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BUILDING A CONCEPTUAL PROPOSED MODEL FOR THE TOTAL INNOVATION DNA

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ABSTRACT: *The study depended on a grounded theory approach (Walker, 2007), Dubin's scientific method steps had been followed when the proposed model had been built (Dubin, 1978). Therefore, the study tried to link two hot concepts together, which are rising in both the organization theory and the innovation theory fields, these two concepts were the organizational DNA and the total innovation management, so the literature has been reviewed to set a clear definition for the total innovation DNA and to explore the variables, which described the concept of Total Innovation DNA) and to determine how these variables were measured and how they are related with each other, then the study provided its conceptual model with proposed measurement items for each variable.*

KEYWORDS: innovation theory, organization theory, metaphor, total innovation management, organizational DNA.

INTRODUCTION

Innovation has not been yet an alternative strategy but it has been an imperative one for surviving and growing in such a global competitive Environment (Tucker, 2001; Agrawal, 2006; Lawton, Rajwani & Reinmoller, 2012). Innovation Phenomenon had been interested by many researchers along the past time, they tried to determine the innovation motivators and determinants based on different schools of thought in the organization theory literature (Tidd, 2006; Xu, Chen, Xie, Liu & Zheng, 2007; Abou Zeedan & Hender, 2010).

Moreover, there are many typologies has been set for innovation, thus innovation might be radical and/or incremental according to its type (Tidd, 2006; Ben-Regeb, Gumares, Boly & Assielou, 2008). Innovation might be technical and /or organizational according to the socio-technical model (Adams, Bessant & pheleps, 2006; Crossan & Apyadin, 2010, Gunday, Ulusoy, Kilic & Alpkan, 2011), innovation might be product-oriented, process-oriented, people-oriented, and /or business model-oriented according to its area (Tidd, 2006; Crossan & Apyadin, 2010; Gunday, Ulusoy, Kilic & Alpkan, 2011; Xu, Chen, Xie, Liu & Zheng, 2007).

Organizational DNA is a hot rising metaphor in the organization theory literature that tries to understand, explain and predict the innovation phenomenon in organizations. On the other hand, there is a rising philosophy that sets an integrative framework for the innovation responsibility in the total environment of the organization and this philosophy called total innovation management (TIM).
This paper organized as follows:

First, providing the evolution of the concepts (Organizational DNA, Total Innovation Philosophy, Total Innovation DNA). Second, the paper shows how the innovation theory has been affected by the organization theory a long past time until reaching the organizational DNA metaphor, then conceptual and applied models will be reviewed from prospector studies in the literature. Third, the paper proposed its own model for the Total Innovation DNA.

Evolution of the organizational DNA concept:
The concept had been mentioned for the first time by Gareth Morgan in his book "Images of organizations" (Morgan, 1995: 102-103), when he described the organizational identity through its DNA. According to him, organizational DNA consists of three components (Vision, Mission, Values); these components are unique for each organization and can differentiate it from its competitors in any industry.

After that, a model of an organizational DNA had been produced by (Kapia, Newham & Volckman, 1998), the model tried to link three components together in the organizational socio- technical system (Strategy, Process, People), then the model had been developed later by (Kapia & Milus, 2010).
The developed model seemed like an Egyptian pyramid with four sides. They developed the model to make it reflects the process of re-adaptation of an organization when changes occurred in the organization total environment.

Following that, the concept was used to describe the method of how Toyota converted its tacit knowledge to implicit knowledge through a systematic manner, which contained hypothesis experimentation and continuous learning. This process performed by collaboration of many functions in the firm such as (R& D, Operations, Marketing), and by a collective work of many people from all management levels (Spear & Bowen, 1999).

The concept of Corporate DNA has been provided by (Sheffert, 2002), that every corporation have to achieve the fitness status by connecting its culture values with the right people. It will recruit and staff, because those people are the critical component in the socio-technical system of the organization.Booz-Allen-Hamilton is a consultant company, which provide a consulting service for organizations. The company built the first clear model for the organizational DNA concept (Neilson, Pasternack & Mendez, 2003). The model consisted of four building blocks (Structure, Information flow, Motivators and Decision making authority). According to these blocks, the company sets a typology for organizations. The typology divides the organizations into two groups. The first group contained three profiles that refer to successful and survival ones, which dominates its environment. Those profiles are (Resilient, Lean and Military). On the other hand, the second group contained four failures profiles (Over-managed, Out-grown, Passive-aggressive, Fits and Starts).

After that, many articles have been published in a periodical called strategy + business that provides many studies in the organizational DNA concept as a change-oriented approach, that how can the organization transform its DNA from failure profile to survival ones by using the organizational genetic reengineering (Neilson & Fernandez, 2006).Indeed, organizational DNA is a Rising Approach that tries to understand, describe and predict many organizational actions in different functions and processes in the organization. Recently many researchers depend on the concept to explain many phenomena in the organization. For example, the process design and the facility layout (Ivanov, 2011), Describing the governance elements (Vershoor, 2004; 2005; Arjoon, 2006). When recruiting, selecting, staffing the workforce to achieve fitness between the organization and its people (Holladay, 2005), when leading, motivating and managing performance (Ray & Barney, 2008; Vicere association, 2008; IBM corporation, 2010) when setting a new marketing mix (Booz-Allen- Hamilton, 2005).

Consequently, organizational DNA is a change-oriented approach that aims to readapt with the total environment of the organization under any contingencies inside or outside the firm. Organizations that success to achieve this re-adaptation process are called evolutionary organizations (Neilson & Fernandez, 2006; Kapia & Milus, 2010; Glaser, 2010; Welborn & Kasten, 2010; Eyring Young, 2011; Lawton , Rajwani & Reimoller, 2012; Bordia, Kromenbery, Neely, 2005).

Recently, there are some specialist text books have been released which are interested in this new metaphor and used it as a change-oriented approach to readapt and reconfigure (Honold & Silverman, 2002; Moore, 2006; Gale, 2017; Duggal, 2018).

According to the organizational DNA approach, organization is an open natural system that works in a whole ecosystem. Critical changes should be made to the organizational DNA when contingencies changed in the total environment. Organizational DNA approach succeeded to solve the argument point between the selection process according to the ecology theory and the readapted process according to the resource based view and the dynamic capabilities approaches, that environment selects those organizations which succeeds to achieve fitness and change its DNA to readapt with the changes that have occurred in the environment.

Some advanced studies show that the re-adaptation process can be achieved through a dual- DNA, one of its component is static and the other is dynamic (Govandirjan & Trimble, 2005; Dobni, 2008; Prange & Schlegelimich, 2010; Ricciardi, 2011). These studies confirm the ideas that had been provided by the chaos theory about the equilibrium state, which can be reached through two paradox forces, or two paradox schools of thinking such as the mechanistic and organismic metaphors. Also innovation can have two paradox forces (External and Internal, Radical and Incremental, from Up –to-Down and from Down-to-Up across management levels, Technical Oriented and Organization Oriented, Process Oriented and People Oriented).

Organizational DNA metaphor depended on many theories and approaches in the organization theory literature such as ecology theory, resource dependence approach, institutional theory, complex systems theory (Li, 2001).This interrelation process fits with the concept of triangulation (Lewis & Grimes, 1999, Jacques 1992; Scandura & Williams, 2000), that the multidisciplinary approach must be used when any new theory have to be built. On the other hand, organizational DNA metaphor depends on principles from the ecology and genetic science, and this make the organizational DNA concept a connecting bridge between different fields and achieve the interdisciplinary way of thinking. Organizational DNA is a complex dynamic concept that consists of many interrelated and integrated blocks. These blocks might be tangible or intangible in the socio-technical system of the organization. That is why; we can define the organizational DNA concept as a constellation of interrelated and integrated tangible and intangible variables that identify the organization. These variables are static in the short term and dynamic in the long one. They are responsible for the readaptation process, which needed when contingencies have changed in the whole ecosystem that any organization is part of it.

This definition confirms some points:

- Organizational DNA is a change-oriented approach that aims to achieve readptation through innovation.
- Each industry should have its unique DNA and each organization should have its unique DNA too, that differentiates the organization from its competitors in a given industry or market.
- The concept of organizational DNA is a dynamic concept, that blocks can be added, removed and/or adjusted according to the contingencies in the whole eco-system.
- Organizational DNA consists of both tangible and intangible blocks, which is existed in the socio-technical system of an organization, so it has equilibrated by paradox.
- The blocks of the organizational DNA are interrelated and integrated in itself, and each block is a sub-system in a whole DNA.

The Rise of the Total Innovation Management Approach:
At the first time, when the concept has been risen, (Tucker, 2001) referred to the concept total innovation

management as a core competence of any organization which aims to survive and grow in an environment. Indeed, innovation is the responsibility of all functions in the firm and can be achieved through the coordinated and collaborated work from different areas inside the organization such as: Production & Operations, Marketing Research, Research & Development, Human resources practices, Administration practices, Strategic orientation and choice.

After that in 2002, a research team from Zhejiang University, which located in China, proposed a conceptual model for the total innovation management. Then, the same team has developed the model in 2007. In addition, they named it The Pentagon model because the model consisted of five corners and blocks, which referred to the universality of the innovation process. These five blocks are (Structure, Technology, Strategy, Marketing Mix, Administrative and Human Resources Practices), and the five corners are (all people, all time, everywhere, all processes, across the whole supply chain) (Xu, Zhu, Zheng & Wang, 2007; Xu, Chen, Xi, Lin, Zheng & Wang, 2007).

According to this philosophy, several stakeholders around the organization can participate and coordinate their efforts to share in the innovation process, and this called orbital management (Tomala & seneschal, 2004). Many countries in Asia have depended on the TIM model as a mechanism to transfer and localize technology (Farris, 2007).

The majority of the international society have been aware of the importance of innovation as a way to achieve sustainable development. Recently, there are more than 125 countries have been ranked by the global innovation index which consists of 80 metrics that measure the innovation system in each country.Hence, total innovation philosophy can be defined as Organization that is doing both kinds of paradoxal innovation in a continuous manner at the same time (radical and incremental, internal and external, process oriented and people oriented, from up-to-down and from down-to-up by aligning and coordinating different efforts, tasks, resources and functions from inside and outside the organization). According to the two concepts (organizational DNA and the pentagon model of total innovation philosophy), total innovation DNA can be defined as : These interrelated and integrated tangible & intangible variables in the macro socio-technical system of the organization that responsible for activating innovation continuously and comprehensively to readapt with the ecosystem and achieve legitimacy, surviving and domination.

This definition reflects some points:
- Using the organizational DNA approach to understand, explain and predict the innovation phenomenon in organizations.
- Innovation is a complex and dynamic concept that contains many changeable variables.
- Innovation must be done in a paradox way and this nature of innovation show strong agreement with the chaos theory and the duality way of thinking.
- Innovation must be done internally by coordinating all functions inside the organization and must be done externally by collaborating with other stakeholders in the ecosystem, this view of point shows strong agreement with the stakeholder approach, Network model and cybernetics philosophy.
- The selection process that occurred by the ecosystem and the legitimacy status that gained by organizations have happened because of the adaptation and innovation processes which had been made by the selected organizations. This view of point confirms the ideas of the institution theory.

The Difference between Innovation and Other Concepts:
Innovation and creativity concepts have been interested and studied by many researchers in the past decades. They agree that creativity is the ability to produce new and useful ideas that help an organization to lubricant its internal process. On the other hand, innovation is the ability to translate those ideas into useful, new and profitable products that satisfy current and potential customer needs.

Therefore, organization cannot innovate before it creates. Besides, creativity is the first step in the innovation chain (Udwadia, 1990; Gumusluglu & Ilsev, 2009; Fu & Tan, 2014; Wang & Tsai, 2014).
In addition, creativity concentrates on the psychological status of the organization. That is why; researchers relate the concept of creativity with other concepts such as perception, emotional intelligence, organization learning, and organization values. On the other hand, innovation concept concentrates on concepts such as (products, process, marketing mix, business model, structure, technology, effectiveness and efficiency (Udwadia, 1990; Fu & Tan, 2014; Spean & Mele, 2012; Borghini, 2005).

Innovation chain consists of systematic consequential phases that start with the problem definition phase then the creativity phase, which begins with producing, collecting and filtering unique and new ideas. Thus, creativity is a phase in the innovation whole chain. After that, the invention phase is coming. In this phase, prototyping and technical feasibility have been achieved, each of the creativity phase and the invention phase is a single phase in the innovation chain (Khiliji, Mroezkowski, Bernstien, 2006; Crossan & Apyadin, 2010; Brennan & Dooley, 2005; Ulusoy, 2003).

Furthermore, Innovation concept is far different from knowledge concept, because knowledge might be stored, retrieved, and shared but innovation might not because of its freshness nature (Gurteen, 1998).

The Evolution of the Innovation Theory:
In 1937, Schumpeter considers innovation in his book "The Theory of "Economic Development" as the optimize blend of production factors that minimize cost and maximize wealth as possible. That was the first appearance of the concept in the literature (Xu, Chen, Xie, Liu, Zhneg & Wang, 2007), Innovation theory have been developed across time parallel to the evolution that happened in the organization theory literature (Tidd, 2006).
T
he Reflection of the Scientific Management Movement and the Administration Process Theory:
In this phase, innovation had been achieved by focusing on the technical system and the production function. Organizations concentrated on areas such as process design, material handling, facility layout, resource allocating, but the human side of the organization was ignored. In addition, in this phase organizations concentrated on how to determine specific tasks, responsibilities as a consultant department (Tidd, 2006; Xu, Chen, Xie, Liu, Zheng & Wang, 2007).

The Reflection of the Human Relations School and the Cooperative System:
According to this school of thought, innovation can be achieved through coordinating efforts between several subgroups in the organization. Besides, organization can motivate people to produce and try new ideas that lubricant the internal process, (Tidd, 2006; Xu, Chen, Xie, Liu, Zheng & Wang, 2007).
The Reflection of the System Theory and the Organization Life Cycle:
Organizations in this phase began to search sources of innovation externally. Researchers have set a systematic model of innovation that consists of inputs, process, outputs and feedback loop (Adams, Bessant & Pheleps, 2006; Crossan & Apyadin, 2010, Tidd, 2006). A famous model had been provided by Abernathy & Uterback called U-A model , which divides the product development process into three phases (Liquid phase, Transitional phase, Solid phase) (Xu, Chen, Xie, Liu, Zheng & Wang, 2007). We can suggest a (Gas phase), which an additional phase come before the liquid phase. The gas phase can explain the process of producing, filtering and condensing creative ideas.

The Reflection of the Soci-technical System and the Contingency Theory:
Organizations in this phase concentrated on how to achieve adaptation with the task environment changes by coordinating subsystems that form the socio-technical system of the organization, According to this way of thinking organizations activate innovation by reengineering, restructuring and

reconfiguration (Becheki, Landry & Amara, 2006; Tidd, 2006; xu, Chen, Xi, Liu, Zeng & Wang , 2007; Crossan & Apyadin, 2010).

The Reflection of the Total Quality Philosophy and the Chaos Theory:
Studies in this phase built complex equilibrated models of innovation that consist of two paradox cores, the static core which refers to the total quality management practices that aim to achieve the lean system characteristics. The second core is the dynamic one, which refers to the innovation management practices, so the whole system will be equilibrated by those paradox cores. Researchers in this phase concentrate on how to integrate and interrelate the Dual-Core. They believe that innovative organizations are quality oriented at fist so innovation and quality are two faces to the same single coin (Daft, 1978; Prajogo & Sohal, 2001; Liu & Kleiner, 2001; Prajogo & Sohal, 2004, 2006; Vijinade & Gonzalez, 2007; Abrunhosa & Esa, 2008; Azis & Osada, 2010; Hussien, 2011; Kim, Kumar & Kumar, 2012; Daft, 1978).

The Reflection of the Network Model and the Institutional Theory:
The concepts of open innovation and innovation chain have been risen in this phase (Ulusoy, 2003; Zhihong, Hua Dazhao & Kang, 2008; Ollia & Alquist, 2011). Moreover, the pentagon model of the total innovation management have been provided for the first time (Menke, Xu & Gu, 2007; Xu, Zhu, Zheng & Wang, 2007). According to this way of thinking, innovation is a complex phenomenon, which need alignment and coordination of several resources and efforts across the innovation chain inside and outside the organization. Recently, many innovation models have been developed which depend on the collaboration concept between more than two parties. This model is called innovation incubators. It might be triple or quadruple (Rothchid & Darr, 2005; Etzkowitz, Mello & Almeida, 2005; Abouzeedan & Hender, 2012; Bjork, 2014).

The reflection of the Ecology theory and organizational DNA approach:
According to these approaches, organization is an open, natural, complex. Continuously self- adaptive system, organization can readapt and innovate by reengineering, restructuring and reconfiguring its DNA. Therefore, organization must concentrate on its strengths and eliminate its weakness. Thus, the change that occur in the organizational DNA resulted from the changes that occurred at first place in the environment, organization can learn continuously by interacting with the whole ecosystem then readapting and innovating. Dominant and legitimate organizations are those organizations that succeeded to change its organizational DNA and entered the mutation phase. The domination and legitimacy status will be reached by different, interrelated, integrated, organizations.

Innovation phenomenon should be studied from a comprehensive view, which contains both dimensions; the organization dimension and the environment dimension. That innovation is the responsibility of all stakeholders around the firm not the responsibility of the organization only. No organization can innovate quickly by itself. Many parties must collaborate to reduce the innovation life cycle as possible because of the limitation and the scarcity of resources needed to innovate in such competitive and selective environment (Govandirjan & Trimble, 2005; Agrawal, 2006; Neilson & Fernandez, 2006; Dobni, 2008; Kapia & Milus, 2010; Eyring & Young, 2011; Sullivan & Bidwell, 2011; Brook, 2013).

LITERATURE REVIEW

Relatively, few studies focused on the concept of innovation DNA in organizations although its importance to understand, explain and predict the innovation phenomenon, this paper classified those studies to conceptual studies and empirical ones.
The conceptual studies:

Dobni (2008)
The study provided a conceptual systematic model for the innovation DNA that consisted of inputs, outputs and results. Inputs in the model played as motives, determinates of innovation, and mentioned as independent variables in the model. These inputs were (Knowledge management, Cluster management, Risk management, Organization flexibility) and all of these inputs worked in an atmosphere of collectivism culture and empowerment. The second part in the model referred to the innovation portfolio as an output in the model. Innovation portfolio contains of several alternatives and scenarios that help the organization to adapt, survive and domain in the ecosystem. The third part referred to the results, which were the ability to repositioning in the market and gaining sustainable competitive advantage. The study built its own model depended on a triangulation concept that the model show clear reflections of many approaches and schools of thought in organization theory literature. It reflected the system theory when the study built its model as inputs, outputs and results. Furthermore, it reflected the network model and agility when using inputs such as cluster management and organizational flexibility. In addition, the model concentrated on a very important point that have been mentioned by chaos theory, which was the duality nature of innovation and the paradox way of thinking. According to the study, innovation must be performed in both levels at the same time, incrementally at the operational level and radically at the strategically one. Besides, innovation must be performed internally by coordinating all organization functions, and externally by collaborating with other stakeholders (Kapia & Milus 2010)

The study provided a three dimensions conceptual model for the organizational DNA that responsible for the transformation and reconfiguration process, the model seemed like an Egyptian pyramid with four core stones (Leadership, Structure, Culture, Strategy), and it has six edges which connect the core stones together (Vision, Governance, Motivation, Decision Authority, Supervision Style, Management by Objectives).

Each edge connects two core stones. The study used a strengthen approach to concentrate on the strong core stones and its edges and eliminate the weak core stone. According to contingencies in the organizations' total environment, the result from this re-adaptation and reconfiguration process is four proposed profiles; each profile has three core stones and three edges. The model did not provide a side for outputs but it concentrated on the inputs as determinants and core stones of the re-adaptation and the innovation process. In addition, the model supposed two-way interactions between core stones, so the role of the edges and its relationships with the core stones is ambiguous. Thus, it was difficult to show the whole model in a systematic sequential path of relationships between its variables.

Prange & Schlegelmich (2010) have provided eight profiles of the innovation DNA. It sets these profiles according to a matrix with two axes (The innovation type: Radical or Incremental, The critical variable needed to activate the innovation DNA of the firm). The study supposed four critical variables for the innovation DNA; they were (Structure, Culture, People, and Technical System). Furthermore, the study concentrated mainly on the mechanisms that associated with each critical variable to achieve the re-adaptation and reconfiguration process of the innovation DNA from one profile to another. Moreover, the study did not provide a systematic sequential model for the innovation DNA and the relationships between the four core stones of the model.

Lee, Oolson & Trimi (2012) has provided a conceptual framework for the proper innovation DNA. It depends on the network model, and the concept of co-innovation, that innovation must be done in both directions internally and externally. Organizations must collaborate with other stakeholders on the network to innovate. The study referred to the proper innovation DNA by dividing it to five practices: value added to the internal and external customer, blue-ocean strategy, create new business models to work in the virtual environment, integration back-ward and up-ward across the supply chain, joint-

venturing with other firms not in the same industry. Consequently, the model that provided by the study concentrated mainly on the idea of external collaboration with stakeholders. That is why; innovation DNA model of the firm must contain external linkages with the ecosystem.

Brook (2014) provided a conceptual human resources management-oriented framework for the innovation DNA of the organization. Furthermore, the study depended on the strengthen approach and the resource based view to build its own model. In addition, the study concentrated on the human resources practices that energize innovation across the whole organization. These human resources practices are (Job description and Job qualification, Selecting & Hiring, Job development, Management by objectives, Teamwork, Leadership, Measurements of effectiveness).

Dahlin (2014) provided a conceptual structure – oriented framework for the innovation DNA. Besides, the study depended on chaos theory and institutional theory to identify the concept of innovation paradox. That innovation is the responsibility of organization and other stakeholders in the ecosystem. There are two kinds of innovation (Radical and Incremental), organizations must do incremental innovation internally and do radical innovation externally). Moreover, the study have concentrated on the structural determinants that should be built in the firms' DNA to achieve total innovation practices. These structural determinants are (Nodes at the business network, Clusters, Liaison roles, Formalization, Agility, External collaborating). According to the study, innovation models must be built at the macro level to cover the innovation practices in a whole ecosystem.

After reviewing these conceptual models, this study can conclude that there is an evolution in the innovation DNA models in organizations. First studies concentrated on the internal environment of organizations and tried to set an innovation DNA model according to some strengthen determinants or core stones. Then, the models have been developed to take the dimension of the environment into consideration, so concepts such as (Open innovation – Co-innovation, Innovation chain, Innovation paradox, Total innovation) had their reflection on the innovation DNA models. In addition, there is no agreement between the reviewed conceptual studies on the number of variables that the innovation DNA must consisted of. Although they agreed all that the innovation DNA consisted of two kinds of variables, the first kind of variables in the technical sub-system and the other kind in the socio sub system of the organization, the most important variables that mentioned in these studies were (Structure, Culture, People, Processes, Strategy).

The empirical studies

Neilson (2004) provided seven profiles of the organizational DNA, which responsible for adaptation and innovation processes. Three profiles referred to healthy organizations and four profiles referred to failure ones. The model that presented by the study show that organizational DNA consisted of four blocks (Structure, Motivators, Decision Making Authority, and Information Flow). The study depended on 19 closed questions to test the proposed model and to determine the existence of these blocks. The study built its model according to the internal point of view and ignored the dimension of the environment. Besides, the proposed framework of organizational DNA did not present the variables in a systematic sequential path of relationships.

Govondirijan & Trimble (2005) built its model dependent on the dual-core hypothesis that mentioned by the chaos theory that any equilibrated system must has dual-core processes: the dynamic core and the static core. According to the study, the equilibrium status of an organization can be reached by doing the two paradoxal types of innovation (Radical- Incremental) at the same time and this called strategic innovation. The study built its model according to a closed system point of view so the environment dimension have been ignored. The study provided the 4S`s model for strategic innovation DNA which consisted of Four interrelated and integrated variables (Structure, Shared Values, Systems, Staff). Each

block of these four must energize both types of innovation. The study used three questionnaires with 21 Likert-scale questions to collect the primary data needed to test the model.

Agrawal (2006) provided a framework of the gene of success in prospector organizations as these organizations are dominating their environments, The proposed DNA consisted of five variables (Structure, Information flow, Knowledge management, Intellectual capital, Networking). The last variable referred to the importance of the environment dimension when innovation models have to be built, the study, depended on questionnaires to collect primary data needed. Although the study provide a specific measurement for each variable, there is a gap to present the proposed framework in a systematic sequential model with clear relationships between its blocks.

Rashid & Chalab (2007) provided a developed systematic model that had mentioned by (Neison, 2004). The developed model aimed to test the relationship between the independent variable, which was the organizational DNA, and the dependent variable, which was the innovation performance. Organizational DNA consisted of four blocks (Structure, Motivators, Information flow, Decision-making authority). Innovation performance consisted of three major axes (Speed, Accountability, Transparency). The study depended on a questionnaire with 49 Likert-scale questions.
(Xu, Zhu, Zheng & Wang 2007)

The study was longitudinal, case study oriented. It took place in the electronics industry sector at a Chinese prospector company, which is called Haier. The study continued for ten years. It depended on a research team from Zhejiang University to conduct in-depth interviews with different functional, territorial, product family mangers. The study proposed and tested a pentagon model for total innovation management, which reflect the total innovation management philosophy and its principles. The model consisted of five interrelated and integrated core stones (Strategy of innovation, Technical innovation, Organization innovation, Business model innovation, Marketing mix innovation). According to this philosophy, innovation must be done by everyone, every time, every function, everywhere, across the whole value chain of an organization. The study built its own model according to the institutional theory and the stakeholder and consistency approaches.

Gunday, Ulusoy, Kilic & Alpkan (2011) study depended on the structural equation modeling analysis to build and test a systematic path analyzed model. The model show sequential relationships between different kinds of innovation and different kinds of organizational performance. The whole model referred to the innovation gene in organizations. The study divided the model into two sides, the inputs side, consisted of four variables at three sequential phases; organizational innovation at phase 1, Marketing innovation and Processes innovation at phase 2, Product innovation at phase 3). On the other hand, the outputs side consisted of another four variables at three sequential phases too, (Innovation performance at phase 1, Production & marketing performance at phase 2, financial performance at phase 3). There were 174 questionnaires had been analyzed to test the model in prospector companies in the Turkish **economy?** The model show reliability and validity and goodness of fit indicators as a whole although the rejection of few hypotheses in the proposed model.

Kim, Kumar & Kumar (2012) study depended on the structural equation modeling analysis to build and test a systematic sequential path analyzed model. The study built its model according to the complexity and chaos theories that total quality and total innovation are complex concepts and each of them consisted of several variables. From other point of view, total quality practices play as a static component while total innovation practices play as a dynamic component in the whole model. Furthermore, innovation practices can be paradoxically classified as radical practices and incremental practices. The model aimed to test the sequential relationships between total quality practices themselves. In addition, the model aimed to test the relationship between total quality practices as a

whole latent independent variable and total innovation practices as a whole latent dependent variable in the proposed model. Therefore, the model consisted of two major sides. The first side was the side of inputs, which consisted of eight variables in four sequential phases (phase1: Leadership was the pure independent variable, phase2: Employee relations, Customers relations, Suppliers relations, phase3: Product design, Quality of data and reporting system, phase4: Process management). The second side in the model was the outputs side, which consisted of five variables in phase5 in the model. This side represented the total innovation practices (Administrative innovation, Product radical innovation, Process radical innovation, Product incremental innovation, Process incremental innovation).

The study used questionnaire to collect primary data. The model have been tested at 22 ISO9001 maintainers from different economic sectors in Canada. The model have shown goodness of fit as a whole although the rejection of few hypotheses.

Yuen-Han (2012)study depended on the structural equation modeling analysis to build and test its proposed model. The model have been built according to the network model and the complexity theory because innovation is a complex concept, which consisted of many variables in the socio-technical system of an organization and in the external environment also. The study used the concept of intellectual capital to determine and explain the concept of organizational DNA. According to the study, organizational DNA consisted of six variables in three groups. The first group was the human capital, which consisted of two variables (Knowledgeable workforce, Transformational leadership). The second group was the structural capital, which consisted of two variables (Innovation culture, Administrative and Technical systems). The third group was the relational capital, which consisted of two variables (Internal communication, External collaboration). The seventh variable in the model was the innovation performance as a pure independent variable the model provided a clear sequential systematic relationships between the blocks of the organizational DNA in the three groups. On the other hand, the model provided a relationship between organizational DNA as a whole latent independent variable which consisted of six sub-variables and innovation performance as the output in the model. The study depend on questionnaire to collect data from the three firms of the study. The firms worked at two different cultures (Hong Kong-Canada) in the Information and communication technology sector.

Bjork (2014) study provided a proposed model of innovation DNA in the hospitality and tourism industry in Finland. Besides, the study depended on the resource-dependence approaches and the innovation incubator to build its model. The model concentrated on the concept of open innovation to build the innovation incubator at a macro level to introduce new products to the market. The study represented a quadruple helix incubator that there were four parts have collaborated with each other to decrease the life cycle of the innovation process. Each part can share with intellectual, physical, organizational resources. The quadruple helix consisted of (Small and Medium size firms in the industry, Local government of ostrobothnia territory, University of Vaasa, Nongovernment organizations which represent the customer, the study used observation, in-depth interviews, and open seminars to collect primary data needed).

Nafei (2015) study depended on the model of organizational DNA that had mentioned by (Neislon, 2004; Rashid & Chalab, 2007). The model aimed to test the relationship between organizational DNA as an independent variable and organizational performance as a dependent variable in the model. Organizational DNA consisted of four blocks (Structure, Decision Making Authority, Information flow, Motivators), while organization performance consisted of two sub-variables (Comparative performance that referred to the competitive position of an organization in the market, Internal performance that referred to the operational performance of an organization). The model have been tested at six industrial firms located in El-Sadat city. The study depended on a developed questionnaire to collect primary data, which needed to test the proposed model. The results of this study show a confirmation of all its

hypotheses.

CONCLUSION

It was so clear that innovation models have developed to be more complex and comprehensive and to consider the environment dimension. Innovation models must be built at the macro level, which collects the organizations' socio-subsystem, technical-subsystem, stakeholders and the general environment in a whole one ecosystem. Innovation must be done paradoxally. It might be internal by the organization itself and external by collaborating with other partners to form an innovation incubator.
There was a general agreement between researchers that innovation DNA must consisted of variables in both the socio-sub system and the technical- sub system in an organization. The most important repeated variables in the literature were (Structure, Culture, Information system, External linkages, Technology, Leader ship).

Few studies depended on the complex systems theory and used the SEM analysis and latent constructs to build and test their models. (Gunday, Ulusoy, Kilic & Alpkan, 2011; Kim kumar & Kumar, 2012; Yen – Han, 2012). The results of these studies show a goodness of fit for the proposed and tested models. Although there were few rejected hypotheses in those models, the variable of strategy did not appeared in recent empirical studies as a component of the innovation model although the confirmation of its importance by conceptual studies. Moreover, the variable of external linkages, which refer to the harmonization with the ecosystem, did not appeared in these empirical studies except (Yen Han, 2012). Furthermore, there is an agreement between studies about the importance of the innovation performance variable as an output variable in their innovation models.

The proposed model:
The study proposed its conceptual model after reviewing variables, measurements, confirmed and rejected hypotheses in conceptual and /or empirical studies. The study built its model depending on several integrated approaches. It depended on the complex systems theory that the model consisted of seven variables. It started with a pure dependent variable (Innovation strategy) and it ended with a pure independent variable (Innovation performance). In addition, the model contained five mediating variables, which represent a whole construct variable that might called (Innovation DNA). The model depended on the organizational DNA approach that these five variables reflect tangible and intangible items in the socio-technical system of the organization and reflect its dependency relation with the whole ecosystem. The model agreed with the paradox way of thinking when innovation model have to be built. Therefore, the model reflected both directions of innovation (Internal and External). The model contained also different types of innovation according to the organization socio-subsystem and technical sub-system.The next table represents the variables, sub-variables and measurement items of the proposed model.

Table (1): Variables, Sub-Variable, Measurement Items for the Proposed Conceptual Model of Total Innovation DNA

Variables	Sub-variable	Measurement items
Innovation strategy	• Technology prospecting • Blue ocean strategy	- Advanced technical system - Entering new fields to conduct new business
Agile structure	• Alertness	- Evaluate the competitive position of the firm. - Evaluate the profitability of each single product.
	• Recon figuration	- Growth and expansion - Downsizing and shrinkage
	• Internal collaboration	- Resources sharing - Liaison roles - Coordinators - Team working - Internal information sharing
Innovation culture	• Top-management support	- Motivating and empowering
	• Collectivism	- Several and different workshops between departments and branches - Sharing of all functions and management levels in the development plan
Co-innovation	• Innovation incubator	- Concurrent research projects - Outsource some research tasks - External linkages with research, business society and Entrepreneurs.
	• Technology transfer and localization	- Joint-venturing - Capital restructuring
Information flow	• Internal flow	- Continuous performance evaluation reports for all functions - Permanent, updated and secured data bases - Information sharing
	• External flow	- Updated data base for suppliers and distributors - Interactive website
Human capital	• Quality of work life	- Safe and heath practices - Incentives - Promotions - Health insurance - Athletic and social activities
	• Creativity	- Think tanks - Experimentation - Work force advanced studies certificates
	• Training	- Continuous training programs after staffing - Training programs for supervisors and managers

Innovation performance	• Products	- Providing new single products to market continuously - Continuous researching to register patents - Continuous developments on current products - Speed - Product lines width - Product lines depth
	• Processes	- Flexibility - Responsiveness
	• Marketing	- Systematic developments in the product features. - Innovational promotional methods - Continuous increasing in the network of distributors and middlemen - Different pricing and payment offers according to customer.

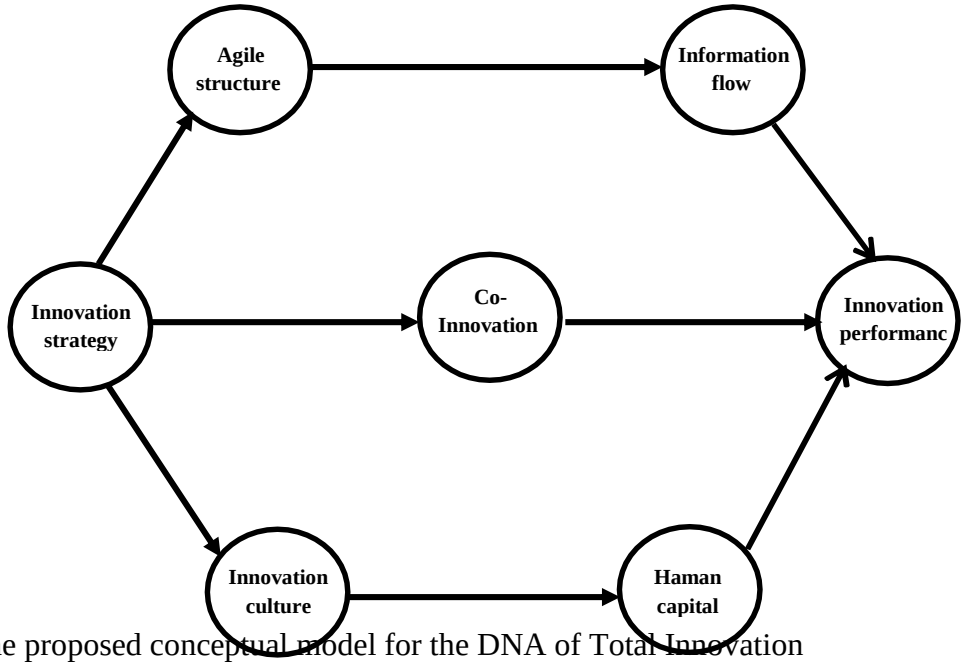

Fig. (1): The proposed conceptual model for the DNA of Total Innovation

The total innovation DNA is a unique change-oriented approach. It is a royal gate for activating the re-adaptation process in the organization and for achieving surviving, growing and dominating. Organizations, which readapt and reconfigure its innovation DNA, are those organizations, which dominate and have legitimacy in the whole ecosystem.

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