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ANALYSIS FRAMEWORKS OF THE COLLABORATIVE INNOVATION PERFORMANCE

VIEWPOINT AND REPLIES ON PREVIOUSLY PUBLISHED ARTICLES

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Abstract

Time management is one of the resources by which we can achieve improved performance innovation. This perspective of resource management and process efficiency by reducing the timing of incubation of ideas, selecting profitable innovations and turning them into added value relates to that absolute time, a time specific to human existence.

In this article I will try to prove that the main way to obtain high performance through inter-organizational innovation can be achieved by manipulating the context and manipulating knowledge outside the arbitrary concept for "time".

This article 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.*

1. Performance in absolute time and relative time

The biological time is a resource for companies because their main purpose is to obtain value-added, wealth for their shareholders in a smallest fraction of their existence (and shareholders are provided a limited existential time, sic!). Moreover, there is an impressive literature related to time management in order to achieve economic and social success.

Addressing inter-organizational innovation performance in my previous articles was performed in anticipation of a framework represented by collaborative structures and by identifying within this frame relevant variables and elements regarding the content and context (Serghie, 2014, 2013, 2011). Around the independent variables were identified managerial levers circumscribed to fundamental rules of business processes and innovative networks, aimed at achieving performance. Handling these levers by managers allows obtaining value by exploiting collaborative innovations according to the company's aims.

As resource of the performance model, viewed as a dimension of content or context, time becomes a measure of the speed of change in the structure of the innovation ecosystem. The general perception accepted by me is that time in science is a dimension of speed with which the structures identified by human senses are changing: the speed by moving a body in space (Newtonian physics), the rate by which the body degrades in terms of aging in the course of life (anatomical age), the speed through which the botanical processes are running in a garden (much lower than the speed perceived by human senses), the speed by which the ingredients from a certain raw state reach a prepared state in the oven from the kitchen etc. As a resource of the innovation ecosystem, time will measure the speed with which innovative structure undergoes a transformation from one state to another.

First, people have defined an absolute time observing cyclical changes in the modification of celestial bodies' position seen as a cosmic system. Time has measured conventionally, by a label, (or name), the speed (perception related to locomotion ability or reaction in relation to other peers or systems) with which the structure of that system modifies between two supposedly identical phases. Extending this label through divisions and multiples has been linked to biological existence in an attempt to measure the speed in which the system, represented by the human body, changes between two main structuring, birth and death.

Mechanical Physics introduced an arithmetic approach (and very limited) of the concept of time as being the space covered by an object moved in a unit of speed. If we cut a cube, a sphere, or any other geometric shape no matter how irregular in the three-dimensional space including the space where the object is moved, we would obtain a system and two structures of matter and energy contained by this. Time can be perceived as a dimension of the speed with which that system came from one state to another. Moreover, the fact that time is not related to travel, we can highlight it by the speed of transformation of the contents of cup of fresh milk into curd.

Einsteinian approach proposed the notion of relative time, repositioning actually, within the analyzed systems the one who introduced the time measurement convention: man. Because structural changes in systems are perceived by observers through the senses, from this point was taken into account the perceptive relativity of time by humans compared to other positioning or other landmarks of the observation.

According to this theory, time is not an independent resource, but a measure of the speed of change of collaborative space (which may denote the existence or absence of physical resources or knowledge in a particular segment) under the influence of informational energy. If changes at the level of the smallest collaborative structure elements (included in the concept of DNA or other factors specific to the network) are stopped, then time is a resource of no importance and it cancels, in its turn, the possibility of obtaining innovative performance. Similarly, if we extended a system observable at a cosmic scale and no particle, no matter how insignificant, from its contents would not undergo any change, there would be no time for that system.

In terms of time, we can identify two directions of analysis:

1. Evaluation of performance within the time resource (as linear time of human existence and physical reality) and
2. Performance assessment within the dimension of relative time, having as premise the differentiated modes of perception on the usefulness and innovation conditions, born in agreement with an increase or a decrease in collaborative ecosystem changes (including entities, processes, and in particular knowledge). Relative time is comparable to time resource and can take positive or negative values in relation to it. For example, a manner of changing the patterns of thinking, of seeing the utility of the process or the product can accelerate the relative time.

On the first line of analysis according to absolute time (or resource), we highlight the performance of collaborative innovation on the time axis through a sequential approach, allowing quantification using the indicators mentioned in the previous chapters.

An exemplification with a few sequences is illustrated in the figure 1.

The performance of collaborative innovation analyzed at some point on the physical time axis based on content coordinates (variables) becomes for the economist the current network performance. Innovation performance at the present time is founded on a collection of factors and variables that have been perceived in the past on a specific time horizon. Instruments through which we perceive these factors, closely linked to human senses, are unable to perceive and analyze the innovative performance in the relative time dimension, integrating the collaborative system in a holistic perspective. The estimation of a practitioner regarding the performance of innovation at time 0 consists, actually, in a measurement of the consequences of the action of factors and variables in the past and, in no way, this doesn't provide an analysis or value of the present moment in relative time. This estimation can be compared to a picture whose image is a projection at some point of a past evolution and not a projection of the present.

The difficulty in the performance analysis of innovation occurs in future estimations. Typically, past performance is a result of the changes that had occurred within the innovation system, and future performance is determined by the conclusions of the analyst (as mental projection) about other modifications in the system that will take place (also induced by knowledge of the past).

In the second analysis direction, depending on the context, we can analyze the performance of collaborative innovation in relative time (figure 2).

In the figure, by the horizontal arrow I represented absolute time (the observer's) and the blue line, the relative time induced by handling the context and manipulation knowledge. Relative time can climb the graphic positively when the collaborative structure accelerates by obtaining superior performance (thought patterns of actors change, for example) or it can drop below the horizontal axis in the negative sense when handling context is poor and has the effect of reducing network performance.

2. Sequential Estimation of performance

Organizations' concern is to achieve financial performance of sales, lower costs and more efficient processes. Interorganizational collaborative innovation is looming as a sub process with increased potential to provide higher positive results in these directions. The value analysis and hence of the performance, on segments as fine as possible of the innovative cycle within a network structure can provide us directions of action to incubate valid and effective ideas, in order to select those that can be exploited in economic terms and to obtain financial benefits according to the organizational goal to provide shareholders wealth.

In this section I will divide, gradually, the specific activities of each innovative cycle and I will suggest, within each stage, working tools and a list of possibilities for estimating innovation performance by the indicators described in the previous chapters. Examples of tools associated with different stages of collaborative inter-organizational innovation have been adapted from a study on business intelligence systems made by Kislin (2007).

1. *Identification of conceptual space of knowledge for a process, a product or service in accordance with adjacent possibilities of extending the economic usefulness.*

The model for accessing knowledge: searching.
Actors: manufacturers, customers, final users, universities, research centers
Collaborative structure: shaping the network based on weak ties (**RLS)**
Activities and areas of expertise: knowing the environment in which is generated and exploited the process, the product or service and the extension of information scanning and associations to external environment (firms, sectors, markets etc.).
Examples of instruments:

1. Methods of analysis and tools: Pareto, SWOT, Ishikawa diagram, BCG Matrix Method MACT, Utility and value analysis, Six Sigma, Analysis of the business process etc.,
2. MEPD questionnaires,
3. Business plan, Organizational Project Management, PERT etc.

Processing the collected data to estimate performance indicators:

The parameters through which we can estimate the performance of this stage are those specific to variables relating to the content (concerning the functional efficiency of the network) and diversity estimators.

2. *Derivation of the possible adjacent in searching processes information storage*

The model for accessing knowledge: search, observation, association, query standardization of communication channels through which information circulates
Actors: organizations and individuals from various fields of knowledge
Collaborative structure: establishing network nodes based on weak ties (RLS) and increasing intensity of communication between actors
Activities and areas of expertise:

1. Ability to analyze decision problems at organizational level and projecting (organizing) search problems of information within the network,

2. Transposition of information in a common language and its framing in conformity with the product or service concerned,
3. Prior research and information storage,
4. Defining a set of informational indicators,
5. Monitoring and evaluating processes for submitting information under a common language for actors situated in different planes with different areas of knowledge or expertise.

Examples of instruments:

1. private networks of employees and partners,
2. databases, software and human resources documentation,
3. search engines, meta-browsers, employees or partners that have developed in time extensive network of weak ties,
4. information portals,
5. software applications to discover sources,
6. warning agents,
7. intelligent agents,
8. specialized portals,
9. search engines,
10. documentations,
11. archives and other forms of records,
12. Semantic search applications in the online environment.

Processing the collected data to estimate performance indicators:

Parameters through which we can estimate the performance of this stage can be selected from the indicators of the content concerning operating efficiency of the network in stage of incubation of innovative ideas. The inventory and classification of information collected through interactions within the network of suppliers, customers, sometimes competitors and other actors, in databases, should allow providing, at some point, important and relevant information in a particular context. Organizing information within the network involves several basic elements:

1. Establishing the criteria for organizing information (taxonomy)
2. Ensuring the availability and access to information within the network (intranet)
3. Organizing information after a processing and analysis allowing them quick access to the user.

3. Validation of information and identification of sources of knowledge that can foreshadow interorganizational innovation

The model for accessing knowledge: experimentation, practice and knowledge transfer

Actors: economic organizations with the purpose of obtaining value, individuals, universities, research centers

Collaborative structure: delimitation of network experimentation and knowledge sharing (REP) from the network of weak ties

Activities and areas of expertise:

1. search and use of formal and informal sources,
2. selection of sources from which will be achieved connections within the network of experimentation and sharing of knowledge, memory and storage modalities and traceability of information within the network,
3. evaluation of performance indicators regarding accession opportunities of the possible adjacent for a process, product or service by retrieving information in the network,
4. channels and sources that transcend organizational boundaries, verification procedures and monitoring information,
5. Level of expertise and skills to build an information system and a common language for documentation and information exchange (lexicon, query language and answer, creating standardized queries).

Examples of instruments:

1. Instruments of needs analysis (MEPD, MEDESIIE, UML, Requirements engineering etc.);
2. Methods and audit tools, TQM, PDPA;
3. Brainstorming type instruments and drafting the concepts map;
4. Applications ITC to mediate collaborative activities (Groupware Tools, E-mail, E-conference, workflow);
5. Methods of reasoning based on imagining scenarios, situations and different cases.

Processing the collected data to estimate performance indicators:

The indicator which becomes crucial within this sequence is that of network identity. Other parameters that can predict the performance of this stage can be selected from the content and the context. The use of these tools to quantify the parameters and analyze interactions among network nodes (actors), there should be considered three barriers that can reduce the influence of variables in predicting performance:

1. **Mutual trust.** Network nodes become sources of information, of practice and gates of sharing knowledge. If there is a history of interactions, the essential technical aspect to ensure liquidity of the network is the level of trust of actors concerning the received information, their relevance and the potential to provide

value within the collaborative structure for innovation.

2. **Source Motivation.** Reciprocity of interactions and exchange of information requires that actors do not hide interests more or less obvious that violate the ethical code. The flow of information between network nodes must be characterized by clarity, objectivity and be relieved of private interests.
3. **The dependence of other actors.** Excessive interaction between certain nodes of the network or from a small group of the overall structure becomes harmful for creativity, for a dynamic combination of ideas, observations, associations and experiments and finally for the innovation performance.

The existence of these three barriers affect performance in each stage of the loop of the collaborative innovation spiral and within any of the three network types defined (weak ties network, network testing and sharing knowledge respectively innovation network and sharing of a vision) . If these are not outweighed by antecedents like experience or history of actors involved in the collaborative structure, the three barriers can be dimmed by the ethical code of the network, culture open to collaborative innovation induced by organizations that form the network etc.

4. Processing of innovation opportunities, selection of creative ideas to be tested

The model for accessing information: In decision-making and selection processes, information is needed for the assessment of ideas, for the evaluation of the economic impact from the implementation of innovation, for the evaluation of the organizations' position on the market following the marketing of collaborative innovation etc. After making selection decisions, it is necessary to build a basic strategy of valorisation.

Actors: economic organizations having the purpose of obtaining value, managers and leaders with decision-making powers

Collaborative structure: The innovative network and sharing a vision (RIV)

Activities and areas of expertise:

1. Interpretation of creative ideas and possibilities for innovation;
2. Ability to analyze and interpret the usefulness and potential of marketing on the market;
3. Decision making on the selection of ideas to be tested, the processes to be implemented and the products and services that will be marketed;
4. Existence and knowledge of decision-making processes within the network;
5. Close monitoring of performance indicators;
6. Monitoring indicators on decision making.

Examples of instruments:

1. Decision support systems, SIS, Databases and Data Mining;
2. Management Tools, scoreboard, matrices and decision trees.

Processing the collected data to estimate performance indicators:

The parameters through which we can estimate the performance of this stage are estimated by the indicator of identity network and content indicators, but with a greater share of the values quantifying resource management and strategy implementation.

Selection of creative ideas for testing and commercialization through innovation, and analysis of opportunities for implementing new processes or sale of products or innovated services requires that network organizations have the potential to launch and support the product development on the market according to a life cycle thereof.

5. Activities to launch and capitalizing on the market

In this specific stage RIV, there are assigned roles and responsibilities regarding the collaborative innovation capitalization on the market, there are selected actors or organizations that will support the management process focused on financial issues and economic performance of the investment. Also during this stage, there are shared benefits and investment costs of the innovation launched on the market. In the fourth chapter, specific to this stage, we estimated the recovery operational performance of a collaborative innovation on the market. Other economic effects that could be quantified are the effects of learning (acquired competence, the number and effectiveness of the implementation of new processes in the organization, etc.), those related to competitiveness and financial accumulation by recourse to evaluation criteria of investment, such as VAN , IRR, RIRM etc. (Figure 3)

CONCLUSIONS

Obtaining performance through collaborative innovation is a process and not an end. The best model of collaborative structure is created and managed according to the nature of organizational actors, objectives and interests, as well as the entities (individuals), their talents and skills. The estimation of future performance is a mental projection developed on these considerations.

Innovations that reach the stage of being valued through exploitation on the market are filtered for profit objective by organizations in terms of the process efficiency of innovation or usefulness of the process of innovation for customers. Mental projection of future

performance, which guides managers in managing the collaborative network, however, is different from ecosystems' evolutions in the universe. Biologists, astronomers and physicists describe evolutionary processes that are not based on a projection of the future, because they do not incorporate intelligence able to process knowledge and information. Changing a natural system between two states is realized under the effect of factors able to act on content elements of the system by means of force (energy). A collaborative ecosystem can be modified under the influence of factors that cause mutations in content (on entities, attributes, relations and processes). The difference between the two cases is the fact that collaborative ecosystem includes information processing capabilities and handling of knowledge.

As presented in previous articles, information is a manner of encoding specific to a human (to his capacities of internal or external storage) and to models developed by him for its processing, through which are stored sensory perceptions concerning entities, attributes, energies and processes specific to dimensions possibly observable, and in which the human biological body system suffers changes. For systems that include individuals, including collaborative networks, due to its ability to handle knowledge, changing the structure between two states of context is influenced by the desirable projection of the future capable to bring value to the organizations involved, imagined by decision makers based on passed information.

Collaborative structures operate primarily with information and knowledge (coded data and interpretation of spatial patterns of innovation). Systems including living entities based on intelligence have the ability to continuously change the context under desirable objectives of actors. In the sequence of successive modifications and adaptations, the system interprets the adjacent environment and opportunities for innovation, absorbing through perception information, codifying them as their models and external capabilities for processing (network intelligence type) - Figure 4.

The ultimate goal of the collaborative interorganizational network is to achieve value through innovation for the enterprise. Foreshadowing desirable objectives (imagining the future based on the past) is just the impetus that will animate actors in the network to involve in context handling processes and handling of knowledge with increased performance effects in a physical time. Ideas, creativity, radical innovations thus become the appanage of collaborative systems that succeed to detach from "quantities of time" and are not dependent on processing models of "normal" or standardized knowledge. Otherwise, innovations will be at most incremental.

Intelligent collaborative system has the capacity to process sequences of information absorbed through perceptions about the environment structure, to combine and associate them with their information and to conduct an innovative process that leads to maximize its performance. However, collaborative system must be adaptable in the sense that can adapt its own structure to facilitate punctual goals (e.g., to ensure domestic liquidity necessary to the combination and association of ideas).

Flat networks that lack any hierarchy and constraints, through a self-interaction adaptable with the environment, would develop an emergent behaviour within the collaborative space- relative time perfecting with every innovative cycle a self-organization model, which induces smooth-system environmental adaptability. The collaborative structure will oscillate between periods of stable economic exploration of environment, markets and utility and dynamic periods of experimentation and innovation launch on the market.

Based on the concepts of collective intelligence (Wheeler, 1911) and intelligence "swarm" (Beni, 1989), we can conclude that the collaborative interorganizational systems can self-organize through stigmergy. The term of stigmergy comes from the entomologist Pierre-Paul Grasse since 1959, being used to explain the construction of nests of tens of thousands of times greater in size compared to "builders", by unifying efforts within certain communities of termites. Observations concerning raising "objective" revealed the existence of two distinct phases: a) a first phase disordered and b) a second one ordered, which will result in completion of the work only if a critical point of termites density is exceeded. Performance is driven by the purpose of the activity and not by workers, the workers being somehow guided by foreshadowing future. This form of stimulation is named stimergy (stigma - stimulus, ergon - work). Self-organization of a collaborative interorganizational system through stigmergy assumes to develop mechanisms for modifying the structure (content) via its component entities and corresponding to a mode of interpretation of knowledge according to a particular context. By stigmergy organization, the collaborative system will be influenced by a double emergence: emergence induced by collaborative space content (and described in previous articles) and an emergence of innovations that can be circumscribed to a possible space adjacent to contextual knowledge (possibly, will make the subject of future research).

Moreover, the model proposed in this paper for analyzing and estimating performance of collaborative innovation can be applied to networks with acceptable dimensions. Such a model can be applied easily in absolute time and under the

assumption of independence collaborative system - observer. In the case of open innovation networks, in which are involved, in addition to organizations, a large number of individuals, taking into account that the degree of complexity of network is given by the multitude of variables, interactions and processes, the quantification of indicators becomes inaccessible.

However, due to the uniqueness of the observer, the analyst applying ontological distinction between "absolute time" and "relative time", we can develop a theory of the collaborative innovation performance by recourse to information entropy and by considering the innovation process as being characterized by a discontinuous character, nondeterministic.

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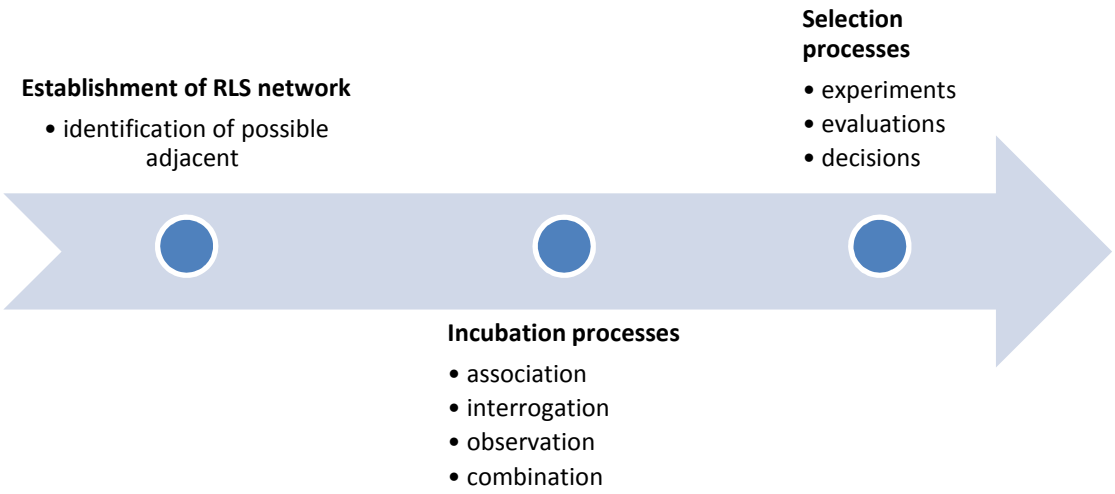

Fig. 1. Analysis of innovation performance on a sequence of physical time

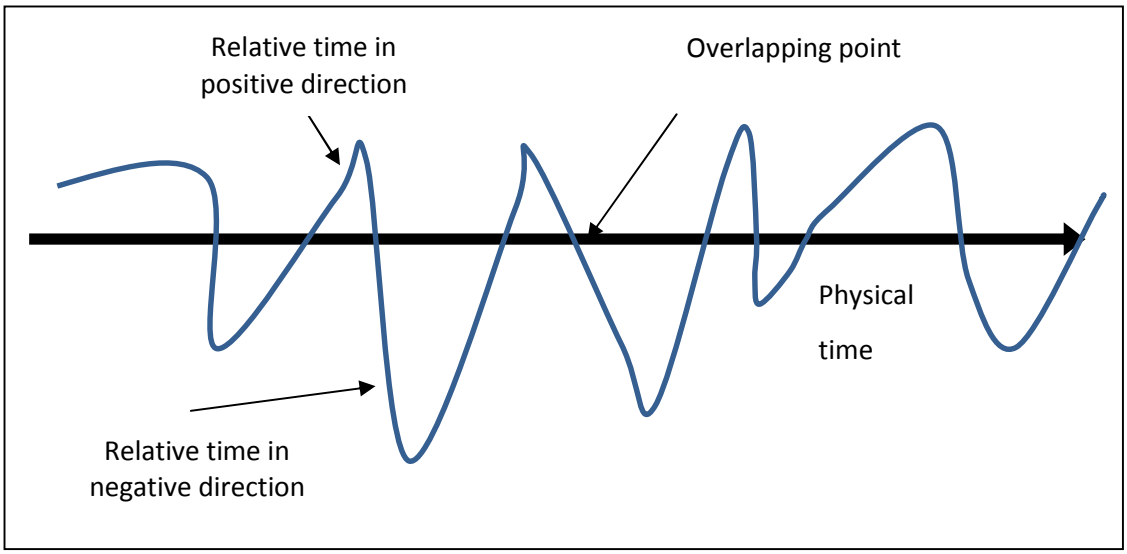

Fig. 2. Analysis of innovation performance by manipulating context (relative time)

1. IDENTIFICATION OF THE KNOWLEDGE SPACE AND OF THE POSSIBLE ADJACENT FOR EXTENDING THE ECONOMIC UTILITY
   - THE COLLABORATIVE STRUCTURE: NWL
   - PROCESSES: SCANNING, ASSOCIATION, SIGNIFICATION
   - 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

2. SCANNING AND EXPLORATION OF THE POSSIBLE ADJACENT
   - THE COLLABORATIVE STRUCTURE: NWL
   - PROCESSES: SCANNING, ASSOCIATION, COMMUNICATION, SIGNIFICATION, PRACTICE
   - 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
   - THE COLLABORATIVE STRUCTURE: NED
   - PROCESSES: EXPERIMENTATION, ASSOCIATION, COMMUNICATION, SIGNIFICATION, PRACTICE
   - 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
   - THE COLLABORATIVE STRUCTURE: NED/NIV

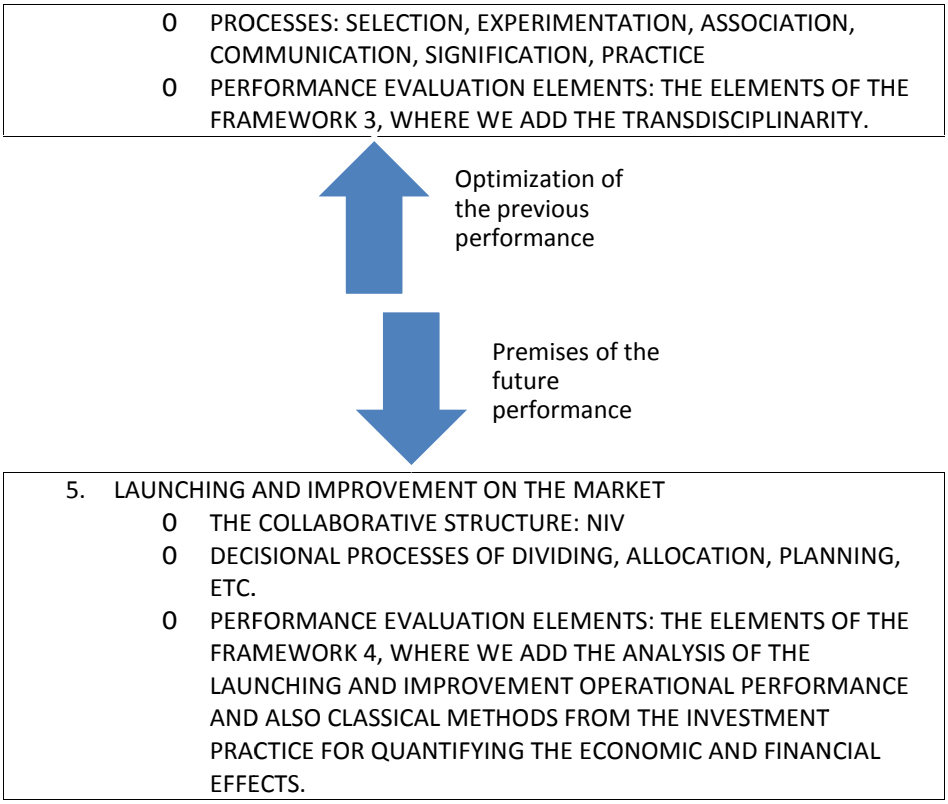

Fig. 3 **Sequential analysis and evaluation model of the performance** (through a rational and refined process of selection of the performance indicators, aiming at providing the shortest and most relevant list of criteria)

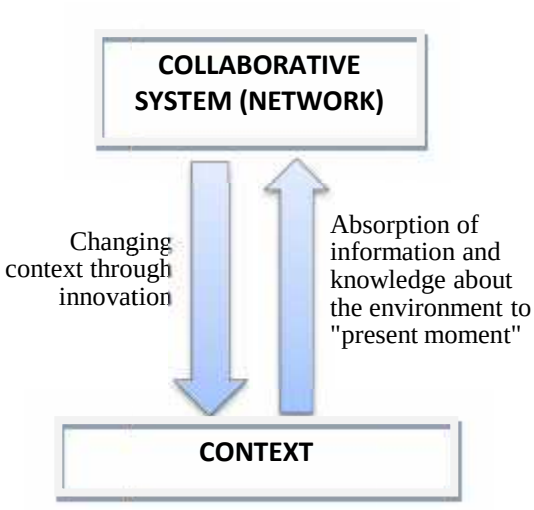

Fig. 4. Changing context by living innovative systems