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Reproducing Organizational Networks in Laboratory with Mirror Neurons Perspective

Laura Tampieri

Abstract

The paper analyses the development of new organizational arrangements focusing on inter-organizational forms building and adopting the mirror neurons perspective. This approach could be tested with the Practice Management (Simulimpresa) methodology, based on learning by doing, for two reasons: first, it consists in the reproduction of a real organization in a simulated environment and, secondly, it is a didactical methodology addressed to develop behaviours oriented to networks management. The paper investigates the dynamics of internal and external ties developed by Perting Ltd, the Practice Firm established since 2001 in Bologna University, still in use for didactical and research purposes. The hypothesis is concerning the existing of a correspondence between internal and external ties produced during experimentation. This would be an attempt to study the appliance of mirror neurons theories to the building of organizational forms starting from the virtual ones realized by Practice Management, as a way to facilitate the reproduction of organizations in the real world. The findings point out that intra-inter organizational ties developed by Perting in simulation laboratory seem to have a significant relation to new forms of organizing created by the symmetry real-simulated environment and as a structured feedback from managerial activities realized by participants.

Il paper analizza lo sviluppo di nuovi assetti organizzativi concentrandosi sulla costruzione di nuove forme organizzative adottando la prospettiva dei neuroni specchio. Questo approccio potrebbe essere verificato con la metodologia di Simulimpresa (Practice Management), basata sul learning by doing, per due motivi: in primo luogo, l'approccio consiste nella riproduzione di una vera e propria organizzazione in un ambiente simulato e, in secondo luogo, la Simulimpresa costituisce una metodologia didattica indirizzata allo sviluppo di comportamenti orientati alla gestione di reti. Il lavoro indaga le dinamiche dei legami interni ed esterni sviluppati da Perting Srl, l'impresa simulata avviata, introdotta dal 2001 nell'Università di Bologna, ancora in uso per scopi didattici e di ricerca. L'ipotesi riguarda l'esistenza di una corrispondenza tra legami interni ed esterni prodotti durante la sperimentazione. Questo vorrebbe essere un tentativo di studio dell'applicazione delle teorie dei neuroni specchio alla costruzione di forme organizzative partendo da alcune forme virtuali realizzate tramite il Practice Management, come un modo per facilitare la riproduzione di organizzazioni nel mondo reale. I risultati sottolineano che i legami intra-inter organizzativi sviluppati da Perting nel laboratorio di simulazione sembrano avere una relazione significativa con nuove forme di organizzazione create dalla simmetria "ambiente simulato / ambiente reale", come un feedback strutturato derivante dalle attività gestionali realizzate dai partecipanti.

Keywords: Practice Management, Ties, Mirror Neurons, Organizational Networks

1 – Introduction

The paper investigates the development of new organizational forms through Practice Management (PM) of Simulimpresa and its location in the theory assuming the perspective of mirror neurons as a neuronal expression of interactions among people and their organizations. This approach could be applied in Simulimpresa considered, from one side, as the reproduction of a real organization in a simulated environment and, from the other side, a didactical methodology addressed to develop behaviours oriented to networks management.

These topics are discussed considering the case of Perting Ltd, the Practice Firm (PF) established

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since 2001 in Forlì School of Economics, Management and Statistics – University of Bologna that represents, still today, an unique laboratory to test managerial practices.

PF (also known as simulated enterprise, training firm, virtual enterprise) is a simulated business set-up experienced by students, during their studies, under the supervision of teachers/tutors (Tampieri, 2014) with the main aim of developing managerial and technical skills, according to the "learning by doing principle" (Krasniqi *et al.,* 2011) and, starting from 2010, to test the organizational behaviour and theoretical hypothesis on network dynamics.

In particular the research detects the dynamics of internal ties (with teacher/tutor and other organizational units) and external ones (with individuals/organisations such as: central office, customers, suppliers, consultants, business partner and University partner projects) developed by Perting Ltd units during A.Y. 2014-2015 Simulimpresa course.

The hypothesis refers to the existing of a correspondence between internal and external ties produced during the experimentation. This would be an attempt to study the appliance of Mirror Neurons Theories (MNT) to the building of organizational forms starting from the virtual ones realized by Practice Management, as a way to facilitate the reproducing of organizations in the real world.

The paper, after briefly outlining the theoretical background, presents the methodological structure used to determine the main findings. The results will be useful for producing further research insights on the field.

2 - The theoretical background

The multidisciplinary approach, that is developing in management, information technology and biomedicine field and based on competencies in Neuronal Analysis, Big Data Mining, Practice Management and Network Organization is outlined. This considers the neuronal model of networks with high standards of performance and its control that defines the neuronal structure of these organizations as the projection of connected perceptual structure of people.

The biomedicine, in particular, is handling the operation of neural networks and their outward projection for the perception , understanding and action on the world around (Arbib *et al.,* 1997; Rizzolatti & Vozza, 2008) according to the hypothesis that organizational structures are a projection of the neuronal structures of people.

In this field, the more recent studies have identified, in the frequency of different functional areas usage by the neuronal structures, the significant behavior profiles that distinguish the exploring from the exploiting approach by linking these two aspects to the continuous renewal to which the connections are submitted in order to assess the reproducibility of the network organizations in a perspective of self and co –generation (Sebastiani *et al.,* 2014; Hutchison *et al.,* 2013).

The analysis of the processes of self and co - generation is connected to the dynamics of internal and external ties developed by organizations as well as models of neural networks according to recent results obtained from experiments in biomedicine (Della Penna *et al.,* 2015a,b) and neuroscience (Rizzolatti & Sinigaglia, 2010) .

The application of neural approach to the study of organizations has, as a key area, the one related to decision-making processes that are delegated to lower levels of hierarchy or peripheral areas as it is estimated that many decisions are not " different from those usually taken " (Babiloni *et al.,* 2007).

This case opens the way to the hypothesis about the process of automation and optimization of resources based on neural approach.

According to this perspective, most of the decision-making processes is more similar to a recognition of a situation rather than to an explicit assessment of costs and benefits.

It is noted that the literature of management (Frigotto *et al.,* 2014; Vicari & Troilo, 2003) implicitly assumes that people have cognitive general competencies that can be applied to any type of problem. Furthermore it is assumed that to face a problem with the same characteristics people behave in an equivalent manner.

Instead the approach of neuroscience suggests that the behaviour critically depends on how a specific problem can be analyzed by the particular neuronal module that fits that type of analysis. In this regard, in fact, when there is a specialized neuronal module and this is applied to a particular task, the processing is fast and the task is effortlessly performed. To do this, however, the surrounding organization must be appropriately structured according to a functioning that is compatible with the neural model. The problem that then arises is whether, under this perspective, the organizational network created by the relationships between organizations and / or between their component units gets in their operation parameters of structure and process similar to those of neuronal networks.

According to Babiloni *et al.* (2007), knowing how the brain solves problems and what neuronal specialized modules it has to do that, will change our way of understanding how people differ from each other in their behavior inside the organization.

The application of neural approach to the study of organizations and organizational networks focuses on the knowledge and defines the organization as a network of neurons characterized by a great adaptive capacity and flexibility of action and reaction. In this way the organization can incorporate and disaggregate

parties, all within streams and cross-cutting processes (Iacono, 2001).

Recent studies conceptualized social systems as self poietic using the idea of self- closing and self-reproduction of the elements and of the unity to identify a class of systems distinguishing the different types based on specific ways of self poietic reproduction (Addario, 2010; Mella, 2014). The theory of social systems has, as its unit of analysis, the system obtained by the distinction system / environment. This requires to establish what precisely distinguishes these systems and what they have in common, identified in their self poiesis (Luhmann, 1986).

Further to these Theories many scholars investigated a multiplicity of streams related to interorganizational ties dynamics (Dagnino *et al.,* 2016; Ferriani *et al.,* 2012; Ahuja *et al.,* 2012), network analysis (Owen- Smith *et al.,* 2015; Quintane *et al.,* 2013) and new organizational forms (David *et al.,* 2013) contributing to widen the variety of management approaches that may be used.

The practice offers many tools to reproduce and analyse organizational networks as: DNA-7, KeyNetiQ, Kumu, Orgnet, OrgMapper, Polinode, Socilyzer, Synapp and Syndio. These have different specifications that allow, for instance, to capture, visualize and analyze complex networks of formal and informal relations within an organization, to realize network analysis including the integrated visualization and calculation of advanced network statistics.

The study of complex systems has opened many fields of exploration that attracted a great scientific interest. In particular, the importance of intangible capital , the emergence of an organization increasingly networked, relational and cognitive as well as the design of new business artificial models gave impulse to research able to investigate relational behaviors and organizational processes / structures (Siggelkow, 2002).

The organization is a system that tends towards an "organized complexity". The turbulence and uncertainty of the environment, the global competitiveness and the unpredictability of the market, urge scholars to address cross-cutting themes that move from neuronal analysis, big data mining, practice management as well as network and performance evaluation.

On this purpose MNT could be useful to the development of managerial knowledge considering an analogical thinking perspective. Any case without an empirical and experimental validation the analogy is only a formal connection with problems in the practical appliance on the ground of theories derived by analogical thinking.

The MNT uses itself an analogy that implies the symmetrical reproduction of structures and behaviours. Therefore, considering this dual extent of the analogy, in neurosciences and in management, the empirical and experimental approach assumes great importance for the validation of the proposed and discussed hypothesis.

The neuronal analysis based on mirror neurons perspective gives evidence to the feasibility of the hypothesis as it determines a feedback process between two subjects in which the activation of some brain area of one subject produces a similar reaction in the brain of the other subject as it concerns the location in the brain structure and the process of learning. Summarizing, in managerial terms the hypothesis could be that, on the same time there could be a reciprocal correspondence as it concerns the structure and the process of building and changing organizational forms.

The organizational structure could be expressed in general terms in a network form and in particular in a hierarchical/functional asset. As it regards the process, the renewal of ties is assumed to be originated or cancelled by performed interactions.

In Management Studies the developing of new theoretical contributions could be associated to analogical thinking and interpretation, from which new candidate inferences are derived, or counterfactual thinking and reasoning, through which existing theories area challenged and, in turn, rethought and remodelled (Cornelissen & Durand, 2014). These Authors distinguished different types of analogies (heuristic, causal and constitutive ones) in theorizing basing the way by which researchers move from a domain of knowledge on which they have familiarities to another target domain not yet fully understandable and explainable for processing an extended metaphor. Therefore the presence of metaphors systems among domains suggests that such metaphors are processed as systematic analogies (Gentner *et al.,* 2001).

The analogy, based on component processes that comprise structural alignment, inference projection, evaluation, schema abstraction and re – presentation, play a central role mainly in learning (Gentner & Colhoun, 2010) focusing on similarity and association as the two main forces of mental organization that influences interorganizational behaviours.

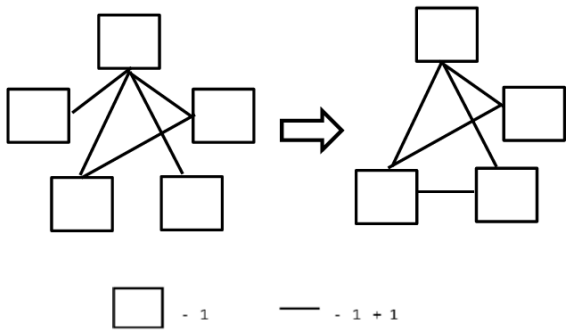
A way of investigation can be connected to MNT that could facilitate the explanation of Simulimpresa methodology effectiveness for experimenting new forms of organizing as a result of creating and implementing intra and inter organizational ties.

On this purpose Oberman *et al.* (2005) explored many fields in which applying MNT, as they are primarily thought to be involved in perception and comprehension of motor actions, but they may also play a critical role in higher order cognitive processes such as imitation, theory of mind, language and empathy.

Borenstein & Ruppin (2005) investigated the role of mirror neurons with two directions: action understanding and imitation. In particular, mirror neurons perspective is considered an adaptation for imitatory behaviour (Ramachandran, 2000). Becker *et al.*

(2011) suggested that much of what people learn during socialization is processed unconsciously within the brain. So employees automatically and often unconsciously imitate one another's behaviour and feeling through operations undertaken through mirror neurons. The paper considers the organizational ways of reproducing intra and interorganizational ties in simulation laboratory in which the socialization and the networking play the central role in the learning process and started from a model of evolution based on the input/output of units/ties that produces organizational forms (**Fig. 1**).

Fig. 1 – The changing of organizational forms as the result of evolutionary or interactive process with elements acquisition and elimination.



Then a further step was to consider the reproduction of an organizational form starting from an existing one and as a result of the exchange of information between the two contexts: the existing and the new one. This perspective gives us a framework to detect the exchange of information represented by organizational actions from two environments each of them working as an organization with units and ties influenced by this exchange (**Fig. 2**).

A concrete example could be represented by a Company that wants to create abroad a new unit using the model coming from the mother one. This could be realized by the sending of team leader to the new context with the mission of reproducing the unit with the same methodologies and structure of the sending organization.

In an interconnected context this process could be supported in an effective way by the exchange of information and contacts through internet or other ICTs that facilitate the transfer of data and knowledge.

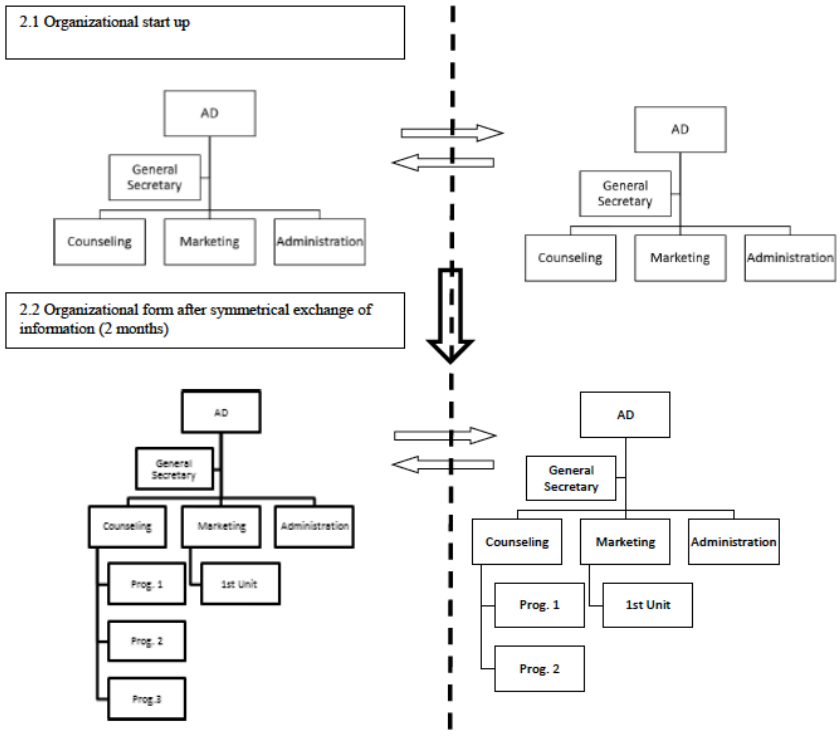
3 - The methodological structure

On the basis of these advancements since 2010 the collection and analysis of the exchange of information were started within the activity of project management realized by the Practice Firm created in the Bologna University Laboratory of Practice Management.

So far the analysis allows to detect organizational forms created in laboratory as a result of symmetric behaviours between simulated and real environment and opens the investigation on the incoming MNT and its feasibility on the processes managed between two organizations in terms of information ties and their influences on the reciprocal activation of links and units in the two involved organizations. In Simulimpresa this reproduction is realized by the support of a real organization (named "Business Partner") that assumes the role of advisor or facilitator. This connection is needed to make clear to PF participants, mostly without a business experience, how the market environment works and the functioning of main organizational structures and processes.

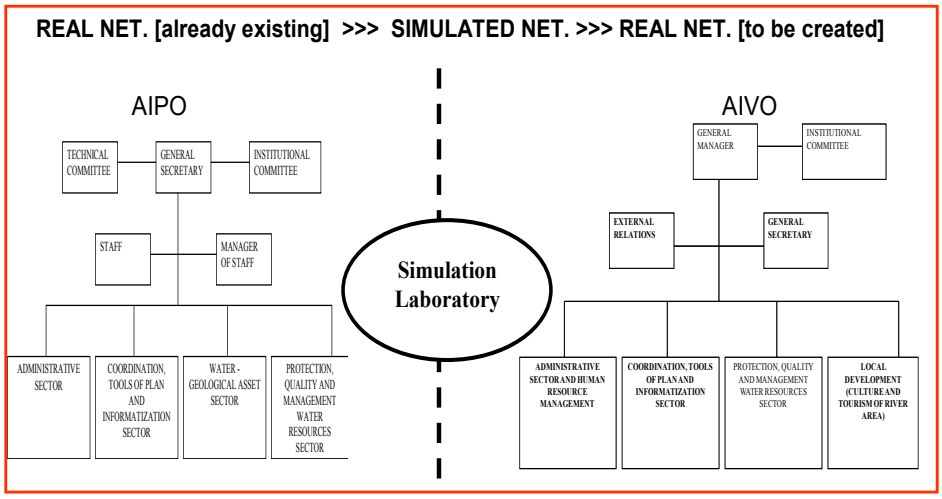
This facilitates business and relationships management in the specific sector chosen for the simulation application.

Fig. 2 – Reproduction of an existing organizational form as a result of exchanged information and reciprocal influence in structure building.



The organizational symmetry between the real environment and the simulated one can be explained with the experimentation applied between Bologna and Astrakhan Universities in the frame of the Project MIUR "Exploratory seminar on models and methodologies for the entrepreneurial and touristic development of low Volga" during the period 2009-2010. In this case (**Fig. 3**) the real organization (AIPO – Interregional Agency for Po river) has supported Simulimpresa application in the laboratory as an experimental attempt to reproduce, after the simulation, a new real organization (AIVO – Interregional Agency for Volga river) with its network of Customers / Suppliers (C/S) relationships in a process as: Real Organization → Simulated Organization → Real Organization.

Fig. 3 – The process Real Organization → Simulated Organization → Real Organization.



Further several researches have been realized on Simulimpresa methodology, first of all focusing on the C/S ties through a mathematical model (Bianchi & Tampieri 2013a,b). Moreover the analysis took into consideration the reproduction of organizational assets. This didactical process could be facilitated by the creation of symmetric behaviours between real and simulated environment implementing the feedback among real and simulated operators.

In particular last research carried out by Bianchi & Tampieri (2013c) pointed out a ties longevity curve of C/S, obtained by a mathematical model, similar to the one detected in a real sample of Italian SMEs in the period 1980-2013 (Bianchi & Barzanti 2004) and arguing that the same curve could be extended to interorganizational links.

Tab. 1 shows the educational profile of Simulimpresa application in Bologna University – Forlì School of Economics, Management and Statistics, together with the Perting Ltd networking profile in terms of C/S, starting from 2010 to the examined A.Y. 2014/2015 and featured by the reproduction of organizational forms with external partners.

Tab. 1 - The educational profile of Simulimpresa and the networking of Perting (2010-2015).

Academic Year	Educational profile of Simulimpresa course				Networking profile of Perting	
	No. teachers	No. tutors	No. students	No. hours	No. customers	No. suppliers
2010/2011	1	2	116	50	23	12
2011/2012	1	2	75	50	28	7
2012/2013	1	1	36	50	27	25
2013/2014	1	1	23	40	26	1
2014/2015	1	1	28	40	21	3

In order to study the ties reproduction through PF methodology, the analysis made a distinction between the internal ties (with teacher/tutor and other units) from the external ones (with individuals/organisations such as: central office, customers, suppliers, consultants, business partner and University partner projects) developed in the period September-December 2014[1], during the experimental module of Simulimpresa in Resilience Project Management within the project RESINT "Collaborative Reformation of Curricula on Resilience Management with Intelligent Systems in Open Source and Augmented Reality" (**Tab. 2**).

Owing to the limited duration of each operative meeting (3/4 hours) the frequency of internal and external ties is not relevant for the purposes of this analysis so that the existing of a tie is expressed by "1" while "0" means none tie.

The survey has been realized through a questionnaire submitted to 28 participants and composed by two parts: the internal networking was detected with questions about the number of ties with operative

[1] The survey has been realised on the operative meetings of 30 September, 3,7,10,14,17,21, 24 October, 11,14,21,25,28 November ,2,5 and 9 December 2014.

units and teachers/tutors and the typology of contact (information / document).

Tab. 2 - Summary of operative units and tasks in the RESINT Experimental Course (2014-2015) (Source: Tampieri, 2015a, p.8).

No	Operative Unit	Code	No. participants	Tasks
1	Human resource Administration and General Affairs	HRD - GA	4	Contracts of employee's assumption of Perting; elaboration of Perting microstructure, signing of labour contracts; administration and management of human resources. Communications with Italian and foreign simulated enterprises and reopening of the activities and sending promotions. Exchange of information with the Advisory department and verbal recruitment of Perting' employee, in connection with Project Units
2	Accounting	AC	4	Learning on the usage of software OS1; view of the balance before adjustment to produce the balance of the previous exercise in connection with Project Units
3	Management Control	MC	4	Annual Budget: training on OS1. Adjustment entries: Draw up financial statement before the closure
4	Treasury , finance and Tax	TF / TX	2	Economic situation and IBAN: check of bank communications. Sending F24 filled by the fiscal office. Printing tickler made by accounting department and check customers and suppliers expired. Sending payment reminder to customers and suppliers. Treasury budget. Preparing F24 for treasury. Increasing Fiscal variation on gross profit and calculating Ires.
5	Marketing	MK	3	Market analysis through Europen database; communication with Italian and foreign enterprises; updating the catalogue in paper and on line; production of promotional materials; customer satisfaction surveys, in connection with Project Units
6	Sales and Warehouse	FS / NS / OW	5	Learning about the procedures for fulfilment of modules to foreign firms; execution of received foreign orders; issuing of sale documents to both European Union (EU) and non-EU countries. Elaboration of adjustment records; issuing of national invoices. Updating stock management and online orders based on goods received from customers. Purchases from other Italian simulated enterprises: process.
7	CAMUS Project	CAMUS	2	Project management, preparation of proposal on "Recovering the Historical Heritage on catastrophic events in the Museum of Post and Telecommunications". Contacting university partners to implement Simulimpresa. Organisation of videoconferences with foreign universities.
8	CARO Project	CARO	2	Project management, preparation of proposal on "Education for Operative Room Staff". Contacting university partners to implement Simulimpresa. Organisation of videoconferences with foreign universities.
9	CARG Project	CARG	2	Project management, preparation of proposal on "Creation of an Agency for river governance". Contacting university partners to implement Simulimpresa. Organisation of videoconferences with foreign universities.

The external networking profile was surveyed through questions on the number of ties with external bodies and on the typology of contact (information / document). During the first operative meeting each unit received from tutors the instructions to organize the list of the ties internally or externally activated by e-mail, fax, skype, face to face, and phone.

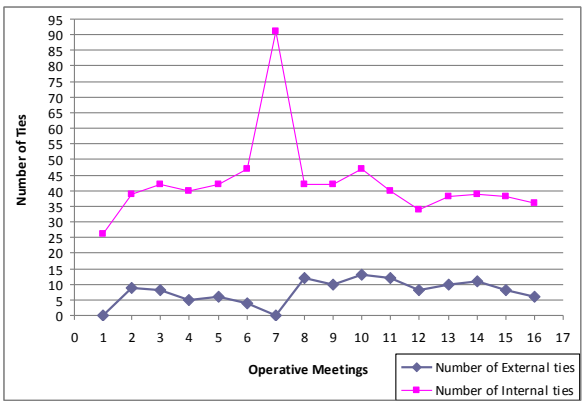
4 - The main findings

The research results outline the emerging orientation of Perting units towards internal ties respect to external ties (**Fig. 4a**). This evolution was connected to the necessity to create an initial relational asset within the boundaries of Perting and to exploit this internal network over the time to ensure PF methodology efficiency.

In particular in the first meetings (1-3) the involvement of teachers and tutors was higher to explain and support the PF application and to make clearer the operative working as most of participants hadn't a business experience.

After activities start up, the PF, in this case representing a company of project management, reproduced an organization in touch with external organizations.

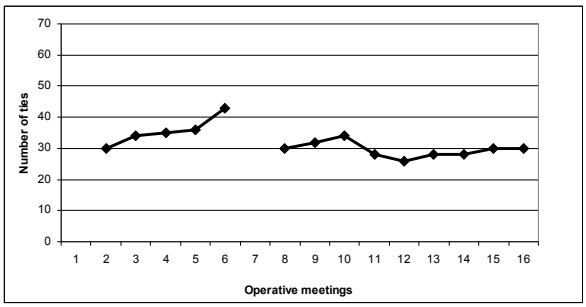
Fig. 4a – The evolution of internal and external ties (Source: Tampieri, 2015b)



During the experimental module realized in A.Y. 2014-15, the external ties were created mostly by CAMUS, CARO, CARG units that were engaged in preparing project ideas together with the support of

other internal units (mainly HRD – GA, AC, MK) and addressed to foster collaborations with external partners[2]. The purpose was to create new organizations or restructuring the existing ones through the reproduction of the model experimented in the didactical environment of Simulimpresa.
The findings (**Fig. 4b**) underline the stability of the gap between internal and external ties as a sign of the reciprocal interdependencies between the PM Unit and the external one opening the research to the investigation on the connection among the trend of inputs and the renewal of structures.

Fig. 4b – The stability of the gap between the level of internal and external ties (Source: Tampieri, 2015b)



Two exceptional cases of none external ties are evidenced in the first operative meeting as it was addressed to Simulimpresa illustration, selection colloquium, division of participants into Perting units (with the creation of 26 internal ties) and in the seventh operative meeting in which each unit presented the intermediate results to the others creating 91 internal ties.

5 - The connection between Organizational Networks and Brain Networks

The growing connection between Network Theory and Cognitive Sciences as well as the development of complex systems science, significantly influenced the way in which the organization and dynamics of cognitive and behavioral processes are investigated and understood (Park & Friston, 2013).

For a more detailed analysis of the existing parallelisms between Organizational Networks (ON) and Brain Networks (BN), the starting point is that organizations are a projection of the human way of thinking . Therefore the organizational structures reproduce, even beyond the perspective of mirror neurons, structures and processes of BN.

In this field a research program can be based on the study collaboration of ON and BN. First, the empirical situation in which ON alternate moments of great activity to quiet moments, is similar to that for BN. Particularly in the ON model the situation of rest may be reflected by an organization still connected internally, but who works in the absence of requests from external users (suppliers/ customers, which could be assimilated to external stimuli). In BN the condition of rest is the one in which the subject is not doing anything special, at least in relation to external stimuli (we can't control if then the person internally thinks, or dreams for example).

Secondly, there is the distinction between ON that transversely converse among each other and with the central networks, from those segregated that only communicate with the core networks. In management we have in fact local networks that mainly communicate each other while others are tied to the general level.

As it regards the analysis of BN, however, it is necessary to specify that the brain uses multiple channels (frequency bands) of communication.

The organizational model, which tries to reproduce dynamics of ties distinguished in strong and weak ones, is focused on a single network and enables to simulate the network behavior over time with reference to different inputs (basically growing, stable or decreasing). The model also allows to reproduce the renewal of organizational connections, some of which are stabilized in time and, in some cases, disappear for desuetude.

In this regard, the investigation on ON is addressing to three levels of validation : the empirical (derived from data collected on the real organizations), the logical- mathematical (with the reproduction of the behavior of network connections through a mathematical model) and experimental (with simulation of organizational behavior in the laboratory of Practice Management).

The architecture of brain connections was investigated by several studies (Santarnecchi *et al.,* 2014; Achard *et al.,* 2006) so that there are groups that work with theoretical models of BN using parameters of anatomical connections obtained by imaging methods. They foresee the dynamic of oscillatory systems (which simulate local groups of neurons in the brain) based on parameters of functional connections obtained from experimental data.

The analysis could focus on human subjects using a paradigm that simulates a typical situation encountered by ON.

From processing data an attempt of research could measure what connections within and between BN and therefore which local and central integration

[2] Respectively with Poste Italiane, Interregional Agency of Po River and the Operative Room of Ravenna Municipal Police with respectively the aim to create a Museum on Resilience in Post Service, an Agency for the Governance of Big Rivers and an Operative Room for resilience management.

structures / dynamics, during rest, predict the performance throughout the task.

For instance a further insight could demonstrate if an ON that has the same communication structure of the human brain is more efficient than an ON that has a different structure.

The analysis of neural behavior of ON could produce new understandings on the connections and the frequency of their activation as it regards, for example, project and enterprise networks.

However it could reason about model and related algorithm in order to connect, from a theoretical point of view, the networks at rest with the effects of their activation.

In this field the investigation of ties dynamics managed by an organization could be connected to the structural and functional BN allowing a better understanding of connections and cognition processes. To this purpose the simulation by Practice Management Laboratory could enrich with experimental data the empirical surveys on these topics.

6 - Conclusions

The emerging parallelism between the frequency of interorganizational relationships created within the laboratory and those developed with external organizations, could be a sign of reciprocal influences between Simulimpresa internal and external actors. In such terms the organizational activities realized in the laboratory to reproduce an organization and the building of ties reflect themselves on the external environment to which the PF is in connection.

As result of these interactions the creation of organizational forms in the target partner can be considered coherent with the sending unit of Simulimpresa with an evolution that is summarized in Figure 2.

Particularly, as the mother company proposed at the beginning a hierarchical structure was based on a balanced functional organizational chart with three main functions as Counseling, Marketing and Administration, after two months of working the target organization created in another context will assume, through the exchange of internal/external ties, an asset with the prevailing of counseling orienting both structures to a similar form.

The hypothesis to be further developed is that the common asset based on a symmetrical exchange of stimuli deriving by a reciprocal way of management, from one side contributes to new structures and processes building by PM and, from the other, it confirms the model of mirror neurons as a perspective in the networking study.

Any case, although the criticism on some interpretations of MNT (Rizzolatti & Senigaglia, 2010) there are several mechanisms through which to understand the organizations evolution. Within these hypotheses the mirror neurons perspective allows us to understand how the learning by doing process undertook by PM could contribute to the evolution of organizations starting from the interactions with others and the process that in a general way it is named networking.

Summarizing the results the intra-inter organizational ties developed by Perting in simulation laboratory seem to have a significant relation to the new forms of organizing created by the symmetry real-simulated environment and as a structured feedback from managerial activities realized by participants.

This perspective could open the way to future researches addressed to an extended confirmation and to examine further variables in measuring, in an experimental condition as Practice Management, the evolution of intra-inter organizational ties facing different situations.

References

Achard S., Salvador R., Whitcher B., Suckling J. and Bullmore E. (2006), A resilient, low-frequency, small-world human brain functional network with highly connected association cortical hubs, *The Journal of Neuroscience*, 26 [63–72].

Addario N. (2010), Il contributo della teoria dei sistemi sociali alla Teoria Generale dei Sistemi [The contribution of the theory of social systems to the general theory of systems], *Riflessioni Sistemiche*, 2 [1-11].

Ahuja G., Soda G. and Zaheer A. (2012), The Genesis and Dynamics of Organizational Networks, *Organization Science*, Vol. 23, No. 2 [434-48].

Arbib M. A., Erdi P. and Szentagothai A. (1997), *Neural Organization*, Bradford Books, Cambridge, MA.

Babiloni F., Meroni V. and Soranzo R. (2007), *Neuroeconomia, neuromarketing e processi decisionali* [Neuroeconomics, neuromarketing and decision-making processes], Springer-Verlag, Italia [31-32].

Becker W.J., Cropanzano R. and Sanfey A.G. (2011), Organizational Neuroscience: taking organizational theory inside the neuraò black box, *Journal of Management*, Vol. 36, No. 4 [933-961].

Bianchi M. and Tampieri L. (2013a), Business ties selection in the analysis of organizations. Experimental and empirical results. In AA.VV. *Organizing in turbulent times: the challenges ahead*. Roma, 30-31 Maggio.

Bianchi M. and Tampieri L. (2013b), Effects of networking activities by internet on the creation of a business network: experimental results of Simulimpresa Laboratory, in P. Spagnoletti (ed.) *Organizational Change and Information Systems. Working and*

Living Together in New Ways. Springer-Verlag Berlin Heidelberg [119-128].

Bianchi M. and Tampieri L. (2013c), Longevity of business ties and input variation of new entries in companies networks, in XXXVI AIDEA conference proceedings "The firm's role in the economy: does a growth-oriented business model exist?, Cacucci, Italy, [1-9].

Bianchi M. and Barzanti L. (2004), Stabilizzazione delle relazioni interaziendali e apprendimento organizzativo, *Economia Aziendale 2000 WEB 1*, www.ea2000.it.

Borenstein E. and Ruppin E. (2005), The evolution of imitation and mirror neurons in adaptive agents, *Cognitive Systems Research*, 6 [229-242].

Cornelissen J. P. and Durand R. (2014), Moving forward: Developing theoretical contributions in management studies, *Journal of Management Studies*, Vol. 51, No. 6 [995-1022].

Dagnino G.B., Levanti G., and Mocciaro Li Destri A. (2016), Structural Dynamics and Intentional Governance in Strategic Interorganizational Network Evolution: A multilevel approach, *Organization Studies*, [1-25].

David R. J., Sine W.D. and Haveman H. A. (2013), Seizing Opportunity in Emerging Fields: How Institutional Entrepreneurs Legitimated the Professional Form of Management Consulting, *Organization Science*, Vol. 224, No.2 [356–377].

Della Penna S., De Pasquale F., Sporns O., Romani G.L. and Corbetta M. (2015a), A Dynamic Core Network and Global Efficiency in the Resting Human Brain, *Cerebral Cortex* [1-19].

Della Penna S., Spadone S., Sestieri C., Betti V., Tosoni A., Perrucci MG., Romani GL. and Corbetta M. (2015b), Dynamic reorganization of human resting-state networks during visuospatial attention, *Proceedings of the National Academy of Sciences of the United States of America*, Vol. 112, No. 26 [8112-8117].

Ferriani S., Fonti F. and Corrado R. (2012), The social and economic bases of network multiplexity: exploring the emergence of multiplex ties, *Strategic organization*, Vol.11, No 1 [7-34].

Frigotto ML., Rossi A., Trento S. and Zaninotto E. (2014), Le decisioni manageriali e la rivoluzione comportamentale, *Sinergie*, 95, [121-140].

Gentner D. and Colhoun J. (2010), *Analogical processes in human thinking and learning. In Towards a theory of thinking*, Springer Berlin Heidelberg [35-48].

Gentner D., Bowdle B., Wolff P. and Boronat C. (2001), Metaphor is like analogy, in D. Gentner, K. J. Holyoak and B. N. Kokinov (eds.), *The Analogical Mind: Perspectives from Cognitive Science*, MIT Press, Cambridge, MA [199–233].

Hutchison RM, Womelsdorf T, Allen EA, Bandettini PA, Calhoun VD, Corbetta M, Della Penna S., Duyn J, Glover G, Gonzalez-Castillo J, Handwerker DA, Keilholz S, Kiviniemi V, Leopold DA, de Pasquale F, Sporns O, Walter M and Chang C. (2013), Dynamic functional connectivity: Promises, issues, and interpretations, *NEUROIMAGE*, Vol. 80 [360-378].

Iacono G. (2001), *Dal knowledge management alla e-enterprise. Le organizzazioni nell'era di Internet*, Francoangeli, Milano [151-152].

Krasniqi F. X., Topxhiu R. and Pula J. (2011), The role of practice firms in preparing youth for the labor market in Kosovo. *Asian Journal of Business and Management Sciences*, 1, [122-134].

Luhmann N. (1986), The autopoiesis of social systems, in F. Geyer and J. van der Zowen (eds.) *Sociocybernetics paradoxes*, Sage, London [174-192].

Mella P. (2014). *The Magic Ring: Systems Thinking Approach to Control Systems*. Springer. New York, Dordrect, London.

Oberman L. M., Hubbard E. M., McCleery J.P., Altschuler E. L., Ramachandran V. S. and Pineda J.A. (2005), EEG evidence for mirror neuron dysfunction in autism spectrum disorders, *Cognitive Brain Research*, No. 24 [190–198].

Owen-Smith J., Cotton-Nessler N. C. and Buhr H. (2015), Network effects on organizational decision-making: Blended socialmechanisms and IPO withdrawal, *Social Networks* No. 41 [1–17].

Park H-J. and Friston K. (2013), Structural and Functional Brain Networks: From Connections to Cognition, *Science*, Vol. 342 [1238411]

Quintane E. Pattison P.E., Robins G.L. and Mol J.M. (2013), Short- and long-term stability in organizational networks: Temporal structures of project teams, *Social Networks*, Vol. 35 [528– 540].

Ramachandran V.S. (2000), Mirror neurons and imitation learning as the driving force behind "the great leap forward" in human evolution, *Edge*, No. 69.

Rizzolatti G. and Sinigaglia C. (2010), The functional role of the parieto-frontal mirror circuit: interpretations and misinterpretations, *Nature Reviews Neuroscience,* Vol. 11 [264-274].

Rizzolatti G. and Vozza L. (2008), Nella mente degli altri. Neuroni specchio e comportamento sociale, Zanichelli, Bologna.

Santarnecchi E., Galli G., Polizzotto N. R., Rossi A. and Rossi,S. (2014), Efficiency of weak brain connections support general cognitive functioning, *Human Brain Mapping*, Vol. 35 [4566–4582].

Sebastiani V., De Pasquale F., Costantini M., Mantini D., Pizzella V., Romani G.L. and Della Penna S. (2014), Being an agent or an observer: different spectral dynamics revealed by MEG, *Neuroimage*, Vol. 102 [717-28].

Siggelkow N. (2002). Evolution toward fit. *Administrative Science Quarterly*, 47(1) [125-159]

Tampieri L. (2015a), Innovating the Didactical Methodologies Applied in Universities Through Second Life and Practice Firm, *Technology, Innovation and Education Journal*, Springer, Vol.1, No. 3 [1-14].

Tampieri L. (2015b), Detecting new forms of organizing through ties analysis and mirror neurons' perspective. Paper presented at *WOA 2015*, Padova 21-22 May.

Tampieri L. (2014), The Network of ties in practice firm for the education to entrepreneurship. The case of Perting Ltd, *Procedia-Social and Behavioral Journal*. 5th World Conference on Educational Sciences, Vol. 116 [1073–1082].

Vicari S. and Troilo G. (2003), Creatività organizzativa e generazione di conoscenza: il contributo della teoria dei sistemi cognitivi [Organizational creativity and generation of knowledge: the contribution of the theory of cognitive systems], *Sinergie*, No. 61-62/03 [189-211].