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THE PERFORMANCE OF THE INTERORGANIZATIONAL COLLABORATIVE INNOVATION

- Abstract of the PhD thesis -

0. ONE LOGIC OF MEASURING THE INTERORGANIZATIONAL COLLABORATIVE PERFORMANCE

The implication of the organization in collaborative innovation structures is formed into one of the multiple levers available to the manager aimed at supplying positive economic results necessary for remunerating the shareholders (increasing the sales, reducing the costs or streamlining the use of the assets). Mastering the knowledge and the means by which one can ensure the quality of generating and improving a collaborative innovation, the ways of involvement in interorganizational communities by a subject company (taken into analysis) can provide to a decision manager the necessary information regarding the performance that can be obtained after allocating resources, time and energy. The analysis of the performance can be done either *post factum*, in which case we can talk about recommendations and improvements, or *a priori*, in which case we can talk about identifying some options of strategic success for the organization.

During the development of the research I have selected a critical mass of factors that I believed to be relevant in building the model, turning to a unitary approach of the ontological forms, of content and context of the collaborative structures, and also of the association, experimentation, implementation, communication, signification and improvement processes, developed inside or outside of the structures.

Within the research I have used in a convergent manner traditional scientific **research methods**: the methods of formal logic and of dialectic, the evolutional approach, observation methods (the study of the organizational documents and of the actors), statistic methods (the gathering and processing of information and the comparative

interpretation of the empirical data) etc. By correlating more methods I have tried to exceed the limits generated by the selection of some parameters, by the ways of measuring that are slightly rigorous for different variables or by the very large range of identification options of the independent and dependent variables, and also of the functional relations among them. The alternative method of close and sometimes microscopic observation of details provided valid scientific results in defining the model's variables.

I have carried out **study cases** on five companies (Newell Rubbermaid, two companies that have represented the DeWalt brand in Romania and the Labormed and Expert Moldova Trading companies where I have worked for many years). In the casuistic method of study of the interactions suggested by these companies, I have included the collection and analysis of several proof sources: the analysis of the documents regarding internal and external communications, decisions, strategic programs, interviews, and the observation of the participation and collaboration manner within the networks alongside the interested parts.

Furthermore, I have done **exploratory interviews** with five leaders with executive attributions in Romania, representatives of some international technological brands and with an opening towards obtaining performance through interorganizational collaborations. The interviews aimed at ascertaining in what moment and under which forms they have stimulated or were involved in interorganizational collaborations and which were the levers that led to and maintained these structures.

Through the **statistic method** I have investigated a number of fifty-six companies specialized in basic industrial technology, situated in Eastern Europe, resorting to questionnaires addressed to the department

chiefs from every organization, for one of the following three professional categories: production, marketing-sales and supply, departments that are believed to be more inclined towards interorganizational collaboration according to the case. The project was coordinated through the Romanian Foundation for Business Intelligence.

1. PARADIGMS IN THE COLLABORATIVE INNOVATION EPISTEMOLOGY

By investigating the specialty literature from the last five years, I have developed an original analysis of the research typologies and manners on this segment and I suggested a **non-systematic classification of the studies**, according to the identified research traditions, and also by highlighting the epistemological relevance of the empirical researches, of field. The suggested classification is achieved by identifying the directions from the research of the interorganizational innovation and revealing the epistemologically similar elements, the logic integration of the instruments used by the researchers and highlighting the common paradigms that lay at the basis of the thorough study process of the field, and it includes:

1. Collaborative paradigms founded on free will,
2. Natural collaborative paradigms,
3. Contractual collaborative paradigms and
4. Determinist collaborative paradigms.

2. ONTOLOGY – CONCEPTS AND COMPLEXITY IN THE INTERACTION BETWEEN ORGANIZATIONS

Chapter two suggests a **normative research**, having as an object the discovery and application of ontological notions and building the collaborative structures, the ethic concepts, expertise, vision and common targets and also of the non-economic motivations in the sphere of relations and the interorganizational collaborative practice. The methodological orientation on this level is deductive and analytical, in the light of network approach, not only under functional aspect, but also ideatic and normative. The orientation of the normative theory is evaluative and prescriptively deducted from the rational action of the actors which is in accordance with a vision and non-economic motivations built socially in the innovative community. The hypotheses on which the normative research is built are positivist.

The development of the performance research has as a starting point the **ontology**, an objective philosophy of the collaborative structure within the physical reality, and also a common language through which the performance must be shaped and which will facilitate the research approach. In this chapter I have identified a series of referential terms, interconnected through a logic scaffolding. I have built the concept of **network identity** as an ideal identity to which are associated a set of qualities through which I have bounded the intension of the term. I have nominally defined the network identity as *a set of abstract characteristics, capable to maintain a strong connectivity between the actors and to ensure in time the durability of the collaborative structure towards obtaining performance through innovation*.

In defining the network identity I have included the following component elements:
1. The ethical behavior norms of the community members;

2. The non-economic motivations;
3. The regulative body;
4. The interactionist dynamics between the actors indicating the way in which a similar or complementary vision of the organizations is built;
5. A high level of branching some expertise, ideals and common targets.

The research is emic, because it reports the studied elements to the particular environment in which they are situated, and it defines the analysis units through the function that the network actors assign them.

3. THE CONTEXT THEORY – A MODEL OF MANIPULATING KNOWLEDGE

The research presented in chapter three materialized itself in a **systemic study**, suggesting a holistic type of approach, of integration of the collaborative structure in ample social or economic systems. Within this approach, the performance of the collaborative structure is analyzed in the light of the context. The hypotheses on which the systemic study is done are interpretable, and the interference is more abductive, because certain hypotheses are suggested, then the consequences are deducted and the deducted predictions are tested in an inverted *modusponens* logic form. The undertaking of the chapter consists of the identification of some knowledge manipulation frameworks and of the performance increasing possibilities on this basis.

Through the context theory, describing a management system of the collaborative network, the maturity level of the system is introduced as an essential element in designing a clear image regarding the expectations generated by the collaborative innovation strategy and in what it can be done to improve the system in itself and to increase its performance. The indicators introduced in the model within the context theory are: the diversity, through which we quantify the ratio between the number of spaces of different knowledge accessed by the network and the number of links between the nodes and the transdisciplinarity through which we estimate the positioning in the spiral model of innovation and as an ecosystem of informational entropy.

The indicators suggested for the integration of **diversity** (D) as a variable of the performance model are:

1. A **synthetic indicator**, estimated as a ratio between the number of different accessed knowledge platforms (s) and the number of links

that have different intensities within the network between organizations or persons (r). The higher is the platforms ratio/number of links, the higher is the innovation potential of a network (initiator company of the network) in relation to others.

$$D = \frac{S}{r}$$

The marketing department analysis of EMEA – Newell Rubbermaid, located in Munich, revealed a number of 40-50 external links with different organizations situated in different technological fields, links that provide concrete information about the network diversity with collaborative and innovative potential.

2. A **global indicator** of the diversity estimated as a sum of the partial indicators: lt – the number of links that connect various technologies, lc – the number of links that connect different creativity models and lm – the number of links with various marketing agents, in the total number of links within the network (L).

$$D = \frac{lt}{L} + \frac{lc}{L} + \frac{lm}{L}$$

Transdisciplinarity. The interorganizational structures suffer a dynamic of the collaborative typologies from networks delineated around some weak links (NWL), by experimentation and dividing structures of knowledge (NED) and finally we get to a compression of these two in innovation and dividing structures of a common vision (NIV). An innovating cycle that ends delivers the knowledge to other networks (usually structured by weak links), each of them solving problems that are specific to their competences. From this perspective, I have built in an original manner a *spiral model of innovation* that

accesses various and multiple platforms of human knowledge. The processes specific to each type of structure are the association, interrogation and observation for NWL, the experimentation and knowledge transfer for NED, and respectively the allocation of roles and responsibilities, business processes planning, launching and commercialization of innovation on the market for NIV.
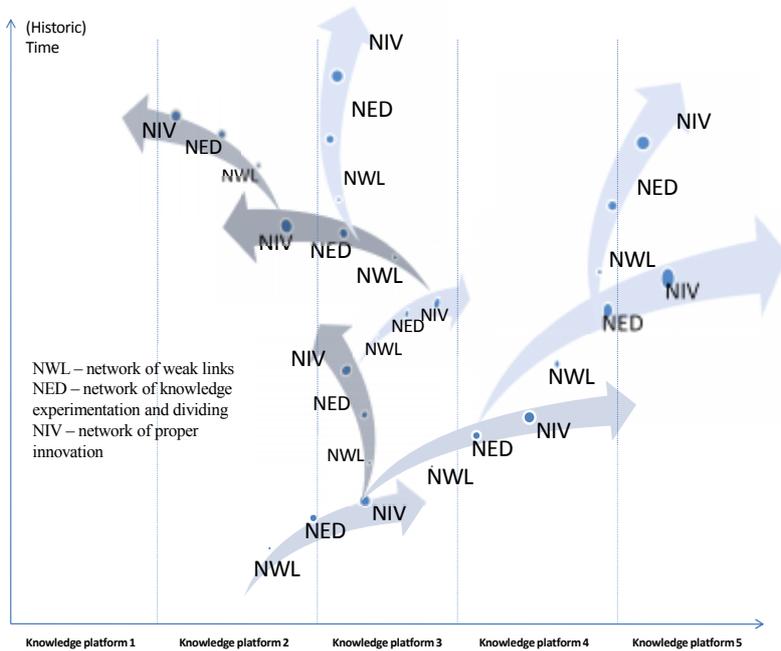

Fig. 3.1. The trophic chain of the innovative ecosystems (enchainment of the three types of networks and the knowledge transfer)

4. THE CONTENT THEORY– THE COLLABORATIVE SPACE STRUCTURE

From this point forward the research is directed towards an **institutional study**, having as an object the content of the collaborative structure, the rules, the procedures and the formal mode of organization of these, and also their impact on the collaborative innovation practice. The methodological orientation on this level is inductive, relativist, and both qualitative and quantitative; and the theory orientation is normative, evaluative, prescriptive and empiric. The hypotheses on which the institutional study is based are positivist and interpretable, and the study perspectives are to define an informal, democratic model of the collaborative network, claimed from good organizational practices and limited on the other hand by conservationist, hierarchic attitudes due to the central role of some dominant organizations within the network. The research hypotheses comprise a direct correlation, in a positive sense, of the structure elements with the innovation performance.

The **content theory** suggests the use of some representative elements, which I divide into categories: resources, behaviors induced by the organizational management, communication processes, interaction, practice, dividing and improvement processes.

► **Human resources** as content variables are quantified within the performance model by indicators that measure the collaborative capability (the number and quality of the actors engaged in the collaborative structure), the collaborative potential (the level and quality of human resources), and also the creative potential.

Starting from the psychological features of a person, I suggested an **analysis** methodology **of the collaborative behaviors typologies**,

by aggregation of three dimensions of performance: a) individual performance – obtaining results as a consequence of fulfilling your own tasks, b) performance within the organization – obtaining results that come from the collaboration within the company and c) performance in the interorganizational community – obtaining results that come from the collaboration within the interorganizational community.

Moreover, I have defined an arithmetic indicator of the collaborative capabilities (Pco):

$$Pco = P_1 \times P_2 \times P_3$$

where:
- P_1 is the number of weak links in the total of connections of the initial network (NWL), respectively of the strong ones within the structures, NSS, respectively NIV,
- P_2 is the number of actors that function as mediators or catalysts in the total of network members,
- P_3 is the number of persons situated within the frame of the efficient ones described in the behaviors typologies (those who obtain performance both individually and by collaboration).

Through the statistic method I have suggested the testing and checking of three hypotheses based on the mentioned variables:
I1: The network identity is directly correlated and in a positive sense with the performance of the interorganizational collaborative innovation.
I2: The organizational culture of encouraging collaboration is directly correlated and in a positive sense with the performance of the interorganizational collaborative innovation.

I3: The communication intensity is directly correlated and in a positive sense with the performance of the interorganizational collaborative innovation.

► The independent **''network identity''** variablehas been previously approached in the ontological and microscopic research of the network.

► The independent **''organizational culture oriented towards collaborative innovation''** variable is measured by independent variables at an organizational level: leadership, motivation, communication, and learning. The degree at which these influence the collaborative innovation performance at a network level is quantified by the identification of the cultural and formal control mechanisms that appear at an organizational level.

► Through the independent **''communication intensity''** variable I have measured the communication frequency, the implication ratio and the communicational flow between different knowledge levels. The evaluation of the communication intensity was done under a physical aspect (using some information transmission media) and under a dynamic aspect (measuring the frequency of information exchange with the main partners).

► The economic effectsafter exploring the collaborative innovation on the market stop on the **operational performance** of launching and improvement, considered as the last link and also the dependent variable of the poll based on investigation.

The results showed that, both the network identity and the communication intensity, and the organizational politics of innovative-collaborative nature are significantly correlated in a positive sense with the operational performance of innovation improvement on the market

through a correlation coefficient higher than 0.5. The result is stronger when a factor is used in combination with the other.

Therewith, based on the gathered values of the statistic poll I have defined some statistic indicators of communication: the involvement rate and the communication frequency, and then introducing the probabilities and the communicational flow in their evaluation:

1. The implication rate (r) defined as the intensity of human resources allocation in collaborative structures at 100 actors:

$$r = \frac{C}{R} \times 100,$$

where:
C = employees engaged in external collaborations
R = human resources of the organization (medium number)

2. The communication frequency at a network level (c):

$$c = \frac{I}{A} \times 100,$$

where:
I = the number of monthly accesses (followed by informational exchange) through any of the communication mediators of all the actors from the network
A = actors engaged in the collaborative structure

By **communicational flow** I have defined the communication through various mediators between the actors of the common collaborative structure and who belong to a different knowledge field (or department), in a given period. I have evaluated the analysis on two fields (f) and (o) in the light of the relation of the implication ratio, as follows:

$$rfo = \frac{Cfo}{Rf} \times 100$$

The evaluation has a probabilistic character targeting the probability of collision of ideas from the fields (f) and (o) and, on the other hand, we evaluate the attraction degree exerted by the knowledge stage from the (o) field on the actors with knowledge in the field (f).

As a visual method of analysis, I have suggested a new instrument, the graphic analysis of the interaction dynamic between the actors. The prescriptions that can be suggested, after graphically identifying potentialities, can be done, either by relation to a standard path, or as new, innovating solutions. I have defined this analysis mode **''toposensitivity''**.

To establish the lines dimensions between every two nodes and of the dots that will be placed in the network center, I suggest the use of two main indicators:

$$Ip = \frac{the\,number\,of\,interaction\,initiations}{the\,total\,number\,of\,interactions\,through\,mediators}$$

$$Ip = \frac{the\,number\,of\,participation\,in\,interactions}{the\,total\,number\,of\,interactions\,through\,mediators}$$

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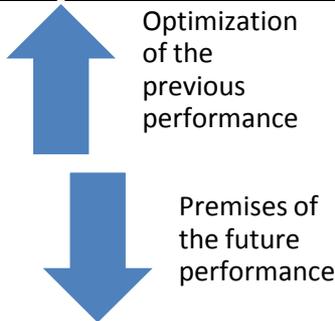

Fig. 4.1. A possible representation for a NWL network

5. ANALYSIS FRAMEWORKS OF THE COLLABORATIVE INNOVATION PERFORMANCE

This chapter presents the results of the research suggesting a **sequential analysis and evaluation model of the performance** through a rational and refined process of selection of the performance indicators, aiming at providing the shortest and most relevant list of criteria.

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1. Identification of the knowledge space and of the possible adjacent for extending the economic utility
   - o The collaborative structure: NWL
   - o Processes: scanning, association, signification
   - o Performance evaluation elements: the network identity, the communication intensity (the implication rate, the communication frequency, the communicational flow), toposensitivity, diversity.

Optimization of the previous performance

Premises of the future performance

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2. Scanning and exploration of the possible adjacent
   - o The collaborative structure: NWL
   - o Processes: scanning, association, communication, signification, practice
   - o Performance evaluation elements: the elements of the

framework 1, where we add the collaborative capabilities and the creative potential.

Optimization of the previous performance

Premises of the future performance

3. Validation and prefiguration possibilities for the future innovations
  - o The collaborative structure: NED
  - o Processes: experimentation, association, communication, signification, practice
  - o Performance evaluation elements: the elements of the framework 2, where we add the organizational culture of encouraging and the innovative collaboration.

Optimization of the previous performance

Premises of the future performance

4. Selection of creative ideas to be transformed in innovations
  - o The collaborative structure: NED/NIV
  - o Processes: selection, experimentation, association,

communication, signification, practice
- o Performance evaluation elements: the elements of the framework 3, where we add the transdisciplinarity.

Optimization of the previous performance

Premises of the future performance

5. Launching and improvement on the market
   - o The collaborative structure: NIV
   - o Decisional processes of dividing, allocation, planning, etc.
   - o Performance evaluation elements: the elements of the framework 4, where we add the analysis of the launching and improvement operational performance and also classical methods from the investment practice for quantifying the economic and financial effects.

I have extended particular elements, of distinction through which it can be measured the collaborative innovation performance in the sphere of the external capabilities of stocking, processing, dividing and protection of information within the network. I have quantified the efficiency of such an information management in a conceptual framework, defining the **network intelligence** as the capacity to extract the essence and to intuitively develop information, the processing effect, and the absorption and dissemination capacity towards partners.

As an **applicative value**, the study suggests a set of **levers, instruments and practices (LIP)** for the collaborative innovative management, which can be identified on four levels:

✓ The **ethic and functional level** of the network characterized by the concept of identity and its argumentation as an establishing and defining component of the innovative systems:
  - Within the sphere of human resources, along with the LIP of selection (through promotion and recruitment) and the change of collaborative and creative behaviors (through economic motivation and instruction), managers can resort to non-economic motivations, the ethical code, or other abstract elements, components of the network identity.

✓ The **practical level** of the collaborative structure approached from an individual, professional and the company's point of view through the organizational factors as intermediaries of the collaborative structure:
  - LIP of construction of liquid networks,
  - LIP of fostering a human resources management that can obtain both a performance of the employee and a performance from the interorganizational collaboration.

✓ The **communicational level** measured through the frequency of information exchange between the network actors:
  - The allocation of necessary resources and aggregation of an optimal system of communication mediators,
  - LIP that can stimulate the frequent collisions of ideas and the absorption and processing of new ideas with improvement potential through innovation.

✓ The **knowledge level** comprised in the system and evaluated through diversity, as a result of the company's orientation towards different organizations (of persons towards entities that have or don't have a level of expertise, their location on different knowledge

platforms) or which can be distinguishes bycomplementary perspectives and visions.

The sequential model suggested by me, argued in three dimensions (componential, identity and evolutional), as a methodological foundation of the strategic management, is still in the refining and consolidation stage, and can be amended due to some limits discovered during the research process.

Epistemological and political limits of the research

We can talk about a threshold of the epistemology which depends on the theoretic exactness of the interorganizational innovation. The hypotheses that the researcher builds in the sphere of the performance are first of all connected to the collaborative space and context, in order to theorize the performance in an abstract form. If the performance cannot be inscribed to an axiomatic and formalized form, then, it will remain a consequence of the transitory interactionist and collaborative phenomena, capable of generating a different influence on the business processes, and the research process will be reduced to the study of these phenomena.

On the other hand, the research of whose results are presented in the herein Ph.D thesis is academically limited. The suggested approach has the form of a preliminary exploration of the theoretical possibilities of the performance analysis and evaluation, under the presumption of the independent innovative structure – observer (the person who analyses the performance of some covered stages or evaluates the future performance). The context theory and the emic conception can be extended towards the consideration of a very large field of phenomena, time stages of the society and manifestation or interpretation modes of the identifiable human intelligence, especially, in the general-evolutive field of humanity or in every space of knowledge from the network. The temporal relativism of the collaborative connections can form an important aspect in obtaining performance, especially in the case of radical innovations. If future research hypothesis are accepted in relative time and by considering the uniqueness of the observer, it becomes clearly that the performance approach is governed by an indetermination, discontinuous principle. The research problems on the performance are directed towards a collaborative structure in which knowledge and information intervention will always change its configuration.