criticism from a larger team. From this perspective, the advantages of pair working do not lie only in skill complementarity (Hunter et al., 2017) but also in emotional compatibility, mutual trust and shared purpose (Alvarez et al., 2007; Farrell, 2003). We want to leverage this exploratory case-based study and dig deeper through a larger and more structured data sample.

On the flip side, when pairs eventually join teams, the benefits of their earlier work (an increased paired meaningfulness) may also be detrimental to subsequent teamwork. Indeed, more often than not each pair comes into the team with a deeper understanding of its own direction, reinforced by the previous internal intimate dynamics: every individual in a pair is supported by his/her peer. Hence, we may expect a greater acrimony in the dialogue between different pairs that join a team. Yet, this also presents advantages. If pairs do not step back, they will not water down their previous vision and instead engage even further in the search for a more advanced synthesis. In addition, social loafing is less likely to have a negative impact on the collaborative sensemaking process of a team if people have previously worked as a pair (Karau & Williams, 1993) despite the increased number of individuals involved. In fact, it partially benefits from the pseudo-intimacy of comparing a half number of directions per time: complexity is reduced, and synthesis is easier. Bringing these considerations together, we assume that this power of engaged critical reflections occurring in a team of pairs provides a further boost to the meaningfulness of the innovative direction. Hence, we propose the following:

Hypothesis 2: In passing from pairs to teams, the individual's meaningfulness perception continues to grow.

In terms of the magnitude of this growth, it is interesting to compare the contribution of moving from individuals to pairs with the contribution of moving from pairs to teams. Here, we expect two contrasting dynamics. On the one hand, we know that further resources, such as skills, information, ideas and assets, are assembled as team size increases (de Dreu et al., 2008; Khurana & Rosenthal, 1998). On the other hand, collective sensemaking is more difficult as it involves a higher number of people and perspectives in the process of synthesis (Albanese & Van Fleet, 1985; Gooding & Wagner, 1985; Levine & Moreland, 1990). Hence, a higher impact of conflicts and social loafing is expected in the team than in the pair. Moreover, the increasing size of the team negatively affects the individuals' perception of self-efficacy (Kerr, 1989) and directly impacts the individual's meaningfulness perception of the vision developed. Since convergence towards a shared direction implies multiple agreements with all actors in the team, we expect this latter negative dynamic to increase exponentially with the number of people and therefore to have a higher impact when moving from pairs to team than in the earlier step when moving from individuals to pairs. Hence, in line with findings on team size (which point to decreasing marginality as team size increases), we formulate our third and last hypothesis:

Hypothesis 3: The growth rate of the meaningfulness perceived is larger when passing from individual to pair than from pair to team.

METHODOLOGY

Context Description

Our objective was to observe the collaborative sensemaking process people pass through when developing shared and innovative direction. To demonstrate our hypothesis, we ran numerous empirical observations in both B2B and B2C companies of different industries, during real project settings and simulated workshops where the main intention was to support an organization to envision and develop an innovative direction. Comprehensively, we involved 7 different companies and a total of 127 people. The people involved were top managers from different business units, i.e., they were all strictly connected with company strategy development and accustomed to performing an intersubjective collaborative sensemaking process (Dougherty et al., 2003). According to an action

research approach (Lewin, 1946; Shani & Pasmore, 1985) the team of researchers participated directly in the innovation journey as facilitators and observers. This enabled the collection of rich and deep data on how people interact during the sensemaking process.

Table 1 synthetizes the main features of the sample considered.

The 7 initiatives had different natures and dynamics in terms of sectors, size of the organization, group composition, professional background of the participants, nationalities of the participants and innovation process (from small workshops of 5 days sprints to 3 month-long projects implying several meetings). This varied context was designed to strengthen the external validity of the analysis and make it as independent as possible from the specific method the companies adopted to search for a new direction. The common factor, in all these projects, was that all teams followed the same path for engaging people into vision development—instead of gathering individuals directly in teams, they all passed through a paired working.

- *INSERT TABLE 1 HERE* -

The Action Research Approach

As mentioned earlier, the empirical observation followed an abductive action research approach. In particular, this study followed the Canonical Action Research Cycle (CAR) proposed by Susman and Evered (1978), which has been already used in other studies with approaches similar to the present one (Clegg et al., 2017). Indeed, despite the different length in projects, with all the companies the following steps have been followed:

- *Diagnosis*: each project aimed to support the company in developing shared and innovative directions towards which conceive innovative products or services in the upcoming years.
- *Action Planning*: Given the strategic relevance of the project itself, the action plan consisted in the definition of an inside-out process made of specific moments of working session aimed to enable the envisioning and development of the new directions (this process is detailed in the upcoming section of the paper). All these moments were spaced out with meetings within the research team and the company top management in order to validate the course of action and defined shared next steps.
- *Action Taking*: a project plan was followed that (i) started with a kick-off meeting where took part all the top managers involved, (ii) an inside-out process was followed in envisioning the innovative direction, where participants were asked to work individually before to collaborate with a partner and later in a team (this part of the project is the focus of the present study) (iii) some promising directions have been selected in order to be evaluated by some experts carefully selected by the companies (iv) the resulting direction was tested with real clients through prototypes. Those project that lasted only 3 days followed only point one and two of the present actions.
- *Evaluating*: After each step of the Action Plan, a core team selected by the company and the research team carefully reviewed the output of the step just completed. This review process enabled to deepen in the assumption made during the "workshop", this help to have a better understanding of their value, applicability and relevance.
- *Specifying Learning*: Outcomes of these projects provide insights on the convergence process people pass through when developing innovative directions. Specifically, for this paper, it enables researchers to gather insights related to the collaborative sensemaking process performed by people engaged in innovation. Indeed, the empirical setting provided by these projects allowed to gather the empirical data presented in this paper.

Although the steps of the action research approach have been presented separately and apparently linearly, in reality, these steps were considerably interdependent and iterative one from the other (Coughlan and Coghlan, 2010). In the upcoming section, we explain in detail the inside-out process followed as part of the CAR process above described.

The me-pair-team process

In supporting the companies involved to envision innovative directions, we guided them through an inside-out process, which starts from the individual (inside-out) rather than from the external environment (outside-in). As already explored by other scholars (Weber, 2006; Charness, Yang, 2014; Frey, Goldstone 2016; Verganti, 2017), the people involved in the study were asked to move from individual ideation to pair ideation before engaging with a larger team in defining the final direction.

The effectiveness of this process in terms of sensemaking is supported by several scholars in the sensemaking field. Weick (1995) claims that people make sense of disruptive changes in a retroactive way, leveraging on memory to shape an improved and new "landscape," which is sufficiently believable to work as a basis for joint action. Also, Coopey et al. (1997) illustrate how the development of relationships within an organization fosters innovation and the development of relevant strategic intersubjective meanings, which are synthesized into generic and shared meanings at the conclusion of the innovation process and can be considered the "substance" of the innovation. From these studies, it becomes clear how the inside-out process we followed is a sequence of sensemaking processes, starting from the individuals and then moving to pairs and teams. At each phase, the participants leverage on the meaning developed in the previous phase to develop an improved meaning, which is reinforced through social interaction.

For the purpose of this paper, we will study how the meaningfulness developed by people in an innovation context involves moving from the individual to the team.

Despite the varying lengths of the workshops among the different companies (Tab.1), the process followed was the same.

Before starting the journey, each participant was asked to develop an innovative direction for the company individually before we drove them through pair and team phases at the workshop.

To create pairs and teams, we referred to algorithms based on "speed-dating" meetings.

In this fields, there are a couple of algorithms that ensure the creation of stable matches among individuals (Roth, 2008; Irving, 1985). In this paper, Irving's algorithm (1985), has been used. It ensures the creation of stable matches among individuals belonging to the same set of *n* participants; a stable matching is a partition of a single set into n/2 pairs so that no two unmatched members prefer each other to their partners under the matching. However, this algorithm is an NP – Hard problem. For this reason, we decided to simplify it by asking participants to rank just their first four preferences (rather than the entire set *n*). In this way, the first pairs/teams were created easily. For those that remained unmatched, we asked them to create a new ranking among the participants who remained unmatched. By operating in this way, 61% of the participants paired-up with their first choice, 17% with their second choice, the 13% with their third choice and the rest 9% with their fourth choice. It is important to notice that in most of the workshops, people do not even know each other, so the choice of the partner was based exclusively on the direction developed individually. This ensured we created pairs with shared vision, which is one of the crucial characteristics of effective pairs (Alvarez et al., 2007; Krause et al., 2015).

During the journey, participants received time and tools (e.g., cognitive tools, prototypes, frameworks) to develop their vision and create innovative directions jointly. Scholars proved that material tools "support the transition from individual to collective sensemaking by facilitating the emergence and the resolution of 'representational gaps' among team members" (Stigliani & Ravasi, 2012; Clark, 2008).

How to measure meaningfulness

Very few scholars have tried to measure meaningfulness or sensemaking. It appears that a consolidated methodology does not exist.

With regard to the innovation field, some scholars focused on the study of sensemaking, leveraging the grounded theory approach (Coopey et al., 1997; Ravasi & Turati, 2005).

Differently, Duffy et al. (2013) measure, in a quantitative and self-reported way, how the meaningfulness perceived by people when solving complex problems socially evolves through time. They proved that there is an enhancement of meaningfulness through time and that it continues to evolve until it converges in the final solution, hence the final meaning.

Though we cannot use Duffy's entire methodology that assumes an absolute value for the meaning of the best solution to a well-known problem, it proves that meaningfulness can be measured starting from individuals' perception of the results that they achieve through the process.

Similarly, we assessed participants' self-perception of meaningfulness through time in three specific moments—after the individual, pair and team sessions, respectively.

In framing the question, we consider sensemaking to be an evolutionary and retrospective process (Weick, 1995) by asking each participants to declare how meaningful they found (on a personal perspective) the latest meaning compared to the one developed in the previous phase using a Likert-like scale from a value of 1 (much less meaningful) to a value of 100 (much more meaningful).

As an example, Figure 1 reports the question asked after the pair activity.

- *INSERT FIGURE 1 HERE* -

This tool has evolved through different experimental stages. Before using it in real innovation projects, we built prototypes with different measurement approaches and questions. Prototypes were tested first in a Master of Science class, where students had to develop an innovative vision for a business partner and second during a one-day engagement workshop on innovation with the leadership team of a manufacturing company. An ex-post discussion of the results with the participants of these preliminary tests helped us to refine the tool sequentially until we arrived at the one we present in this paper.

RESULTS AND DISCUSSION

In the present section we presented the results of the data gathered following the methodology just described. The first section presents the detailed results for each hypothesis with an analytical perspective, while the following is focused on the discussion and key insights of the present research. Moreover, in discussing the findings, additional qualitative data are provided.

Results

In this section we present the results of our research.

To verify the first hypothesis, we asked participants to answer the question presented in Figure 1 after the pair session. The response rate was equal to 88%.

The distribution of the data gathered is represented in Figure 2.

- *INSERT FIGURE 2 HERE* -

Hypothesis 1 is verified if the attended value of the population we are looking at is higher than 50 (which stands for a similar level of meaningfulness between pair's and individual's vision).

Looking at data distribution (mean = 73.90, asymmetry index = -0.779), it is slightly asymmetric on the right side, hence it seems to support our hypothesis. For a deeper understanding of the data, a T-test on the mean has been performed, evaluating the confidence interval of the difference of the Test Value (equal to 50) from the mean.

Results reported in Table 2 fully demonstrate Hypothesis 1.

- *INSERT TABLE 2 HERE* -

To test Hypothesis 1b, two types of information are required: the meaningfulness assigned by the individuals to both their initial visions and the vision developed as a pair.

To define the second value required, we need to derivate it from the data gathered according to Figure 1.

To do this, we assume that:

- if the respondents assign an extreme value (100 or 1) to the pair's vision, the derived value has to be extreme as well (respectively 100 and 1);
- if the respondents declare that the pair's vision is similarly meaningful to the vision developed individually, which corresponds to a value of 50, the derived value will have to be equal to 50.

In this way, we derived value on a scale asymptotic to 100. The function is described as follows (Figure 3):

- *INSERT FIGURE 3 HERE* -

Where:

- $V_{Individual}$ is the meaningfulness assigned to the vision developed individually
- $V_{Relative}$ is the meaningfulness assigned by each individual to the pair's vision relative to the individual vision they developed before.

V_{Pair} has been derived for each respondent. Since each pair can be defined as a set *I* of *i* entities so that $i=\{i_1; i_2\}$, we have for each individual of a pair a set of value $V_{i\ Individual}$ and $V_{i\ Pair}$.

To measure the distance of both individuals' visions and the pair's vision of a generic pair *I*, we proceed as follows (Figure 4):

- *INSERT FIGURE 4 HERE* -

We can conclude that the hypothesis is verified if the mean of the distribution $V_{Distance}$ is greater than zero.

To be precise, the condition $V_{Distance} > 0$ does not mean that the vision developed in pair is perceived as more meaningful than the individual vision by both individuals.

Indeed, it could happen that both the individuals agreed that the vision developed in pair is less meaningful than the individual vision, and $V_{Distance} > 0$ would be verified as well.

However, we believe that the measure of $V_{Distance}$ is a useful indicator of how similarly two individuals perceive the meaningfulness of the jointly developed vision.

We have been able to calculate $V_{Distance}$ only for 6 companies out of 7. The final dataset is composed of 36 items.

To verify the hypothesis, a T-test on the mean of $V_{Distance}$ has been performed. In particular, we evaluate the confidence interval of the difference of the Test Value (equal to 0) from the mean. The T-test fully demonstrates Hypothesis 1b (Table 3).

- *INSERT TABLE 3 HERE* -

To verify Hypothesis 2, after the team session, we asked participants the same question asked to them in pairs in Hypothesis 1.

The response rate was equal to 82%. The data are represented in Figure 5.

- *INSERT FIGURE 5 HERE* -

As for Hypothesis 1, Hypothesis 2 is verified if the attended value of the population in question is higher than 50.

Looking at the data distribution (mean = 68.74, asymmetry index = -0.518), it is slightly asymmetric on the right side, hence it seems to support our hypothesis. To have a deeper understanding of the data, a T-test on the mean has been performed as for hypothesis 1. Results reported in Table 4 fully demonstrate Hypothesis 2.

- *INSERT TABLE 4 HERE* -

In our last hypothesis, we compare the data gathered during the pair session with those gathered during the team session.

We created a new variable as the difference among Team's Meaningfulness and Pair's Meaningfulness. Then, we ran a T-test on this new variable, setting 0 as the Test Value. Our hypothesis is verified if the mean of the distribution is lower than zero. Unfortunately, the T-test does not verify the hypothesis both for an alfa of 0.05 and 0.1 (Table 5).

- *INSERT TABLE 5 HERE* -

Starting from the results reported, we went back to the dataset and noticed that the range of the data was significantly wide (maximum = 58, minimum = -75).

We decided to analyze the data related to the maximum 58 to understand the reason for such an increase in meaningfulness when passing from the pair to the team. We discovered that both the individuals assigned a low rate of meaningfulness to the pair's vision and the highest rate of meaningfulness to the team's vision. We can assume that they were not able to overcome conflicts when working in pairs and came up with a compromising output that did not convince either of them. On the contrary, later they felt really committed about the vision developed jointly with another pair. For these reasons, we decided to consider this pair as an outlier and to remove it from the dataset. Thus, we ran a new T-test, which verified our hypothesis (Table 6).

- *INSERT TABLE 6 HERE* -

Discussion and additional findings

In this study, we were interested in observing how people develop an innovative shared direction and how the number of people involved influences the collaborative sensemaking process people pass through to envision a new direction.

In demonstrating our first hypothesis, we find out how pair working provides the right intimate context where a person feels free to share his/her personal ideas and, at the same time, listen and focus on the critical feedback provided by the partner, and therefore critically and jointly reframe the vision. However, it also emerges that six participants dissent on the growth of meaningfulness.

Testing the reason for misalignment in pairs was not a part of this study. As researchers, we participated in the workshop and greatly benefited from direct ethnographic observation of the pairs' dynamics. In particular, interesting insights emerged by looking at their output, the description of the proposed direction. First, by comparing the number of words used to describe the direction by those who rated it as high in meaningfulness and those who rated it as poor, it emerges that those who perceived a higher meaningfulness used a higher number of words to describe the vision. It seems that those who have a higher meaningfulness perception have been able to better finalize the final meaning in a well-detailed direction. Second, looking at the keywords used to describe the vision, those who dissent in the growth of meaningfulness describe the vision with words very close to their actual scenario (e.g., in the energy company, they used words such as "clean energy"). Thus, the innovative direction did not emerge. On the contrary, those who valued the vision as higher in meaningfulness used words quite unusual for their context (e.g., in the pharma company, they focused on the relationship between humans and the planet or referred to "big data"). Table 7 synthetized these observations for 3 of the 7 case studies analyzed.

- *INSERT TABLE 7 HERE* -

On a theoretical perspective, we assume that the reason for the dissent of a few pairs could be imputed to the personal orientation of the participants. For instance, a low level of initial personal engagement in the innovation project, a sort of "emotional resistance", could prevent the pair from collaborating. Moreover, pair effectiveness could be affected by factors such as time constraints or group composition (Tuckman, 1965). Indeed, because of the specificity of the context of investigation, it could be that time constraints forced people to speed up the identification of a vision even if they did not personally believe in it.

Finally, group composition can explain the dissent of the two participants whose partners was their third choice but not the dissent of the others, who were paired with their first choices. This poses interesting questions for a deeper investigation of the reasons for failed convergence during pair working.

In Hypothesis 1b, we gathered interesting insights on the process of convergence towards a shared meaning in two individuals. Irrespective of the fact that the pair's vision is perceived as more or less meaningful than the vision developed individually, the meaningfulness perception of the pair's vision is similar between the two individuals. It means that when working in a pair, the convergence process towards a shared direction happens successfully. Finally, it confirms that "the movement towards consensus can be considered analogous to the construction of a ground truth that informs response" (Duffy et al., 2013).

The main finding of our second hypothesis is that in passing from pair to team, meaningfulness perception continues to grow. This can be related to a few factors. First, since pairs merged in larger teams, the number of visions shared in the team were significantly lower than the number of visions they could've managed if moving directly from individual to team working. Second, it is possible that each individual felt protected by having a companion in the team to fall back on. This prevented them from stepping back. On the contrary, it seemed to have motivated them even more in looking for a more advanced synthesis of the directions. Unfortunately, because data were collected in a context of action research (Lewin, 1945; Shani & Pasmore 1985) during real workshop sessions, we do not have the benefits of a control group in verifying the robustness of our data. However, we are quite confident of the results because of the homogeneity of the data collected among a sample of very heterogeneous companies as summarized in Tab.1.

In our third hypothesis, we demonstrate how the meaningfulness perception was higher after the pair activity rather than the team one. This can find at least two explanations in the theory. First, the increasing size of the team negatively impacts the individual's perception of self-efficacy (Kerr, 1989) and increases the impact of conflicts and social loafing that can bring about a watering down of the final output (Karau & Williams, 1993). Second, the increasing size of the team and time constraints can force participant to converge quickly without the possibility of absorbing all the tensions generated in the process (Dougherty et al., 2003).

These findings suggest that the benefits of collaboration grow linearly in a progressive expansion of a team, whereas the impact of negative factors, due to the numerosity of the team members, grows exponentially (or, in any case, with an exponent that is larger than the exponent of the benefits of collaboration). Future studies will have to demonstrate this by leveraging on a control variable to better understand if this continuous growth in meaningfulness is effectively related to the central role of pairs in the process and what is the trend and impact of negative factors on the team activity.

The results of the survey are further corroborated by our ethnographic observations. In particular, we observed the behavior of participants when the facilitators were interacting with pairs compared to their reaction during teamwork.

In most instances, when people worked in pair, they tended to reject our support or simply ignore us as they were totally focused on the interaction with their sparring partner. They had created a private psychological space and were not keen to allow others to enter that space, not even the facilitators.

On the contrary, when individuals moved into teams, their behavior changed significantly. They were open to letting the facilitator interact with the team and even welcomed and frequently invited the facilitators to join. They came with explicit requests to help untangle the complicacy of convergence. This supports Farrel's (2003) assumptions on the ability of pairs to create an intimate environment where people feel protected and share ideas more fluently even at the risk of failure. The interaction with external people would compromise that intimacy. However, creating this intimacy presents higher challenges when the number of participants in the team increases. Hence, solving conflicts becomes harder and therefore impacts the final individual meaningfulness perception of the direction developed.

CONCLUDING REMARKS

This paper represents the first attempt to identify a set of insights about the role of pairs in innovation. We investigated if pair collaboration can support the collaborative sensemaking process in developing an innovative and shared direction in the context of innovation projects.

We found that working in pairs seems to enhance the engagement of individuals around an innovative and shared direction and further affects progress towards the engagement of others in innovation.

Of course, our study is not free of limitations. In particular, the verification of the effectiveness of pairs as an intermediate step could benefit from the presence of a control group. Moreover, everything happened during workshop projects and not in a "daily life" environment. Despite the consistency of the information gathered among the different companies and the insights we gathered as researchers, future studies should have a more ethnographic perspective in studying pairs in innovation. Finally, we focused on a specific type of innovation (shared direction). It would be interesting to see if our results can be generalized to other situations related to innovation.

Despite these limitations, this study provides contributions both to theory and practice.

On a theoretical perspective, this study explains how the collaborative sensemaking process evolves when people aim to envision innovative and shared directions by focusing, at first, on the pair as the smallest unit of collaboration. Thus, it contributes in explaining how people moved from individual to collective sensemaking (Fellows & Liu, 2016), and how sensemaking benefits from the intimacy provided by the pairs before to engage with others in innovation: in sensemaking a certain level of intimacy is required to establish a comfortable communication of tacit knowledge (Leonard and Sensiper, 1998) Moreover, by building on what scholars already unveiled in relation to the team dynamics that influence the creation of shared vision (Pearce & Ensley, 2004), this study explores how social loafing and conflicts impact the collaborative sensemaking process. Indeed, apparently, when people engage in pair working phenomenon such as social loafing, free riding and conflicts have a reduced effect, resulting in a higher perception of meaningfulness compared to the team working.

As a consequence, on a practical perspective, we are the first to contribute to the understanding of how those conflicts and bandwagon effects that affect teams when developing an innovative direction can be mitigated. The pair seems to be a possible intermediate step before moving on to a larger team. Indeed, the pair seems to provide a critical moment of reflection, which enables each person to deepen their vision, reframe it, and make it more robust with the support of a partner. This moment of reflection appears as essential to move forward and engage with others in the innovation process. Finally, this article sheds light on an underestimated dynamic of innovation, work in pairs, which has real potential to address one of organizations' most problematic challenges: people engagement and the convergence towards an innovative direction.

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Company Characteristics			**Characteristic of the people involved in the activity**				
Company ID	*Sector*	*Company Size (number of employees)*	*Number of participants*	*Group Composition*	*Key Business Unit represented*	*Nationalities represented*	*Lenght of the activity*
1	Aerospace	130.000	18	44% Female 56% Male	Human Resources, IT, Operations, Procurement, Policy management, Innovation management	France, Germany, Spain	3 days
2	Engineering	7.500	38	34% Female 66% Male	IT, Human Resources, Sales, Operations, Marketing/Communication	Australia	3 months
3	Energy	300	17	24% Female 76% Male	Human Resources, Sales, Digital, New Product Development, Communication/ Marketing, IT and Digital Development, Legal, Procurement	Italy	3 months
4	Pharma	1.400	20	40% Female 60% Male	Marketing, Brand and Communication, IT and Digital Development, Sales	Italy	3 months
5	Mechanical	3.000	12	100% Male	Human Resources, Head of product lines, Sales, Finance	Italy, France	2 days
6	Healthcare	134.000	12	50% Female 50% Male	R&D, Legal, Marketing, Sales	Sweden, France, Germany, Switzerland	3 months
7	Service Provider	8.000	10	40% Female 60% Male	NA	Italy	5 days

Table 1 – Sample characteristics

	Descriptive Statistics				T-test		
Hp1	N	Mean	Dev.st	Ass. Index	Lower Limit	Upper Limit	p-value
Driver of the Vision	111	73.90	20.97	- 0.779	19.96*	27.85*	0.000

**alfa = 0.05*
Test Value = 50

Table 2 – Hp1 Interval confidence

	Descriptive Statistics				T-test		
Hp1b	N	Mean	Dev.st	Ass. Index	Lower Limit	Upper Limit	p-value
Driver of the Vision	36	5.56	13.52	0.042	0.987 *	10.137*	0.019

**alfa = 0.05*
Test Value = 0

Table 3 – Hp 1b T-test

	Descriptive Statistics				T-test		
Hp2	N	Mean	Dev.st	Ass. Index	Lower Limit	Upper Limit	p-value
Driver of the Vision	104	68.74	22.587	- 0.518	14.35*	23.13*	0.000

**alfa = 0.05*
Test Value = 50

Table 4 – Hp 2 T-test

	Descriptive Statistics				T-test		
Hp3	N	Mean	Dev.st	Ass. Index	Lower Limit	Upper Limit	p-value
Driver of the Vision	99	-5.1414	26.32	- 0.213	-10.392*	0.096*	0.055
Driver of the Vision	99	-5.1414	26.32	- 0.213	-9.535**	-0.7475**	0.055

**alfa = 0.05*
*** alfa = 0.1*
Test Value = 0

Table 5 – Hp 3 T-test N=99

	Descriptive Statistics				T-test		
Hp3	N	Mean	Dev.st	Ass. Index	Lower Limit	Upper Limit	p-value
Driver of the Vision	97	-6.40	25.061	- 0.408	-11.45*	-1.35*	0.014

**alfa = 0.05*
Test Value = 0

Table 6 – Hp3, T-test N=97

	High Meaningfulness		**Low Meaningfulness**	
	Average number of words used to describe the new direction	*Keywords*	*Average number of words used to describe the new direction*	*Keywords*
Energy	18	"I **manage** my energy…" "I **decide** about when and how to use my energy…"	10	"clean energy" "smartphone"
Pharma	35	"health for **humans and the planet**" "**system biology** and **big data**"	14	"high **quality** of healthcare"
Healthcare	70	"**holistic** understanding" "transparent data handling and ownership" "minimize impact"	16	"**Simplicity**" "**Tailored service**" "Trustworthy"

Table 7 – Pairs vision: Meaningfulness and key content

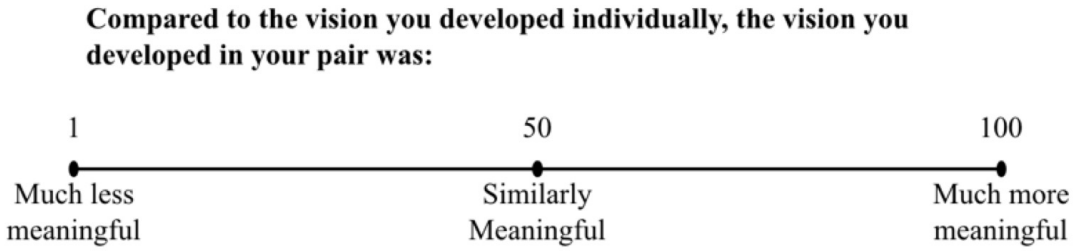

Figure 1 – Pair meaningfulness

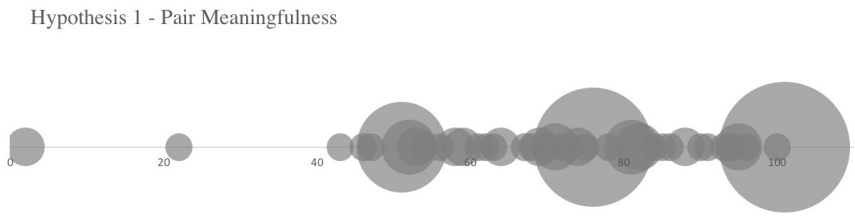

Figure 2 – Hypothesis 1, Pair meaningfulness

$$V_{Pair} = V_{Individual} + (100 - V_{Individual}) \times \frac{(V_{Relative} - 50)}{50}$$

Figure 3 – V-Pair formulation

$$V_{Distance} = \left[max_i (V_{i\,Individual}) - min_i (V_{i\,Individual}) \right] - \left[max_i (V_{i\,Pair}) - min_i (V_{i\,Pair}) \right]$$

Figure 4 – V-Distance formulation

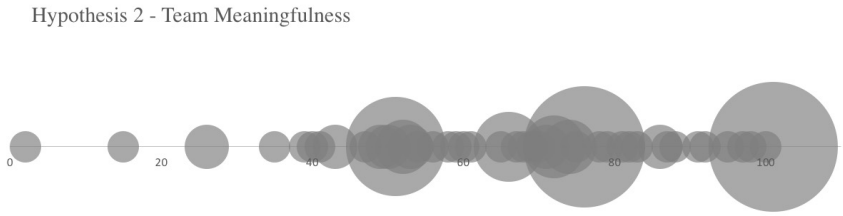

Figure 5 – Hypothesis 2, Team meaningfulness