Chapter 2
The Cognitive Foundations of Networked Flow: Intentions, Presence, and Social Presence

Abstract What makes a subject "present" within a group? Is to enough to physically be with the other group members in order to be "in"? And what happens when the others are not with me physically, such as in a chat room? Why are not all groups the same? Why are there groups in which people are able to make the most of their potential, while in others the subject feels closed in and crushed? Finally, what makes a group creative and productive? In this chapter, we will try to answer all of these questions, and the starting point of our analysis are the concepts of "presence" and "social presence":"Presence" is defined as the non-mediated (prereflexive) perception of successfully transforming intentions in action (enaction) within an external world;"Social Presence" is defined as the non-mediated perception of an enacting other (I can recognize his/her intentions) within an external world.Thanks to these two concepts, it is possible to demonstrate that not all groups have the same creative potential: it is above all those groups characterized by an optimal group experience—*networked flow*—that generate innovations which result as being particularly original. Specifically, an optimal personal experience—characterized by high levels of presence and social presence—produces memes that are used by the group to define its own culture (subculture). When these memes are internalized by most individuals, through imitation and communication, they modify and shape the culture and the behavior of the individuals.

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In this book, we will try to answer all of these questions, and the starting point of our analysis is data concerning "presence" and "social presence" (Riva 2008b; Riva and Mantovani 2012a, b):

- "Presence" is defined as the non-mediated (pre-reflexive) perception of successfully transforming intentions in action (enaction) within an external world;

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- "Social Presence" is defined as the non-mediated perception of an enacting other (I can recognize his/her intentions) within an external world.

These concepts are the result of the most recent reflections from two emerging sectors of cognitive science: the movement of "*situated cognition*" and that of "*embodied cognition*".

Thanks to these two movements, it is possible to demonstrate that not all groups have the same creative potential: it is above all those groups characterized by an optimal group experience—*networked flow*—that generate innovations which result as being particularly original (Riva et al. 2010). But what is *networked flow*? It is possible to define it in cognitive terms as an "optimal" experience (Delle Fave and Bassi 2000): *at individual level, each subject experiences a state of conscience characterized by high levels of concentration, involvement, control of the situation, clarity of objectives, natural motivation*, *and a positive emotional state; at group level, all the members of the team share the same intention (collective intention) that is experienced as critical to produce a long-term change relevant both for the team and for themselves.*

This experience is the result of the association between a situation of *liminality* and maximum levels of presence and social presence. First, it is necessary that the members of the group experience a situation of *liminality* (a state of transit, of "being about to") and that within the group they identify a common strategy (collective intention) to overcome it. Second, it is necessary that group members experience a high level of social presence: the sensation of sharing one's own goals and emotions with others. Finally, it is needed that each subject experiences a high level of presence: the feeling of being able in the group of successfully transforming their intentions—both individual and collective—in actions. It is during this experience that the group creates and shares new meanings and new intentions.

The focus on optimal experience and its link with creativity is not a new concept. The seminal work by Mihaly Csikszentmihalyi in the mid-1970s identified in the optimal experience, or "Flow", a specific consciousness state experienced during challenging activities characterized by deep absorption and enjoyment (Csikszentmihalyi 1990). More, in his book "Creativity: Flow and the psychology of discovery and invention" (1997) Csikszentmihalyi, reporting the results of a series of interviews to 91 internationally recognized creative people, clearly described creativity as the result of three elements: a culture that contains meanings and symbols, a person who uses optimal experiences to bring novelty into the symbolic domain, and an external group who recognize and validate the innovation.

The main criticisms to this vision are three (Riva 2012). First, the lack of attention to the interpersonal context: we experience optimal experiences, like the "networked flow", that are the outcome of a social interaction. Second, linking the optimal experience to the balance between perceived high challenges/opportunities for action and high personal skills is too vague to be useful within a scientific research program: What is high and low for me and you?

Third, if creativity is a process linking the individual with a culture and a reference group, how does it work? No specific cues are offered by the author.

To address these issues, we will start from the concept of experience. According to the Merriam Webster Dictionary, it is possible to define experience both as "(a) the fact or state of having been affected by or gained knowledge through direct observation or participation" (personal experience), and "(b) direct observation of or participation in events as a basis of knowledge" (subjective experience).

These definitions underline the two connected faces of our experience: on one side, we can intentionally control the contents of our experience (subjective experience); on the other side, its contents define our future emotions and intentions (personal experience). In other words, we both shape and are shaped by it.

However, there is a critical difference between subjective experience and personal experience. If subjective experience is the experience of being a subject (experience as subject, the "I" described by William James), personal experience is the experience affecting a particular subject (experience as object, the "Me" described by William James). This simple shift suggests that, independently from the subjectivity of any individual, it is possible to alter the features of our experience from outside. In other words, personal experience becomes the dependent variable that may be manipulated and studied by external researchers. Specifically, we suggest that it is possible to manipulate the features of our experience in three separate but related ways (Riva et al. 2012):

- *By structuring it* using a goal/meaning, rules, and a feedback system.
- *By augmenting it* to achieve multimodal and mixed experiences.
- *By replacing it* with a synthetic/fictional one.

For example, as suggested by "Positive Technology", it is possible to use technology to manipulate the quality of experience, with the goal of increasing creativity and well being both in individuals and groups (Botella et al. 2012).

The other advantage offered by the concept of personal experience is that it allows the connection between the three levels originally identified by Csikszentmihalyi: the individual, the culture and the group. Specifically, an optimal personal experience produces memes that are used by the group to define its own culture (subculture). When these memes are internalized by most individuals, through imitation and communication, they modify and shape the culture and the behavior of the individuals.

In the following paragraphs, we will endeavor to justify this claim. In order to do so, we will begin with the analysis of the transformations which are characterizing cognitive sciences and which constitute the principal new element in the central question of action.

2.1 A New Model of Cognition

When one thinks about cognitive processes, the first thing which comes to mind is the brain–computer association. This association originated from cognitive psychology's traditional approach—the *symbolic approach*—(Johnson Laird 1988;

Newell and Simon 1972) which uses symbolic processors as its model of the mind.

In this view, by using symbolic language it is possible to represent a subject's complete knowledge (an explicit representation of knowledge). From this knowledge base, it is then possible to draw the conclusions necessary to make the agent act in an "intelligent" way.

In this view, the structural characteristics of human cognitive processes are largely independent from the type of *hardware* on which they *operate*, just as a piece of *software* is independent from the type of computer on which it is installed: the same piece of software can be used on very different computers. It is on this theoretical basis that the area of research concerning Artificial Intelligence has developed.

Nonetheless, the limits of Artificial Intelligence systems and the discoveries of neuroscience have thrown the brain–computer association into crisis, leading to the redefinition of the concept of cognition.

An early attempt at this redefinition was made within the situated cognition movement (Bara 2000; Carassa 2002; Clancey 1995, 1997; Lave 1988; Lave and Wenger 2006). This position begins with the observation that in the majority of situations, learning is not the result of an individual process, but of social interaction (Lave 1988; Lave and Wenger 2006). To be more precise, Lave and Wenger (Lave and Wenger 2006; Wenger 2006) maintain that members of a community, by means of common experience, come to share a culture, a language and a way of expressing themselves: a community of customs.

However, this process is only possible if all the subjects share a *common ground*, a range of beliefs, expectations and collective knowledge (Clark and Brennan 1991; Morganti and Riva 2006). This common heritage is continually updated through a process which Clark and Brennan (1991) define as *grounding:* the process of collaboratively establishing *common ground* during *communication*.

The second attempt came as the result of the embodied cognition movement. This position considers corporeity—the sum of an organism's motor-sensory skills which allow it to successfully interact in its environment—as being necessary for the development of social and cognitive processes (Clark 1997; Jeannerod 2006; Johnson 1987; Lakoff and Johnson 1999; Morganti and Riva 2006; Niedenthal et al. 2005; Noë 2004; Varela et al. 1991).

In this view, knowledge can be defined as a "capacity towards interactive action", resulting from the interaction which occurs in real time between a corporal organism and its environment directed toward an objective. Carassa (2002) uses the term "*conceptualization in action*" to underline a subject's capacity to segment and recompose an entire behavioral sequence in order to reach an objective. For this reason, knowledge is necessarily "situated" and "embodied": *it requires continual external feedback in order to coordinate perception and action*.

Although these two visions have been developed separately, a point of contact has been found in a recent discovery in the field of neurophysiology: bimodal neurons. A group of neurophysiologists from Parma, coordinated by Giacomo

Rizzolatti, discovered, first in the premotor cortex of apes, and then in that of humans, the existence of two groups of "bimodal" neurons in which sensory faculties are linked to motor faculties (Rizzolatti and Sinigaglia 2006):

- the first group of neurons (F5ab-AIP)—known as "*canonical*" neurons, are activated when a subject sees an object with which it can potentially interact;
- the second group of neurons (F5c-PF)—known as *"mirror*" neurons, are activated when the subject sees another individual performing the same action.

To justify the existence of these neurons, the Common Coding Theory has been developed; according to this theory perceptual representations (actions perceived) and motor representations (actions to be performed) are based on the same motor code (Knoblich and Flach 2003; Prinz 1997).

In practice, in each phase of a single action—*planning* (I want to move my hand to pick up an apple), *execution* (I move my hand and pick up the apple), and *interpretation* (I see another person move their hand to pick up the apple), the subject is activating the same motor code applied to the context in which the action is being, or will be, performed.

This theory leads us to presume the existence of a simulation system based on motor codes which permits the subject to organize and understand a given action (Barsalou 2003; Gallese 2005; Wilson and Knoblich 2005).

As Gallese points out (Gallese 2003a, b, 2005), during the simulation process, which he defines as "embodied simulation", *internal representations of corporal objects associated with given actions and sensations are generated within the subject, as if he or she were performing a similar action or experiencing similar emotions or sensations.*

For example, the sight of a red apple is believed to activate a simulation of the motor functions necessary to pick it up, while the sight of a person who reaches out to pick up the apple is believed to activate a motor simulation which allows the subject to understand this person's intention.
According to this theory, a subject's knowledge of objects and space is *pragmatic* knowledge (Rizzolatti and Sinigaglia 2006):

- objects are conceptualized through a process of simulation, like "points of virtual action" defined by the intentions directed toward them.
- space is defined by the "system of relationships which such virtual actions utilize and which are limited by various parts of the body".

We will endeavor to explore these two concepts further.

2.2 From Intention to Action

Rizzolatti's studies on bimodal neurons (Gallese and Lakoff 2005; Rizzolatti et al. 1997; 1996; 2000; Rizzolatti et al. 1998) have shown that their activation is influenced by intention. For example, *"canonical" neurons* are distinguishable by the correspondence between motor characteristics (for example a way of picking

something up) and vision (the shape and size of the codified object). This allows the visual information about an object to be transformed into the motor functions required to interact with it.

In practice, "canonical" neurons permit an immediate and intuitive (prereflexive) understanding of opportunities for interaction which various objects may offer (in the case of the handle of a coffee cup, there is the possibility of being taken hold of if the subject wants to drink).

One of the crucial elements of this definition is the concept of intuition. We shall now elaborate on this point. The work of the Nobel prize winner Daniel Kahneman (2002) has emphasized how our cognitive system is based on two systems, *intuition* and *reasoning*:

- *System 1* (Intuition): this generates *impressions* of a perceived and considered object's characteristics. These impressions, rapid and simple from a computational point-of-view, are involuntary and are often unconscious.
- *System 2* (Reasoning): general *judgments* are slow, ordinal, costly from a computational point-of-view, and always explicit and intentional.

The existence of two separate cognitive systems is made evident by the distinction between *being able to do* something, and *knowing* something. On the one hand, we are able to control complex dynamic systems without being capable of explaining the rules which enable us to do so (intuition): for example, we are able to ski or ride a bike without knowing how to explain how we do it. On the other hand, however, we can describe the rules which permit a system to function (reasoning) without being able to put them into practice: for example, reading the highway code and knowing all the necessary information to drive a car does not mean that you will not fail your driving test.

In this sense, the ability to understand a subject's intentions is an intuitive process of which the subject is unaware (Riva and Mantovani 2012a, b). But how can the subject know whether his or her intention has really been transformed into an effective action? We shall try to answer this question in the following paragraphs.

2.2.1 The Structure of Intention

According to Searle, every action is made up of two components (Searle 2001): *movement* and *intention*. The intention component "represents" the conditions which must be met by the action in order for the subject to be satisfied. Movement is the means which is analyzed to verify the success of the intention.

In Searle's words, the representation of the conditions of satisfaction refer to a "previous intention", which defines the conditions of satisfaction, and to a "background" in which they are situated (Searle 1998). Specifically, the *background* includes the set of abilities, capacities, tendencies, and dispositions that humans have and use intuitively, and that are not themselves intentional states.

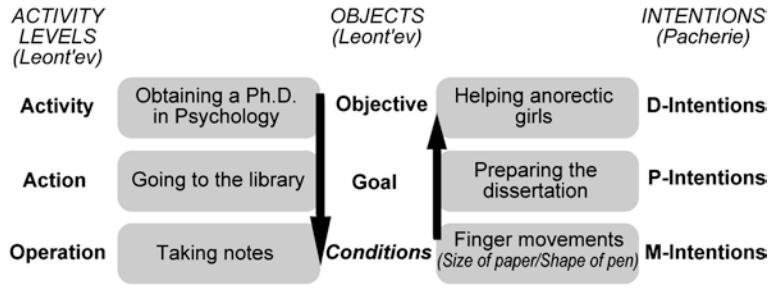

Fig. 2.1 The structure of intentions

For example, my intention to draw a house is satisfied if (a) I manage to produce a drawing and (b) what I have drawn looks like a house (in this case, the background is the implicit knowledge that a house has four walls); my intention to paint my house green is satisfied if (a) I manage to paint or have the house painted and (b) the color of the walls is green. In both cases, the background of the *previous intention* is the knowledge of what a house is and which house is mine.

However, Searle notes that there is an object, the body, which does not respect these conditions of satisfaction. It is in fact, *intention in action* which determines the body's movements (Searle 1983, 1992), an intention which meets its conditions of satisfaction in movement itself *(auto-referential causality)*: my intention to move my arm is satisfied by moving my arm.

In other words, if intentions regarding external objects are satisfied by the accord between a previous intention and the result of the action, in the case of the body, the action is in itself the condition of satisfaction.

But how is it possible to analyze the complex network of intentions necessary to perform difficult actions such as "obtaining a degree in psychology"? Two very similar answers come from two different theories developed in different contexts: *activity theory* and *the dynamic theory of intentions* (see Fig. 2.1).

2.2.1.1 Activity Theory

Activity theory originated in the psychological culture of the former Soviet Union, thanks to the work of scholars such as Vygotskij (1965, 1978), Leontjev (1978, 1981), and Anokhin (1976). The ideas initially formulated by Russian authors were then adapted to the world of media by a number of Scandinavian writers, including Engeström (1990) and Kuuti (1996). A detailed study of this theory in Italian was recently presented by Elvis Mazzoni (2006).

The basic principle of this theory is the fact that it places human activity at the center of psychological studies, and divides it into three levels of analysis*activity, action*, and *operation* (Kaptelinin and Nardi 2006; Leontjev 1978):

- *Activities, composed of the sum of the actions*: Activities are social practices directed toward "objects" (also known as "motives"). Every object is created to

meet man's needs, and determines the limits of possible actions. Activities have a duration of varying length, the beginning and end of which are not always easily recognizable. *One example of an activity is the process necessary to obtain a degree in psychology;*

- *Actions, composed of the sum of the operations*: actions are complex acts, consciously directed toward a precise objective which move the subject closer to the object of the activity. Unlike activities, actions are characterized by a known duration, with a precise beginning and end. *One example of an action is going to a seminar.* An action can simultaneously be part of several activities. For example, attending a seminar can be part of the "degree in psychology" activity, but may also be part of the "finding someone to go out with this evening" activity;
- *Operations*: Operations are the chains of specific motor actions which constitute the structure of an action and are often carried out without the subject's awareness. To be more precise, the operations which make up an action are carried out unconsciously. However, learning about the organization of the operations which constitute an action requires the conscious participation of the subject. *One example of an operation is writing the word "subject", while taking notes during a seminar.* These operations are guided by an "orienting base", composed of unconscious expectations relating to the execution of the operation. The orienting base develops through the process of trial and error.

These three levels are neither fixed, nor structurally separate. In general, for a specific object directing an activity, objectives, actions and operations may change according to the situation in which the subject finds himself (Hasan et al. 1998). For example, an operation may become an action when the expectations which guide it are not fulfilled. If my pen stops working while I am writing the word "subject", a new action will begin, with the aim of finding a new pen.

The three levels of human activity are linked by *expectation, the anticipation of the action*. In relation to the activity, expectation takes the form of *motivation*: I want to graduate so that I can become a psychologist. It is the *objective* which changes according to the level of action: I go to lectures in order to pass the exams as quickly as possible: to write a letter "M" I first move my hand upwards and then downwards at an angle of approximately 45 degrees, and then upwards again at the same angle before moving my hand straight down.

2.2.1.2 A Dynamic Theory of Intentions

The second attempt to explain the structure of intentions was made by the French researcher Elisabeth Pacherie (2008). The main assumptions of this model, known as the *"dynamic theory of intentions"* which was recently published in the journal "Cognition" (Pacherie 2006, 2008), are the following:

- It does not make sense to consider an action as an individual mental act. Intentions are a dynamic structure arranged on a number of levels.

- This organization is hierarchically structured on three mutually inclusive levels:
    1. *Motor intentions (M-intentions);*
    2. *Proximal intentions, situated in the present (P-intentions);*
    3. *Distal intentions, directed toward the future (D-intentions).*
- The relationship between these levels is one of inclusion and organization. Specifically, a distal intention (to build a house) is composed of a series of proximal intentions (to lay the foundations, build the walls), which are themselves made up of a series of motor intentions.
- The connection of inclusion and organization between an upper level and that beneath it is clear to the subject as long as he is not required to intervene in the management of the situation. This means that a conscious distal or proximal intention is carried out through the organization and integration of a series of intentions at the lowest possible level.

If we compare the three levels of the structure of intentions proposed by Pacherie with those of the Activity Theory, the similarities are very clear. In both cases, the subject's activity is a dynamic system of intentions/objects built on three levels, each including and organizing the levels beneath. The overlap of the concept of "intention-in-action" proposed by Searle and that of "operation" and "motor intention" is equally evident.

2.2.1.3 Private Intentions, Social Intentions, and Collective Intentions

The Centre for Cognitive Sciences in Turin has recently become involved in the debate on the structure of intentions (Bara 2007; Ciaramidaro et al. 2007; Walter et al. 2009), suggesting a further distinction: that between "*private intentions*" and "*social intentions*".

- *Private intentions* are all intentions which require nothing more than the intervention of the subject in order to be satisfied. Examples of this type of intentions are "removing a bulb" or "picking up an apple";
- *Social intentions* are all intentions which (a) involve at least one other person, and (b) the other person is essential in order for the intention to be satisfied.

Furthermore, these intentions make a distinction within the category social intentions, between *present intentions* and *future intentions*:

- *Present social intentions* are all social intentions shared in real time by two or more subjects. The prototype of this type of social intention are communicative intentions;
- *Future social intentions* are all social intentions in which the subjects are not interacting in that moment but they will have to do so in order to satisfy their intentions. Examples of this type of social intentions are "passing a psychology exam" or "going to buy a loaf of bread".

In order to verify their hypothesis, Ciaramidaro, Walter, and their colleagues conducted a series of studies using magnetic resonance functional imaging. Thanks to these studies, carried out both on healthy subjects (Ciaramidaro et al. 2007), and subjects suffering from schizophrenia (Walter et al. 2009), it has become possible to monitor the activation of different cerebral areas according to the type of intention that the subject had to identify. While private intentions only activated the precuneus and the right temporal parietal junction, social intentions also activate the left temporal–parietal junction and the front paracingulate cortex. In addition to the research of the Centre for Cognitive Sciences in Turin, we can consider Searle's views on *"collective intentions"* (Searle 1995). Unlike other social intentions, collective intentions are characterized by a 'sense of the other', which moves from being an intentional subject to a collaborative subject and is then able to share the collective intention and collaborate in its realization.

As well as entailing the role of another in order to be satisfied, collective intentions call for a form of cooperation which is not the result of individual intentions. These intentions (We-intentions) which can be expressed as "We intend to do action A", include one or more private or social intentions which represent a subject's personal contribution to the collective action: "I intend to do action B as part of the group's action A".

An example of a collective intention is a husband and wife who intend to assemble the bed they have just bought at Ikea: it is their shared intention which directs and organized the individual activities of the two subjects.

2.2.2 *Verifying the Efficacy of an Action: From the Body to Possible Worlds*

After having carried out this analysis it is possible to propose a structure of intentions (Morganti et al. 2010) which has seven levels (Table 2.1):

- *Motor Intentions*: motor intentions are at the basis of our most simple motor actions (not directed toward an object) such as making a fist or closing my mouth. They are innate as they are part of our genetic makeup.
- *Private, social, and collective proximal intentions*: proximal intentions are at the basis of actions directed toward states, objects or subjects in our present world. They may be *private*—"pick up the pen" or "get up from the chair"—*social*—"climb on daddy's shoulders" or "suckle at mummy's breast"—or *collective*—"communicate". These intentions come about in the relationships between our needs and our surrounding physical and social environment.
- *Private, social and collective distal intentions*: distal intentions are at the basis of our actions toward possible states, objects and subjects in possible worlds. These intentions may be *private*—such as "study more" or "do more physical exercise"—*social* such as "get a degree" or "start a family"—or *collective*—"win the university football tournament" or "prepare the communications project for

Table 2.1 The intentional structure

Intention	Definition	Example	Verification of the action's efficacy
Motor intentions	Simple motor acts not directed toward an object	Making a fist or closing your mouth	Managing to perform the act
Private proximal intentions	Motor acts directed toward objects or states in the present world	Picking up a pen or getting up from your chair	Concordance between representation (previous intention) and perception (resulting action)
Social proximal intentions	Motor acts directed toward subjects, objects or states in the present world	Climbing on daddy's shoulders or suckling at mother's breast	The wishes of the subject/s involved and the concordance between representation (previous intention) and perception (resulting action)
Collective proximal intentions	Motor acts collectively directed toward subjects, objects or states in the present world	Communicating or completing a puzzle together	The wishes of the subject/s involved, sharing a common representation (intention) and the concordance between representation and perception (resulting action)
Private distal intentions	Acts directed toward objects/states in a possible world	Studying more or eating less	Concordance between representation (previous intention) and perception (resulting action)
Social distal intentions	Acts directed toward objects/states in a possible world	Getting a degree or starting a family	The wishes of the subject/s involved, agreement between the subjects of their intentions, and concordance between representation (previous intention) and perception (resulting action)
Collective distal intentions	Acts organized collectively and directed toward objects/states in the present world	Winning the university football tournament or preparing a communications project together	Wishes of the subjects involved, sharing a common representation (intention) and the concordance between representation and perception (resulting action)

the X company". These intentions come about in the relationships between our needs and the various possibilities open to us in our culture of reference.

The first noteworthy element which emerges from the analysis of the proposed intentional structure is that understanding another's actions becomes increasingly difficult as we move from motor to distal to private and social intentions.

Nevertheless, if we compare this intentional structure with the intentions present in other previous studies on mirror neurons, it is evident that the majority of observations made relate specifically to private proximal and motor intentions. There are, however, no studies measuring the response of mirror neurons to social or distal intentions.

The second element which comes to light, is that the greater complexity required by intentions of a higher level, is not only reflected in the comprehension of the other's intentions, but also in the judgment of the efficacy of one's own actions. More exactly, how can a subject verify whether his or her intentions have really been transformed into an effective action?

It may seem a banal question, but to ask oneself whether one's actions have been effective or not is a crucial element for the survival of the individual. Without the ability to verify whether one's actions have been correctly performed—have I managed to get the food that I need? Have I escaped from the predator who was chasing me?—the subject would not be able to survive the dangers of his environment.

Let us answer this question beginning with motor intentions. As we have just seen, these intentions are innate and, as suggested by Searle, they are satisfied by the action itself: I have managed to make a fist if my fingers are closed in my palm; I have managed to close my mouth if I have reduced the distance between my lips.

More complex however, is the case of proximal intentions. We shall begin with the analysis of private proximal intentions, composed of a chain of motor intentions directed toward a state or an object in my surroundings in the present world. In this case, the satisfaction of my proximal intention is linked to the relationship between intentional content (a previous intention) and the real-world object toward which my intention is directed: if I want an apple I will satisfy my intention by picking up the apple, and not the orange next to it.

The subject learns to connect representation to object, stimulus to response by means of imitation, the classic active conditioning. In all cases, the key to learning correct association—this is an apple and not an orange, is *covariation*: the properties of the stimulus and the response change at the same time.

The situation is more complicated in the case of social proximal intentions: even if the learning mechanism is the same—covariation—in order to verify whether my intention has been fulfilled, not only do I have to consider the link between stimulus and response, but also the wishes of another. If I want to take the red apple that Martina has in her hand, it is not enough to verify whether I have taken the apple from her hand instead of the orange on the table. I also have to check whether Martina has allowed me to take the apple or not.

In the case of collective proximal intentions, there is another element to take into account: a universal representation which guides the intentions of various subjects toward a shared objective. If this universal representation is not present, the collective intention is destined to remain unfulfilled.

It is, however, even more complex to ensure the efficacy of distal intentions. Once again, we shall begin with private distal intentions, composed of a chain of motor and proximal intentions directed toward a possible state or object (a possible world).

But what is a possible world? The concept of "possible worlds" was introduced by Leibniz and taken from philosophical logic to denote "alternative worlds", or worlds which could exist but are only possible and not real (Lycan 2002). An example of a possible world is the world in which instead of writing this chapter I am lying on a beach listening to music. It is not my present world, but it could happen.

Using the language of the philosophy of the mind (Crane 2003), every possible world is characterized by an "*intension*"—the sum of the elements which enable to me to describe this world—and by an "*extension*"—the number of situations and contexts in which my theoretical world is in fact real. When a possible world has an extension, that is, it *does* exist somewhere, I am able to verify the efficacy of my intention by comparing its intentional content with the real-world context to which my intention corresponds: if I want to go to the beach and listen to music, I succeed in fulfilling my intention if I really do find myself on a beach and am at the same time listening to music on my iPod.

If, however, the possible world has no extension—for example, I want to become like Albert Einstein, but at the moment there is no one in the real world who corresponds to the description of Albert Einstein, how can I verify whether I have fulfilled my intention? A similar problem exists if the possible world has several extensions. If I want to become a psychologist, but there are various types of psychologist—clinical, industrial, social, etc.—how can I tell whether I have managed to carry out my intention?

In both cases, the answer can be found in the culture of reference—it is my culture which provides me with the knowledge and standards which enable me to say whether I have succeeded in becoming Albert Einstein or not. In practice, when a possible world is not currently real or it is not certain, the only reference that the subject can use to check whether an action has created this possible world as the description that he or she has used to represent it (intension), the result of social conversational practices: I am able to recognize Albert Einstein's main characteristics from what I have learned about him.

The limit of this approach is clear: it is possible to define Albert Einstein in different ways. For example, I can describe him as "a German physicist who won the Nobel Prize in 1921" or as "a member, supporter or affiliate of 34 communist movements between 1937 and 1954" (this is the opening description of the FBI's file on Albert Einstein, available online at: http://vault.fbi.gov/Albert%20Einstein).

In addition to what has thus far been mentioned, in the case of social distal intentions, it is also necessary that the other subjects involved in my intention are willing to accede to it. If I want to start a family with Fabrizia, and Fabrizia does not want a family, my intention cannot be satisfied despite my culture having taught me what having a family means.

There is, however, another problem: the intensions (meanings) which different subjects attach to the possible world may not be the same. For example, if my view of starting a family with Fabrizia means marrying her, but for Fabrizia having a family entails nothing more than living together, my social distal intention will not be satisfied.

This problem is particularly relevant to collective distal intentions which, as well as what we have just seen, also require a shared universal intension which guides the intentions of various subjects toward a common goal. If there is no universal intension, or if the intension is not the same for each of the subjects, the collective intention is destined to remain unfulfilled.

This lengthy analysis makes it clear that very different skills and knowledge are required in order to ensure that an intention is carried out. We can use the language of contemporary cognitive science to affirm that the satisfaction of motor and proximal intentions is always "embodied", that is, it concerns the relationship between the subject as a body, the surroundings and the objects/subjects present therein. The satisfaction of motor and proximal intentions is *objective*—in the sense that is the same for all subjects: I have taken the apple from Martina if the apple is now in my hand.

On the other hand, the satisfaction of distal intentions is always "situated", that is, it concerns the relationship between the subject as a social being, the culture of reference and its possible worlds. The satisfaction of distal intentions is *subjective,* as it is only the same for members of the same culture: to become a "*velina*" is an intention directed toward a possible world which does not make sense for an American (in fact the word "velina" can only be roughly translated as 'showgirl' in English), while it is one of the most common distal intentions for young Italian girls.

This analysis has also demonstrated that mirror neurons alone are not able to recognize distal intentions: the recognition of these intentions requires a reference to a possible world, subjective and semantically definable, which cannot be reduced to the sum of motor acts toward an object. On the other hand, an accurate simulation mechanism is able to work without problems for the identification of motor and proximal intentions.

The difference between "embodied" and "situated" intentions reflects the distinction which currently exists between the two most relevant areas of cognitive psychology: the theory of embodied cognition and that of situated cognition. Despite the differences highlighted in this analysis, the two theories share a common vision of knowledge: *knowing means being able to do*.

In this view, knowledge can be defined as a "capacity for interactive action", the result of interaction in real time directed toward reaching an objective between an organism which has a body and its environment. In such a view, knowledge can be described as the capacity to behave in an *adaptive way* in one's environment: through the analysis and continuous coordination of perception and action within an environment, the subject learns how to fulfill his or her intentions.

2.3 From Action to Perception

The existence of bimodal neurons has led cognitive scientists to reflect on the characteristics of spatial perception, and in particular on the link between action and perception. This reflection has led to the belief—as previously suggested by Piaget *(assimilation)* and Gibson *(affordance)*—that we *view space in relation to the actions which we can perform in that space*.

This hypothesis, recently confirmed by various studies in the field of neuropsychology (Di Nocera et al. 2006; Matelli and Luppino 2001; Postma 2005) has two significant implications:

- The knowledge of the position of an object cannot be separated from the *affordance* that this object offers and from the actions required to reach it;
- There is not one representation of space. The space surrounding an individual is divided and represented in different partial portions of information.

For example, Previc (1998) distinguishes between the "peri-personal" (near) and "extra-personal" (far) representations of space, depending on the type of actions that the subject is able to perform in a given space. More precisely, "peri-personal space" is the result of the multi-sensorial (visual-tactile) integration of the representations required to extend one's arm (*reaching*) and manual manipulation (*grasping*).

The distinction between "peri-personal" and "extra-personal" space is already widely accepted in the scientific literature (Di Nocera et al. 2006; Knoblich et al. 2006). The boundary between these two types of spatial representation is set by the subject's direct actions: *"peri-personal space" comprises the space which is directly accessible by human action, without the necessity to move one's body; "extra-personal space" is the space which is not directly accessible.*

A recent study by Gamberini and colleagues (Gamberini et al. 2008) has demonstrated how crossing the boundary between "peri-personal space" and "extra-personal space"—both physical and virtual space—entails the activation and deactivation of two very different spatial representations. This study also confirmed the flexibility of such boundary, highlighting the effect of the artifacts on the perception of space.

As various researchers in this field (Farné et al. 2007; Holmes et al. 2004, 2007) have underlined, *during an effective action—in which the subject is able to fulfill an intention—the artifact is "incorporated" into the subject's perception*.

In practice, neuropsychological studies have confirmed the ideas of Andy Clark (2003): man is a "*natural born cyborg*" capable of incorporating the technology which he creates and uses into his existence, in order to extend his boundaries.

This process of incorporation takes place on two levels (Riva and Mantovani, 2012a): *on a static level,* modifying the boundaries of the body (Knoblich et al. 2006; Whiteley et al. 2008), and *on a dynamic level,* incorporating the artifact into the *operations,* the motor actions involved (Jacobs et al. 2008). If the use of an artifact immediately alters the subject's boundaries (Holmes et al. 2007), it is only a matter of training for the artifact to become incorporated at the level of motor function (Imamizu et al. 2007).

2.4 From Perception to Presence

In the previous paragraph, we saw how neuropsychological research has confirmed the dialectic dimension among actor, body, and artifact proposed by cognitive psychology's new ideas; by using an artifact, the subject is able to clearly and

intuitively extend his or her boundaries, *becoming "present" in the artifact which is being used.* In practice, *carrying out one's actions through the use of an artifact enables the subject to become present in the artifact*.

But what does it mean to be "present"? We shall find out in the following paragraphs.

2.4.1 Presence as a Specific Cognitive Process

The concept of "presence" originated from and was diffused by the scientific community at the same time as the introduction of a unique piece of communication technology*, teleoperators*: robots controlled from a distance by a human operator. In this case, the term *telepresence* refers to the human operator's sensation of being present in the remote location in which the teleoperator is situated.

In fact, thanks the contribution of cognitive science, it is today possible to directly connect intention to action and the subject's position, using this concept (Riva 2007, 2008a, b; Riva et al. 2011). Presence is the sensation of "being" in an environment, whether it be real or virtual, which results from the ability to carry out one's intentions within one's surroundings through the affordance which that environment offers.

According to Gamberini, Spagnolli and Mantovani, the sense of presence is linked to a subject's capacity for action and his ability to position himself within his physical and social space (Spagnolli and Gamberini 2002, 2005; Spagnolli et al. 2003). More precisely, for Spagnolli and Gamberini (2005): "Presence is the feature of the agent which is manifested through the creation of a space during action" (p. 8).

A similar, but broader view, was recently outlined by Riva and Waterworth (Riva et al. 2006, 2011; Riva and Waterworth 2003; Waterworth et al. 2010). The idea proposed by the two authors is the following: presence can be described as a *selective and adaptive mechanism which allows itself to define the boundaries of action by means of the distinction between "internal" and "external" within the sensory flow.*

In other words, from an evolutionary point-of-view, presence has three functions:

- To permit the subject to position himself in a space—real, virtual, or social—through the distinction between "internal" and "external" and the definition of a boundary;
- To check the efficacy of the subject's actions through the comparison of intention and the result of the action. From a computational viewpoint, the experience of presence is achieved through a forward–inverse model (Fig. 2.2):
  - First, the agent produces the motor command for achieving a desired state given the current state of the system and the current state of the environment;
  - Second, an efference copy of the motor command is fed to a forward dynamic model that generates a prediction of the consequences of performing this motor command;

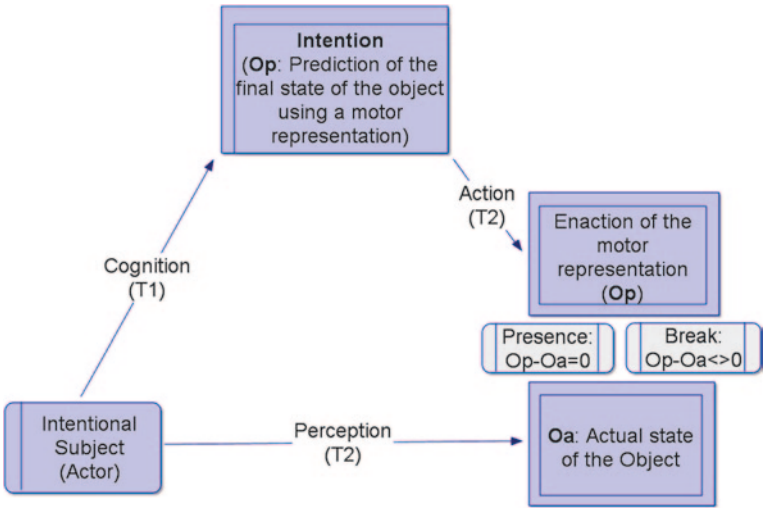

Fig. 2.2 The experience of presence

– Third, the predicted state is compared with the actual sensory feedback. Errors derived from the difference between the desired state and the actual state can be used to update the model and improve performance.

- To allow its own evolution through the identification of *"optimal experiences" (Flow)* and the incorporation of the artifacts—physical and social—linked to it.

To sum up, we can define presence as *the intuitive sensation of "being" in an environment, real or virtual, which results from the capacity to carry out one's intentions within that environment.* In other words, *because of presence, an individual is able to situate himself in a physical and social space by defining his own boundaries*.

This definition emphasizes the close link between consciousness and presence. However, consciousness and presence are dissociable mechanisms:

- *There are types of behavior and stimuli which can be consciously independent from the intentions and actions of the subject:* presence is connected to the link between intention and action. Without an intentional structure there can be no presence, even if the subject is aware of his or her own behavior. An example of this is the *"alien hand syndrome"* (Della Sala 2006): the hand of a patient suffering from alien hand syndrome moves without the patient telling it to. *Despite knowing the hand is theirs, these patients are not "present" in their hand.* The astonishment with which they view the unwanted actions carried out by their own hands comes from the fact that they did not intend to do them.
- *It is possible to unconsciously carry out one's intentions, such as in the case of operations:* a subject can carry out his or her actions without being conscious of doing so. The subject is present, but unaware of carrying out an intention. I am

present while I am pressing the keys on my keyboard to write this sentence, but I am unaware of what I am doing: I am just writing.

2.4.2 Social Presence as a Specific Cognitive Process

The concept of presence concerns the subject and his or her ability to act in the world: I am present in a real or virtual space if I manage to put my intentions into action. But how does one connect to the Other? How does the Other become present for the subject? To answer this question, we will analyze the implications of the "mirror" neurons which we mentioned at the beginning of the chapter.

These neurons, discovered in the ventral pre-motor cortex of apes (area F5), have, among other qualities, that of activating not only when the animal performs a given action, but also when the animal sees another animal—man or ape—performing the same action (Rizzolatti et al. 1996; Rizzolatti and Sinigaglia 2006). Therefore, the individual who observes is able to put himself in the shoes of the actor: I am able to understand what another is doing because when I watch him I gain experience, completely intuitively, the same neuron activity as when I perform that action.
The result is the creation of neural representations which are shared on two levels (Gallagher and Jeannerod 2002):

- On the one hand, execution and observation share the same neural substratum in one individual subject;
- On the other, when a subject observes another subject's action, the same representations are simultaneously active in the brains of both subjects.

This means that at neural level, the action performed and the action observed are codified in a multisubjective format, which does not recognize actor or observer. This process is, however, effective if the subject is capable of distinguishing between an action performed and an action perceived. As Becchio and Bertone point out (2005): *By codifying an agent-free representation of action, mirror neurons support the visual and motor comprehension of the action, but are not in themselves enough to attribute an action to an agent. This level of comprehension, defined as "agentive" by the authors, requires that the agent parameter is specified as a separate parameter: only in this way does the action become the action of a particular agent (p. 859).*

In order to be able to distinguish between myself and another subject, *I have to make use of a specific cognitive process—presence—which is able to position me "in" or "out" by analyzing my actions and their effects.*

At the moment in which the subject is able, through presence, to distinguish between him or herself and another, "an I and an Other are created". The "other similar to the Self" thus becomes, together with the self, one of the two relevant elements which the organism is able to identify within its perceptive flow.

This suggests the existence of a second selective and adaptive mechanism, social presence, *which enables the Self to identify and interact with the Other by understanding his intentions*. In other words, from an evolutionary point-of-view, social presence has *three functions*:

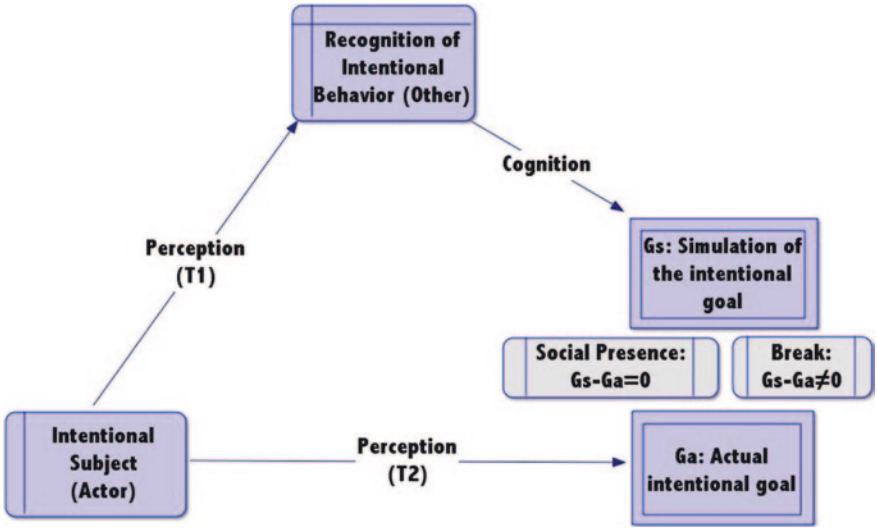

Fig. 2.3 The experience of social presence

- To enable the subject to identify the Other and to attribute to him an ontological status—"the other similar to the self"—different from the other objects perceived,
- To allow interaction and communication through the understanding of the Other's intentions; From the computational viewpoint, it happens using the same approach used by Presence (Fig. 2.3):
  - First, the agent recognizes a motor intention, and identify the actor as another intentional self (other);
  - Second, an efference copy of the motor command is fed to a forward dynamic model that generates a prediction of the consequences of performing this motor command (goal);
  - Third, the predicted state is compared with the actual sensory feedback. Errors derived from the difference between the predicted state and the actual state (break) can be used to update the model and improve performance.
- To permit the evolution of the Self through the identification of *"optimal shared experiences" (Networked Flow)* and the incorporation of artifacts—physical and social—linked to them.

In summary, we can define social presence (Biocca et al. 2003; Riva 2008a; Riva et al. 2003) as *the sensation of "being with other Selves" in a real or virtual environment, resulting from the ability to intuitively recognize the intentions of Others in our surroundings*.

From the combined analysis of presence and social presence, it emerges that the point of contact between these two processes clearly lies in the *intentions*

and their codification by means of *motor representations of action* (Knoblich and Flach 2003; Prinz 1997):

1. On the one hand, presence verifies the effective fulfillment (enaction) of the intention in action;
2. On the other hand social presence permits the identification of the Other's intentions through the analysis of his actions.

2.5 The Evolutionary Role of Presence and Social Presence

In the previous paragraph, we saw that the point of contact between presence and social presence is found in *intentions* and in their codification by means of *motor representations of actions.* We have also seen how the *dynamic theory of intentions* describes an intention as a dynamic structure organized on three levels. In the following section, we will see how this triadic structure can be attributed to the evolutionary process of the Self and is also existent in presence and social presence.

2.5.1 Presence and the Evolution of the Self

In his book, "*Descartes' Error: Emotion, Reason, and the Human Brain*", the neuropsychologist Antonio Damasio identifies the sense of the self as the essential nucleus of the conscious, *the result of interaction and the relationships between the organism and the object* (Damasio 1994). In this view, the conscious consists of the construction of knowledge concerning two elements:

1. the organism which enters into a relationship with an object;
2. the object involved in the relationship which brings about a change in the organism.

In Damasio's view, this ability is not immediately natural for the organism, but it evolves through time leading to a level of conscious (Fig. 2.4).

The origin of the sense of the self lies in the *"proto-self"* (Damasio 1994), "a coherent collection of neural patterns which map second by second the state of the physical structure of the organism in its various dimensions" (p. 189). The proto-self's main task, of which the subject is not aware, is 'positionality', that is, to identify organism's physical boundaries by verifying somatic functions.

Through the evolution of the proto-self, two other types of self successively emerge—the "*core self*" and the "*autobiographical self*"—which are at the basis of conscious experience. The core self can be described as a conscious representation of the present in which there are three elements: the object of which the

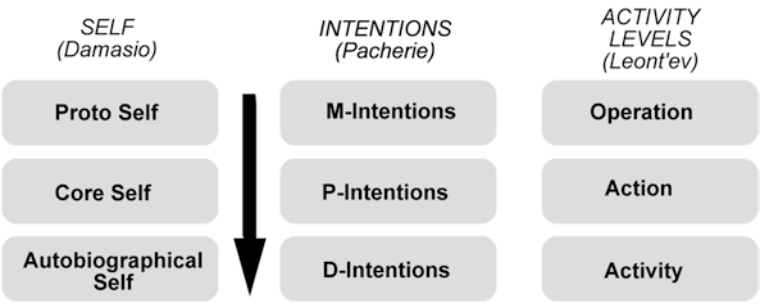

Fig. 2.4 From self to agency

subject is aware, the position of the subject's own body in relation to that object, and the relationship which is established between the two.

The transition from the core self to the autobiographic self is made possible through the use of language. By using language we can create a story, our story, in which we position and structure the different experiences which we have had. It is through the development and awareness of this story that the self becomes self-conscious, aware of itself.

Beginning with this theory, the hypothesis formulated by Riva and Waterworth (Riva et al. 2004; 2006) is that each level of the Self is associated to *a specific ability to differentiate between internal and external* which increases the control that the organism has over its own activities, thus increasing its chances of survival. Furthermore, the close link between the levels of the Self and the dynamic theory of intentions (Riva 2008a) enables us to *associate each level to a specific intentional capacity and a level of presence*.

1. *Proto-self*: Motor Intentions (the Self toward the body);
2. *Core self*: Proximal Intentions, directed toward the Present (the Self toward the World/Nature);
3. *Autobiographic self*: Distal Intentions, directed toward the Future (the Self toward Possible Worlds/Culture).

In practice, the Self evolves by extending the boundaries of its actions through the acquisition higher levels of intentional ability. This allows the limits of the subject's actions to be extended (Fig. 2.5).

In fact, the three levels of intention are differentiated by the limits to the actions which the subject is able to perform. The boundaries of the actions resulting from motor intentions are defined by the relationship between body and mind: I can only move my body. The boundaries of the actions resulting from proximal intentions depend upon the relationship between the mind and the physical world: I can only interact with the objects which are present around me. The boundaries of the actions resulting from distal intentions are given by the relationship between the mind and the possible world: I can try to do everything that I can imagine doing.

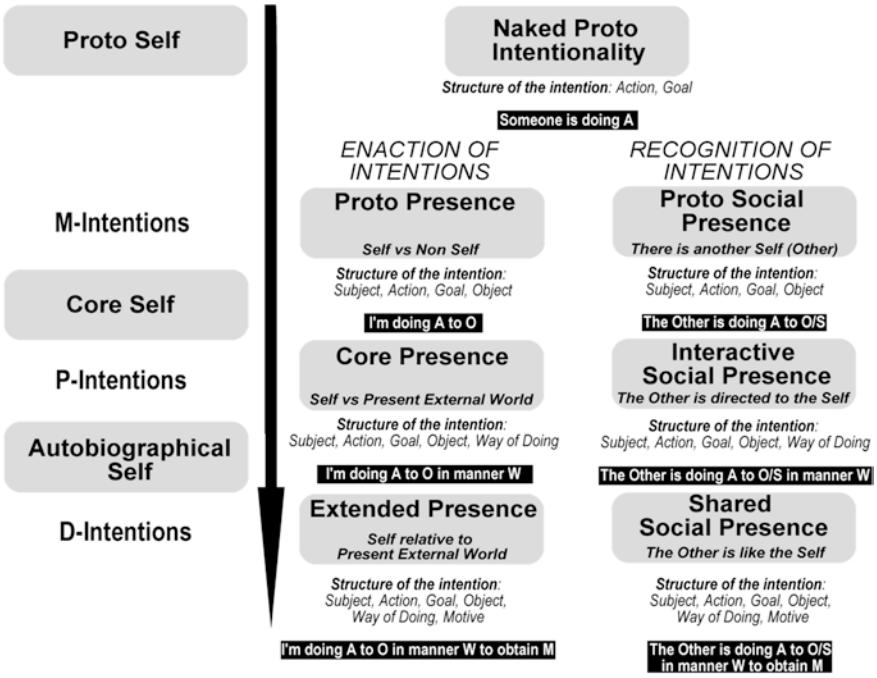

Fig. 2.5 The evolution of self

2.5.2 The Three Levels of Presence

As we have just seen, the development of an intentional ability and the positioning of the Self enable presence to evolve through three successive stages or levels. We shall now analyze these in greater detail.

The first level of the self, the *proto-self,* corresponds to "*proto presence",* the ability to enact motor intentions by moving the body (given that the boundaries of the self's actions are determined by the body). This is made possible by the Self's ability to distinguish between internal and external states. This happens through *perception–action coupling:* the more the organism is able to *correctly associate stimuli to movement in sensorial flow,* the better it is able to differentiate itself from its external surroundings and thus increase its chances of survival (the Self as opposed to the not-Self). According to evolutionary psychology, a newborn learns these skills during the first three stages of the sensorimotor phase (Piaget 1945).

The second level of the self—the *core self*—corresponds to *"core presence",* the ability to enact proximal intentions through the identification of direct *affordances* (the limits of the Self's actions are determined by the present world). This is made possible by the Self's ability to separate and couple representations and perceptions,

picking out those which are relevant. Within the experiential flow, the Self separates intentional information from the real object. The better the organism is able to distinguish between imagination and perception, planning, and action, the greater its chances of survival will be.

However, the organism must also be able to analyze and identify the perceptions which correspond to the intentional information (*relevance*). The more the organism is able to successfully connect intentional information to real-world objects, the greater the likelihood of fulfilling its proximal intentions and thus the greater its chances of survival (the Self in relation to the present world). In general, there are two elements which allow this distinction to be made: *vividity* and *multisensoriality.* In fact, mental images are much less vivid than perceptions, and are also characterized by the predominant visual component.

Coupling, on the other hand, takes place thanks to *recognizability:* the capacity to associate a real object to a given intention. According to evolutionary psychology, a newborn learns this skill during the final three stages of the sensorimotor phase (Piaget 1945).

The third level of the self—the *autobiographic self*—corresponds to *"extended presence",* the ability to enact distal intentions (the co-networked flow in the Self's actions is the possible/conceivable world) through the identification of indirect *affordances.* This is made possible thanks to the Self's ability to analyze representations and identify those which are relevant. The better the organism is able to separate itself from the present and *identify within its own representations those most relevant,* the greater are its chances of survival (the Self in relation to possible/conceivable worlds). According to developmental psychology, the newborn learns this skill in the preoperational phase (the acquisition of semiotic functions) before then moving on to the concrete operational and formal operational stages (Piaget 1945, 1947).

Extended presence is also the element which allows for the subject's "*absence",* that is, *its presence in an exclusively mental activity*. During an experience of absence, such as thinking, daydreaming or meditating, the subject tries to separate itself as much as possible from the outside world and to concentrate exclusively on its own mental processes (the self outside of its external surroundings). In general, the more the subject believes that mental activity is important for its "internality", the greater its attempts will be to isolate itself from the outside world.

What is the link between the three levels of presence? They are evolutionarily organized—from the lowest to the highest—but functionally separate. This means that, in the case of injuries which may impair the subject's ability to activate one of the three levels, the others will still be functional. For example, in the case of a neurologic disorder called *autotopagnosia*—the inability to localize parts of the body—the subject loses its *proto presence*. This does not prevent the subject from continuing to experience core presence and extended presence.

The three levels of presence are linked by their *simultaneous influence on the actions of the subject*: The experience of the action changes according to the presence of the subject on each of the three levels. It is important to note that the subject is usually unaware of the role of the three levels of presence in determining

the characteristics of his or her actions. *However, the subject is evolutionarily programed to consciously understand the variations between the three levels and if necessary, to modify an action in order to return to its initial state.* If, during a virtual reality experience, my arm moves and suddenly comes into contact with a cable, I immediately become aware of the change at the level of proto presence and I shift my attention from my virtual reality experience to the cable which is impeding my movement (Spagnolli and Gamberini 2002).

The same is true for the other levels. If the reality TV show the subject is watching becomes boring or upsetting, the subject becomes immediately aware of the variation in the level of extended presence, and can decide whether or not to pick up the remote control and change channel.

As will we see in greater detail, there are particular situations defined as "flow experiences" or "optimal experiences", in which the subject's actions are so fluent and effective that they produce a feeling of maximum presence within the subject. On the other hand, every glitch in the action makes the medium visible, and thus increases the perception of opacity.

2.5.3 The Three Levels of Social Presence

The importance of imitation in developmental psychology and in particular its link to empathy and intentionality has driven several researchers to explore this area of study. One of the researchers who has studied the development of imitative processes and their link to cognitive processes in depth is the American psychologist, Andrew Meltzoff. Meltzoff's research is well known in developmental psychology for having demonstrated that, unlike Piaget theorized, a child is capable of imitating various gestures made by an adult—sticking out their tongue, opening their mouth, or moving a finger—as early as only 2 or 3 weeks old (Meltzoff and Moore 1977).

Meltzoff and Decety have recently summed up 25 years of research on imitation in a review for the Royal Society (Meltzoff and Decety 2003). The article identifies three phases in the development of imitative skills:

- *The capacity to imitate a human being*: as we have noted, the child begins to develop this capacity when it is 2 weeks old. During this phase, the child learns first which parts of the body to move and how to move them.
- *The capacity to identify a human being who is imitating the child*: the child begins to develop this ability at around 14 months. The child understands that, although he is not controlling the adult's actions, the adult is imitating him.
- *The capacity to recognize intentions and emotions in a human being*: from 18 months the child is able to understand that a subject's activities are structured in terms of objectives and intentions.

On the basis of these points, Meltzoff has developed the "*like me"* model, which explains the structure of the process in three successive phases through which a child is able to develop a theory of the mind (Meltzoff 2007):

- *The presence of an innate predisposition for action representation*: thanks to *mirror neurons* the child is able to experience a perceived action almost as if he had performed it;
- *First person experience*: through his daily experiences the child learns to connect his motor acts with mental states. For example, the child learns to connect the feeling of having a wish being denied with the facial expressions and movements which indicate this.
- *Understanding other minds*: when the child sees other people behaving like him, he is able to understand that, by analogy, they are experiencing the same mental state as he does when he behaves that way.

Our view links the different phases classified by Meltzoff to the capacity to identify the specific intentional levels which permit the subject to perform a given social activity: if the recognition of motor intentions enables the subject to *imitate,* the capacity to recognize motor and proximal intentions allows him to *interact*, while the ability to recognize motor, proximal and distal intentions offers the subject the possibility to *communicate* and *empathize.* It is important to highlight the direct link between presence and social presence: the subject is only capable of recognizing intentions which he is able to perform (see Fig. 2.5).

The first level of imitative skills—the ability to imitate a human being—corresponds to *"proto social presence",* the ability to recognize motor intentions, which allows the Self to recognize an intentional Other: the better the subject is able to *recognize within the sensorial flow the stimuli which relate to "another similar to the self",* the better he is able to carry out an intention, and thus increases his chances of survival (the Other in opposition to the Self).

The second level of imitative skills—the ability to identify a human being who is imitating me—corresponds to *"interactive social presence",* the ability to recognize motor and proximal intentions which allows the Self to identify the Other whose intention is directed toward him: the better the subject is able to *recognize within the sensorial flow the intention direct toward him by "an Other similar to the self"*, the greater the chances of successfully carrying out an action, and therefore the greater the chances of survival (the Other toward the Self).

The third level of imitative skills—the ability to recognize the intentions and emotions of a human being—corresponds to *"shared social presence",* the ability to recognize motor, proximal and distal intentions, which enables the Self to identify Another whose intentions correspond to his own: the better the subject is able to *recognize within the sensorial flow an "Other similar to the self" with intentionsthe same as his own,* the better he will be able to successfully initiate collaborative interaction or communication, increasing his chances of survival (the Other like the Self).

Shared social presence permits the subject to feel empathy, *the capacity to see oneself in another person, to get inside another's thoughts and state of mind.* During the experience of empathy, the subject separates himself from his own intentional and emotional state, and identifies with that of another person (the Other merges with the Self).

What is the link between the three levels of social presence? As with presence, the three levels are evolutionarily organized: from the lowest to the highest. However, unlike presence, the levels of social presence are not functionally separate but mutually inclusive. This leads to two consequences. The superior levels also include the inferior levels: if the subject is able to understand distal intentions (shared social presence), he is also capable of understanding motor intentions (proto social presence). At the same time, it is impossible to activate the higher levels of social presence if the lower levels are not activated first: if I am unable to understand a subject's proximal intentions (interactive social presence) then I will not be able to understand his distal intentions (shared social presence).

The three levels of social presence are linked by *simultaneous influences on the subject's capacity for social interaction*: the way in which the interaction is experienced changes depending on the level of social presence experienced by the subject. It is important to note that, as with presence, the subject is unaware of the role of social presence in determining the characteristics of his actions. He is, however, evolutionarily programed to perceive the shift from one level of social presence to another in social interactions. Furthermore, if this shift offers him a valuable opportunity, the subject can act in order to increase his level of social presence. If a girl starts staring at me at a party, I immediately become aware of the shift from proto social presence (the girl is at the same party as me) to interactive presence (the girl is looking at me). If the girl is interesting, I can approach her and talk to her in order to understand her intentions: is she looking at me because she likes me or because I have a stain on my jacket?

2.6 The Social Process: The Point of Contact Between Presence and Social Presence

So far, we have analyzed presence and social presence separately. In fact, there is a very strong link between these two concepts, and their point of contact is the social process: it is thanks to the correct levels of presence and social presence that it is possible to communicate. To be able to communicate the subjects, as well as sharing a series of common concepts, must be able to recognize the presence of another in the same situation (proto social presence), understand the other's wish to begin communication (interactive social presence), and they must be able to identify the intention which the other expresses through communication (core presence and extended presence) and express their own actions through motor acts (proto presence).

The relationship between social process and presence is, however bidirectional. On the one hand, presence and social presence are necessary in order to

interact and communicate. On the other hand, it is through the social process that the subject and the group evolve. When this happens, the subjects and the group progressively increase both the characteristics of their own intentions (from motor to distal) and the sense of presence that they experience, creating the basis for new creative acts, both individual and group. To understand how this occurs, however, it is necessary to introduce three new concepts: *optimal experiences, memes, and narration*.

2.6.1 Presence, Activity, and Optimal Experiences

One of the deductions which can be made from what has thus far been discussed, is the existence of a link between presence and the effectiveness of an action: the greater level of presence a subject experiences in an activity, the greater the organism's involvement in the activity will be, and this increases the probability of the activity ending well (the transformation of the intention into action).

This concept is particularly important when the subject carries out the activity by using a tool, including media. The use of a tool compels the subject to modify his action, forcing him to adapt himself to the tool. In this case, given equal conditions and skills, the greater efficacy of the activity when carried out using a tool is linked to the tool's ability to facilitate the subject in increasing his level of presence. We shall give an example to explain this concept.

Imagine that we have a computer and have to copy a file from a disk onto a USB stick. We have seen that proto presence constitutes the first level of presence, which concerns the level of coupling between movement and perception. This means that an activity in which it is easy to immediately identify the result of one's own movements is preferable to an activity in which this is not possible. For this reason, the subject, all things being equal, will tend to choose a program which facilitates the direct perception of movement—*I move the file by dragging it with the mouse*—as opposed to one which does not—*the instruction "copy name-of-file a: b:"*. Likewise, using the arrow key on the keyboard to copy the file is preferable to using an instruction, but worse than using the mouse.

During an activity, we are obviously not influenced by only one level of presence, but by all three levels together. For example, when we are doing a distance-learning training course, interaction with the mouse is preferred to interaction with the keyboard (proto presence); the use of multimedia equipment is better than making use of a simple text (nuclear presence); undertaking tasks linked to experience and to the interests of the project is preferable to carrying out abstract tasks (extended presence). But what happens when we have to choose between activities or artifacts which differ within the different levels of presence? For example, how do users choose between a distance-learning training course with interesting modules but which uses only texts, and another which makes extensive use of multimedia but which addresses less interesting topics? In these situations, the level of presence which is evolutionarily superior prevails: first extended presence,

followed by nuclear and then proto presence. Users will, therefore, choose the course featuring interesting topics but which only uses text.

The second consequence of the considerations made in the preceding chapter, is the existence of certain *"optimal experiences", in which the individual experiences the maximum feeling of presence at each of the three levels.* This experience, when it is associated with a positive emotional state (it is also possible to experience the maximum feeling of presence in emotionally negative situations, such as during an escape) is defined as *"flow experience"* (Csikszentmihalyi 1990, 1994). This state is characterized by a high level of concentration and participation in the activity, by the balance of the perception of the difficulties of the situation and the *challenge*, and personal *skills,* by the distortion of the sense of time (the internal clock slows down, while the external one speeds up), and by a natural interest in the process which produces a sense of pleasure and satisfaction.

Similar considerations can also be made concerning the concept of social presence. First, there is a link between presence and efficacy of interaction: *the more often that the organism experiences a high level of social presence during interaction, the greater his ability to understand the other, and therefore the chances of the interaction being successful increase.*

Second, there is also a specific optimal experience for social presence—*"networked flow"*—the result of the association between:

- *The maximum level of social presence*: the feeling of sharing objectives and emotions with others;
- *The group members' perception of being in a phase of liminality*: a state of transition, of being "about to…", in which the earlier *positive* condition is no longer present, and the future *positive* condition has not yet come into being.
- *The shared recognition of a possible common strategy for exiting from liminality*: everybody working toward a shared objective, which the group can change.
- *The maximum level of presence*: the feeling of being able, through the personal involvement in the group, of successfully transforming intentions—both individual and collective—in actions.

Let us now explore these concepts further.

The term *liminality* denotes a state of transition, of being "about to…", in which the earlier *positive* condition is no longer present, and the future *positive* condition has not yet come into being (Turner 1982). A typical situation of liminality is when a recent graduate is looking for work: he is no longer a student, but he is not yet employed. Another example is when a person has been left by their partner: they are no longer part of that couple, but they are not yet part of a new one. When this happens the subject is naturally pushed toward change.

His situation is linked to the psychological concept of the "inner conflict", described by Festinger (1957) and by Miller and Rollnik (1991): the perception of the discrepancy between reality on one side, and aspirations and expectations on the other. The inner conflict pushes the subject to change, but the effectiveness of the change is linked to the *self-efficacy* of the subject: the subject's belief in his

ability to change his own behavior (Bandura 1997). If the subject thinks that he is able to change, he will try to do so. If not, he will wait until he is forced to do so by a feeling uneasiness or by his surrounding environment.

In this case, the maximum level of social presence permits the subject to increase their self-efficacy and to find the motor for change within the shared group activity. As we will see in Chap. 3, there are several cognitive and social factors which influence this process. For the moment, we shall limit ourselves to underlining how the sensation of sharing objectives and ideals, associated to the push for change brought about by the feeling of liminality, can lead the group to the experience of *networked flow*.

This concept shares a number of similarities with the concept of the "nascent state" proposed by Alberoni. Subjects who go through this have a strange experience which causes them to develop an alternative interpretation of existence (Alberoni 1977). *Nascent state is an exploration of the boundaries of the possible, given a certain type of social system, with the goal of maximizing what is realizable within that experience and solidarity for oneself and others in that moment in time. The group of men among whom a nascent state is created will always attempt to construct a way of living which is completely different from the everyday institutional norm (p. 31).* Alberoni's ideas highlight how the experience of *networked flow* is important for the subject and is therefore characterized by a high level of presence. The simultaneous union between high levels of presence and social presence make it a *state of transition* which constitutes the specific conditions for social transformation. It is at this moment that the subjective intention becomes collective (*we-intention).* As noted by Searle (1995), collective action is characterized by the use of an individual action to reach a shared goal: *I intend to perform this action as part of our common action*.

2.6.2 The Result of Optimal Experiences: Memes

What happens during an optimal experience? The hypothesis presented in this book and explored further in the following chapter, is that during an optimal experience the subject is able to produce creative works more easily. Notably, optimal experiences are fundamental for the creation and diffusion of "*memes*". But what is a meme?

The concept of memes was first introduced by the zoologist Richard Dawkins, in opposition to the concept of the gene: an element of culture which can be transmitted from one individual to another by non-genetic means, and in particular through imitation (Blakemore 1999; Dawkins 1989). Dawkins presents the concept of memes as part of the theory of "universal Darwinism", according to which life evolves through the differential survival of entities, which replicate themselves, "replicators".

If a gene is a replicator of a particular genotype, the meme is the replicator of a phenotype (Dawkins 1989): a unit of cultural information which is copied with variations or errors, and whose nature influences its chances of replication. In practice, it is via memes that that skills, habits or manners are transmitted from

one person to another through imitation. For this reason, memes do not overlap with the cultural units, but are selected by them (Dawkins 1989).
There are three elements in Dawkins' definition which are not sufficiently explained by the author (Blakemore 1999; Distin 2005):

- The content of the meme, or, more specifically, what type of cultural information it contains;
- The different ways that memes can be transmitted;
- Whether memes only exist inside the brain or also outside.

This book presents two hypotheses:

1. That the memes' content is intentional: *each meme contains within it a specific intention.*
2. *The creation and diffusion of memes depends on the* level of presence and social presence experienced during action and communication.

More precisely:

- Memes are more likely to be created during an activity characterized by high levels of presence: The condition required for the creation of a meme is *a high level of extended presence*, that is, the intention must contain elements of particular significance for the subject's representations. For example, if I am sitting in my armchair listening to a song on the radio which brings to mind memories from my past—I remember my first holiday abroad—the words and notes will tend to become fixed in my memory. Moreover, high levels of proto and nuclear presence linked to extended presence further increase the chances of creating memes. The more vivid the music is, the greater the possibility that a meme will become activated. The concept of presence allows us to predict the development of memes, even in situations where there is a high level of extended presence but a negative emotional element. For example, the screams of a hunter engaged in combat with a wild beast may become a meme and be used by other hunters to indicate the moment of battle.
- Memes are more easily replicated during an activity characterized by high levels of presence and social presence. More precisely, the replication of memes requires:
  - *High levels of extended presence*: the interaction must contain notable significant elements for the subject's representations;
  - *High levels of shared social presence*: During the intentional interaction I must be able to understand the meaning that the "other similar to myself" attaches to it.

When the meme is produced by a "friend"—a person who I consider like myself, or by a person who I respect—during an activity directed toward an objective which is important to me, the probability of the meme being transmitted (the internalization of the intention) increases significantly. This explains why the behavior of singers and actors is so often imitated by their fans.

2.6.3 From the Group to Society: The Role of Narration

The creation of a new meme—a new product, a new concept, a new idea—does not necessarily imply its diffusion. As we have just seen, the transmission of memes is strongly linked to the level of social presence experienced during the interaction between the subject who passes on the meme, and the subject who receives it. There is, however, a tool which is able to facilitate this process: *narration*. As noted by Bruner (1991): *Just as our experience of the natural world tends to imitate the categories of familiar science, so our experience of human affairs comes to take the form of the narratives we use in talking about them* (p. 5).

It is in fact narration which connects one meme to another, giving them a sense and allowing people outside the group to recognize them as possible intentions (internalization). The link between narrative, memes, individuals, society and activities, exists on four levels:

- *Individual:* narrative thought is the cognitive tool which enables us to interpret situations and to construct a vision of the world which is not only related to the present, and which guides our individual activities;
- *Social:* narratives allow memes to connect with each other, so that the community of customs to be defined. This allows social activities to be structured and artifacts to be constructed;
- *From social to individual*: through the processes of *positioning and internalization,* narratives influence the characteristics of our social identity and our vision of the world;
- *From individual to social:* through narration, made possible by narrative thought and the process of *externalization,* we are able to share our vision, expressed in a series of memes, which allows common activities in the community of customs to be structured.

Narrative psychology maintains that a significant part of knowledge of the self is organized in narrative schemes which the individual uses to interpret reality and to give it meaning (Crossley 2000; Rollo 2007). Hutto, exponent of the *Narrative Practice Hypothesis* (2008), is one of the foremost advocates of this view and he defines the narrative structures which facilitate social interpretation as "*folk psychology narratives*": narratives which allow the listener or reader to understand the thoughts, actions and feelings of the characters. These narratives are not structured as rules, but as descriptions of subjects who act according to precise objectives and whose actions change their emotional state and their relationship with the world.

As Hutto notes (2008), the most effective conversations are those in which the subject is forced to present and negotiate his personal point-of-view: *The most prominent feature of such interchanges is that of participants being unavoidably forced to come to terms with others' peculiar takes. (p. 136).*

Using the same terminology that we have employed thus far, it can be said that only narratives in which the subject is present are able to position the subject: the greater the subject's presence, the greater the positioning effects of the narrative.

2.7 Conclusions: The Process of Networked Flow

In the previous paragraph, we concluded our extensive description of the cognitive processes which allow for the emergence of *networked flow*, and we are thus able to answer the questions that were posed at the beginning of the chapter.

What makes a subject "present" within a group? It can be said that a subject is present within a group if he is able to put his own intentions (presence) into practice and to understand the intentions of the other group members (social presence). This implies that not all groups are the same: it is not enough to put together a group of people in order for them all to be "present". It is necessary to give the group the possibility of expressing itself and of understanding what each individual member is doing. This becomes a fundamental requirement when the group is broken up and the members can only communicate through the use of modern technology.

However, if this should happen, that group may transform itself and become a creative group characterized by an optimal group experience—*networked flow*.

Csikszentmihalyi, in his book on creativity (1996) identified it as the result of three elements: a culture that contains meanings and symbols, a person who uses optimal experiences to bring novelty into the symbolic domain, and an external group who recognize and validate the innovation. At this point we are able to shed some light to the relationships between three elements.

To have a creative group four conditions must be met: (i) *The maximum level of social presence*: the feeling of sharing objectives and emotions with others; (ii) *The group members' perception of being in a phase of liminality*: a state of transition, of being "about to…", in which the earlier *positive* condition is no longer present, and the future *positive* condition has not yet come into being; (iii) *The shared recognition of a possible common strategy for exiting from liminality*: everybody working toward a shared objective (collective intention), through which the group can change; (iv) *The maximum level of presence*: the feeling of being able, through the personal involvement in the group, of successfully transforming intentions—both individual and collective—in actions.

When this happens the team experience an "optimal" experience (Riva et al. 2009) *at individual level, each subject experiences a state of conscience characterized by high levels of concentration, involvement, control of the situation, clarity of objectives, natural motivation and a positive emotional state; at group level, all the members of the team share the same intention (collective intention) that is experienced as critical to produce a long-term change relevant both for the team and for themselves.*

The result of the optimal experience is the creation of new artifacts, memes: new products, new concepts, new ideas. However, the group is not necessarily able to promote and share these new concepts outside its boundaries. In order for this to happen, two things are required: (i) the existence of interactions between group members and people outside the group—characterized by high levels of social presence—which make use of the new concept; (ii) the creation of narratives

which link the new concept to old ones allowing people outside the group to make sense of it (internalization).

In sum, an optimal personal experience produces memes that are used by the group to define its own culture (subculture). When these memes are internalized by most individuals, through imitation and communication, they modify and shape the culture and the behavior of the individuals.

Into this view, *networked flow* is a process of *transformation and creation,* which constitutes the specific means for social change (Gaggioli et al. 2011). We use the term 'process' because the final outcome of *networked flow*—social change—can only take place after a succession of phases. The following chapter will explore these different phases and explain their particular characteristics.