Digital DNA of economy of scale and scope

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Abstract – The research article aims to create a general fundamental theory on the Digital DNA of the modern digital creative economy of the scale and scope. In the frames of our theory, we define the Digital DNA of the modern digital creative economy of the scale and scope, making the following theoretical assumptions: 1) Digital DNA exists in the modern digital creative economy of the scale and scope; 2) Digital DNA consists of a chain of the knowledge with all the information on the modern digital creative economy of the scale and scope; 3) the Digital DNA uniquely identifies and accurately characterizes the modern digital creative economy of the scale and scope in the time, scale, frequency domains; 4) the Digital DNA represents a genetic key, which may help us to better understand the generation of the discrete-time digital business cycles with the different amplitudes, frequencies, shapes and powers in the modern digital creative economy of the scale and scope in the time, scale, frequency domains. In this innovative advanced research, we investigate the following research problems: 1) the existing damaging mechanisms of the Digital DNA's complex knowledge base structure in the modern digital creative economies of the scales and scopes in the time, scale, frequency domains; 2) the possible repairing mechanisms of the Digital DNA's complex knowledge base structure in the modern digital creative economies of the scales and scopes in the time, scale, frequency domains; 3) the specific influences by the damaged/repaired Digital DNA on the discrete-time digital business cycles generation/propagation in the modern digital creative economies of the scales and scopes in the time, scale, frequency domains. In addition, the innovative advanced research aims: 1) to perform the computer modeling on the Digital DNA's complex knowledge base structure in the modern digital creative economy of the scale and scope; 2) to decode the Digital DNA's complex knowledge base structure in the modern digital creative economy of the scale and scope.

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Introduction

The ***fundamental economics science***, including the *macro-, micro- and nano- economics sciences*, has been a *subject of great research interest* at the *universities/institutions* in the *World* in the *recent centuries*. The *fundamental economics science* has been studied, using both the ***social sciences methodologies*** in *Joseph Penso de la Vega (1668, 1996), Mortimer (1765), Smith (1776, 2008)*, *Menger (1871)*, *Bagehot (1873, 1897), von Böhm-Bawerk (1884, 1889, 1921), Hirsch (1896), Bachelier (1900), Schumpeter (1906, 1911, 1933, 1939, 1961, 1939, 1947), Slutsky (1910, 1915 1923), von Mises (1912), Hayek (1931, 1935, 2008; 1948, 1980), Keynes (1936, 1992), Ellis, Metzler (1949), Friedman (1953), Baumol (1957), Debreu (1959), Krugman, Wells (2005)*, *Stiglitz (2005, 2015)*, *Dodd (2014)* as well as the ***natural sciences methodologies*** in *Schumpeter (1906, 1933), Bowley (1924)*, *Fogel (1964)*, *Box, Jenkins (1970)*, *Grangel, Newbold (1977)*, *Van Horne (1984)*, *Taylor S (1986), Tong (1986, 1990)*, *Judge, Hill, Griffiths, Lee, Lutkepol (1988)*, *Hardle (1990)*, *Grangel, Teräsvirta (1993)*, *Pesaran, Potter (1993)*, *Banerjee, Dolado, Galbraith, Hendry (1993)*, *Hamilton (1994)*, *Karatzas, Shreve (1995)*, *Campbell, Lo, MacKinlay (1997)*, *Rogers, Talay (1997)*, *Hayashi (2000)*, *Durbin, Koopman (2000, 2002, 2012), Ilinski (2001), Greene (2003)*, *Koop (2003)*, *Davidson, MacKinnon (2004), Cameron, Trivedi (2005), Iyetomi, Aoyama, Ikeda, Souma, Fujiwara (2008)*, *Iyetomi, Aoyama, Fujiwara, Sato (editors) (2012), Vialar, Goergen (2009)*.

In the *fundamental economics science*, the application of the ***empirical methods in the social sciences*** in combination with the ***mathematical methods in the natural sciences*** resulted in the discovery of the *periodic oscillations* of the *economic variables* in the *nonlinear dynamic economic system* in *Juglar (1862), George (1881, 2009), Kondratieff (1922, 1925, 1926, 1928, 1935, 1984, 2002), Kitchin (1923), Schumpeter (1939), Burns, Mitchell (1946), Dupriez (1947), Samuelson (1947), Hicks (1950), Inada, Uzawa (1972), Kuznets (1973a, b), Bernanke (1979), Marchetti (1980), Kleinknecht (1981), Dickson (1983), Hodrick, Prescott (1997), Baxter, King (1999), Kim, Nelson (1999), McConnell, Pérez-Quirós (2000), Devezas, Corredine (2001, 2002), Devezas (editor) (2006), Arnord (2002), Stock, Watson (2002), Helfat, Peteraf (2003), Sussmuth (2003), Hirooka (2006), Kleinknecht, Van der Panne (2006), Jourdon (2008), Taniguchi, Bando, Nakayama (2008), Drehmann, Borio, Tsatsaronis (2011), Iyetomi, Nakayama, Yoshikawa, Aoyama, Fujiwara, Ikeda, Souma (2011), Ikeda, Aoyama, Fujiwara, Iyetomi, Ogimoto, Souma, Yoshikawa (2012), Swiss National Bank (2012, 2013), Uechi, Akutsu (2012), Central Banking Newsdesk (2013), Ledenyov D O, Ledenyov V O (2013c, 2015d), Union Bank of Switzerland (2013), Wikipedia (2015a, b, c).* More specifically, in the *fundamental economics science*, the

evolutionary development of both the ***empirical methods in the social sciences*** and the ***technical methods in the natural sciences***, led to both the better understanding of the *fundamental economics science principles* and the groundbreaking discovery of the *Ledenyov discrete time digital waves of GIP(t)/GDP(t)/GNP(t)/PPP(t) (the discrete-time digital business cycles)* with the *different amplitudes, frequencies, shapes and powers* in the *modern digital creative economy of the scale and scope* in the *time, scale, frequency domains* in *Ledenyov D O, Ledenyov V O (2015e, f)*. Therefore, presently, we know that the *Ledenyov discrete-time digital waves* can be generated by and propagated in *the modern digital creative economy of the scale and scope* in the *time, scale, frequency domains* in *Ledenyov D O, Ledenyov V O (2015e, f)*.

In this connection, the *following empirical question* may arise: ***Can we formulate the general fundamental theory on the Digital DNA of the modern digital creative economy of the scale and scope with the purpose to accurately characterize the modern digital creative economy of the scale and scope and predict the generation of the Ledenyov discrete-time digital waves in the modern digital creative economy of the scale and scope?***

Therefore, this *innovative research article* aims to create *the general fundamental theory on the Digital DNA of the modern digital creative economy of the scale and scope*, changing in the *time, scale, frequency domains*. In the *frames of our general fundamental theory*, we would like to define the *Digital DNA structure in the modern digital creative economy of the scale and scope*, making the *following theoretical assumptions*:

1. the *Digital DNA exists in the modern digital creative economy of the scale and scope*;

2. the *Digital DNA consists of a chain of knowledge on the modern digital creative economy of the scale and scope*;

3. the *Digital DNA uniquely identifies and accurately characterizes the modern digital creative economy of the scale and scope in the time, scale, frequency domains*;

4. the *Digital DNA represents a genetic key, which may help us to better understand the generation/propagation of the Ledenyov discrete time digital waves of GIP(t)/GDP(t)/GNP(t)/PPP(t) (the discrete-time digital business cycles) with the different amplitudes, frequencies, shapes and powers in the modern digital creative economy of the scale and scope in the time, scale, frequency domains*.

Moreover, in this *innovative advanced research,* we aim to investigate the *following research problems*:

1. the *existing damaging mechanisms of the Digital DNA's complex knowledge base structure in the economies of the scales and scopes* in the *time, scale, frequency domains*;

2. the *possible repairing mechanisms of the Digital DNA's complex knowledge base structure in the economies of the scales and scopes* in the *time, scale, frequency domains;*

3. the *specific influences by the damaged/repaired Digital DNA with the complex knowledge base structures on the generation/propagation of the Ledenyov discrete time digital waves of GIP(t)/GDP(t)/GNP(t)/PPP(t) (the discrete-time digital business cycles)* with the *different amplitudes, frequencies, shapes and powers* in the *modern digital creative economy of the scale and scope* in the *time, scale, frequency domains*.

In addition, the *innovative advanced research* aims to do the *following things*:

1. to *perform the computer modeling the Digital DNA's complex knowledge base structure of the modern digital creative economy of the scale and scope* in the *time, scale, frequency domains*;

2. to *decode the Digital DNA's complex knowledge base structure of the modern digital creative economy of the scale and scope* in the *time, scale, frequency domains*.

Following the above written *introduction*, let us begin a *more detailed insightful scientific thinking* and *discussion* on the *general fundamental theory* of the *Digital DNA* of the *modern digital creative economy* of the *scale and scope*, presenting *our original research thoughts and ideas* on the *subject of our scientific interest* in this *research article*.

Digital DNA of modern digital creative economy of scale and scope

We would like to start our *empirical philosophical research* toward the *creation* of the *general fundamental theory* on the *Digital DNA* of the *modern digital creative economy of the scale and scope* in the *macroeconomics*, using the *following research plan*:

1. *Presentation on the overview of available research information on* ***Deoxyribonucleic acid (DNA)***;

2. *Presentation on the original research proposal on the* ***Digital DNA of the modern digital creative economy of the scale and scope****,*

3. *Presentation on the concluding remarks on the* ***Digital DNA of the modern digital creative economy of the scale and scope***.

Beginning the discussion on the Deoxyribonucleic acid (DNA) in the *biology science*, let us explain that the ***Deoxyribonucleic Acid (DNA) is a molecule, with the complex double helix structure made of the two biopolymer strands in the living cell nuclei, that contains all the biological information in the form of the genetic instructions on how it is possible to develop, function and reproduce the existing living organisms*** in *Miescher (1871), Kol'tsov (December*

12, 1927), Watson, Crick (1953), Watson (2002, 2004), Gamow (July 2 1954a, b), DeVinne (editor) (1985), Dahm (2008), Library of Congress (2015), Wikipedia (2015i). The Deoxyribonucleic Acid (DNA) in the form of the nuclein substance was discovered by Friedrich Miescher, Swiss physician, University of Tübingen in 1869 in *Miescher (1871). The double helix structure of DNA was first discovered by Watson and Crick, University of Cambridge, UK* in *1953* in *Watson, Crick (1953). The coding scheme for the Deoxyribonucleic Acid (DNA) was proposed in Gamow (July 2 1954a, b, Library of Congress (2015).*

Going to the discussion on our *original research proposal on the Digital DNA of the modern digital creative economy of the scale and scope*, we would like to propose a *concise definition* of the *Digital DNA of the modern digital creative economy of the scale and scope* and formulate the *general fundamental theory* on the *Digital DNA of the modern digital creative economy of the scale and scope*.

Thus, performing a *comparative analogy* between the *Deoxyribonucleic Acid (DNA)* in the *biology science* and the *Digital DNA* in the *macroeconomics science*, let us define the ***Digital DNA*** in this *empirical philosophical research* for the *first time*: ***The Digital DNA of the modern digital creative economy of the scale and scope represents an accumulated chain of knowledge, which stores all the information in the form of the "genetic instructions" on how it is possible to develop, function and reproduce the modern digital creative economy of the scale and scope in the time, scale, frequency domains.***

Continuing the research on the *Digital DNA* in the *macroeconomics science*, let us clarify that, in our opinion, a ***chain of accumulated knowledge may include all the spectrum of information, which has been created, exchanged, transmitted and stored by the humans in the natural sciences databases, the social sciences databases, the numerous encyclopedia databases, the intellectual properties databases, the technological standards databases at the governments, universities, institutions, colleges, schools, firms, governmental organizations, non-governmental organizations, cultural organizations, religious organizations within the particular modern digital creative economy of the scale and scope in the time, scale, frequency domains.***

Let us consider the *possible damaging mechanisms* of the *Digital DNA's complex knowledge base structure* in the *modern digital creative economies of the scales and scopes* in the *time, scale, frequency domains.* In our research opinion, the ***Digital DNA's complex knowledge base structure can be severely damaged by the bad governance practices at the governments, universities, institutions, colleges, schools, firms, governmental organizations, non-governmental organizations, cultural organizations, religious organizations at the***

state/province/city/district/organization levels, resulting in a possible disappearance of the certain knowledge in various sectors of the modern digital creative economies of the scales and scopes in the time, scale, frequency domains. For example, the *bad governance practices* may include the *failing strategies creation and execution* by the *presidents/prime ministers/ministers/governors/chairmen/directors/managers* at the *governments*, *universities*, *institutions*, *colleges*, *schools*, *firms*, *governmental organizations*, *non-governmental organizations*, *cultural organizations*, *religious organizations* at the *state/province/city/district/organization levels*, resulting in a *possible disappearance* of the *certain knowledge* in various sectors of the *modern digital creative economies of the scales and scopes* in the *time, scale, frequency domains*.

Let us describe the *possible repairing mechanisms* of the *Digital DNA's complex knowledge base structure* in the *modern digital creative economies of the scales and scopes* in the *time, scale, frequency domains*. In our view, the ***Digital DNA's complex knowledge base structure can be partly/completely repaired by the good governance practices at the governments, universities, institutions, colleges, schools, firms, governmental organizations, non-governmental organizations, cultural organizations, religious organizations at the state/province/city/district/organization levels, resulting in a possible appearance of the certain knowledge in various sectors of the modern digital creative economies of the scales and scopes in the time, scale, frequency domains.*** For instance, the *good governance practices* may include the *winning virtuous strategies creation and execution* by the *presidents/prime ministers/ministers/governors/chairmen/directors/managers* at the *governments*, *universities*, *institutions*, *colleges*, *schools*, *firms*, *governmental organizations*, *non-governmental organizations*, *cultural organizations*, *religious organizations* at the *state/province/city/district/organization levels*, resulting in a *possible appearance* of the *certain knowledge* in various sectors of the *modern digital creative economies of the scales and scopes* in the *time, scale, frequency domains*.

Let us comment that a *number of insightful discussions* on the *existing distinctions* between the *failing strategies* and the *winning virtuous successful strategies*, which can be created and implemented in the *governance/management practices* can be found in *Chandler (1962, 1998; 1977, 1993; 1994; 2001; 2005), Chandler , Daems (1980), Andrews (1971a, b, 1980, 1981a, b, 1984), Rumelt (1974, 1982), Porter (1979, 1980, 1982a, b, 1983, 1985, 1987a, b, 1991, 1994a, b, 1996a, b, 1997, 2001a, b, 2008, December 2013), Porter, Harrigan (1981), Porter, Salter (1982), Montgomery, Porter (1991), Porter, Rivkin (2000), Porter, Sakakibara (2004), Anand, Bradley, Ghemawat, Khanna, Montgomery, Porter, Rivkin, Rukstad, Wells,*

Yoffie (2005), Porter, Kramer (2006), Porter, Heppelmann (November 2014), Schendel, Hofer (1979), Yelle (1979), Dess, Davis (1984), Schwenk (1984), Pitol-Belin (1984), Hambrick (1985), Palepu (1985), Barney (1986, 1991), Huff, Reger (1987), Hill, Snell (1988), Hill, Jones (1998, 2004), Baysinger, Hoskisson (1989), Rue, Holland (1989), Fombrum, Shanley (1990), Pearson (1990), Ansoff (1991), Goold (1991), Goold, Luchs (1993), Goold et al (1994), Goold, Campbell (September, October 1998), Alexander, Goold, Collis, Campbell, Lieberthal, Montgomery, Palepu, Prahalad, Stalk, Khanna, Hart, Shulman, Evans (1992, 1995, 1996, 1997, 1998, 1999), Yip (1992, 1998, 2000, 2007), Campbell et al (1995), Johnson, Scholes (1997), Johnson, Scholes, Whittington (1998), Johnson, Scholes, Whittington (2002, 2003), McKiernan (1997), Child, Faulkner (1998), Martin (1998-1999, 2004, 2005-2006, 2007a,b, 2008, 2009), Moldoveanu, Martin (2001), Lafley, Martin (2013), Shiryaev (1999), Laffont, Tirole (1999), Grant (2001), Welch (2001a, b), Choo, Bontis (2002), Drejer (2002), Sadler (2003), Gavetti, Levinthal (2004), Gavetti, Rivkin (2007), Roney (2004), Thietart, Xuereb (2005), Godard (2006), Ireland, Hoskisson, Hitt (2006), Hitt, Ireland, Hoskisson (2007), Lorino, Tarondeau (2006), Besanko, Shanley, Dranove (2007), Sull (2007a, b, c, d, 2008), Teece, Winter (2007), Samuels (2008), Chamberlain (2010), Holt, Cameron (2010), Ledenyov D O, Ledenyov V O (2015b, n, o).

Going to the *next problem*, let us identify the *specific influences* by the *damaged/repaired Digital DNA* on the *discrete-time digital business cycles generation/propagation* in the *modern digital creative economies of the scales and scopes* in the *time, scale, frequency domains*. The ***authors' strategic vision is that the damaged/repaired Digital DNA may have the specific influences on the generation/propagation of the Ledenyov discrete time digital waves of GIP(t)/GDP(t)/GNP(t)/PPP(t) (the discrete-time digital business cycles of GIP(t)/GDP(t)/GNP(t)/PPP(t)) in the modern digital creative economies of the scales and scopes in the time, scale, frequency domains.*** For example, the *damaged/repaired Digital DNA* may result in the *generation and propagation* of the *Ledenyov discrete time digital waves* of *GIP(t)/GDP(t)/GNP(t)/PPP(t)* (the *discrete-time digital business cycles of GIP(t)/GDP(t)/GNP(t)/PPP(t)*) with the *small/big amplitudes, low/high frequencies, different phases* in the *modern digital creative economies of the scales and scopes* in the *time, scale, frequency domains*. The main reason for the above mentioned facts existence is that the *damaged/repaired Digital DNA* can decrease/increase the *outputs* by the *real sector* and by the *speculative sectors* of the *modern digital creative economies of the scales and scopes* in the *time, scale, frequency domains*. The more comprehensive description of the *Ledenyov discrete time digital waves of GIP(t)/GDP(t)/GNP(t)/PPP(t)* (the *discrete-time digital business cycles of GIP(t)/GDP(t)/GNP(t)/PPP(t)*) is presented in *Ledenyov D O, Ledenyov V O (2015e, f).*

Presently, the *authors' research efforts* are mainly focused on the *following two research problems* in the *macroeconomics science*:

1. the *computer modeling the Digital DNA's complex knowledge base structure of the modern digital creative economy of the scale and scope in the time, scale, frequency domains*;

2. the *understanding of the coding/decoding schemes for the Digital DNA's complex knowledge base structure in the modern digital creative economy of the scale and scope in the time, scale, frequency domains.*

We report a successful development of the *complex software program,* ***DNACode***, to model the existing *Digital DNAs* of the *G20 economies of the scales and scopes* for the *first time*. The *complex software program* can code/decode the *Digital DNA's complex knowledge base structure*, researching *any selected economy of the scale and scope* in the case of the *G20 nations*. It may worth to note that the *complex software program* can accurately forecast the *generation/propagation* of the *Ledenyov discrete time digital waves* of *GIP(t)/GDP(t)/GNP(t)/PPP(t)* (the *discrete-time digital business cycles of GIP(t)/GDP(t)/GNP(t)/PPP(t)*) in the *G20 economies of the scales and scopes.*

Conclusion

The *research article* had a goal to create a *general fundamental theory* on the *Digital DNA* of the *modern digital creative economy of the scale and scope*. In the frames of our theory, we defined the *Digital DNA* of the *modern digital creative economy of the scale and scope*, making the *following theoretical assumptions*:

1. *Digital DNA exists in the modern digital creative economy of the scale and scope*;

2. *Digital DNA* consists of *a chain of knowledge with all the information on the modern digital creative economy of the scale and scope*;

3. *Digital DNA uniquely identifies and accurately characterizes the modern digital creative economy of the scale and scope in the time, scale, frequency domains*;

4. *Digital DNA represents a genetic key, which may help us to better understand the generation of the discrete-time digital business cycles with the different amplitudes, frequencies, shapes and powers in the modern digital creative economy of the scale and scope in the time, scale, frequency domains*.

In this innovative advanced research, we investigated the following research problems:

1. the *existing damaging mechanisms of the Digital DNA's complex knowledge base structure in the modern digital creative economies of the scales and scopes in the time, scale, frequency domains*;

2. the *possible repairing mechanisms of the Digital DNA's complex knowledge base structure in the modern digital creative economies of the scales and scopes in the time, scale, frequency domains*;

3. the *specific influences by the damaged/repaired Digital DNA on the discrete-time digital business cycles generation/propagation in the modern digital creative economies of the scales and scopes in the time, scale, frequency domains*.

In addition, the *innovative advanced research* aimed:

1. to *perform the computer modeling on the Digital DNA's complex knowledge base structure in the modern digital creative economy of the scale and scope*;

2. to *decode the Digital DNA's complex knowledge base structure in the modern digital creative economy of the scale and scope*

Finally, the *present research article* had an *ultimate goal* to continue *our scientific exploration* on the *Ledenyov discrete time digital waves of GIP(t)/GDP(t)/GNP(t)/PPP(t)* (the *discrete-time digital business cycles of GIP(t)/GDP(t)/GNP(t)/PPP(t)*), which constitute a *new class of the discrete-time digital waves* in the *economies of scale and scope* in the *macroeconomics science*.

Particularly, the *present research article* aimed to continue to study the *following early outlined research topics*:

1. the *re-thinking of the foundations of macroeconomic theory*, introducing the *scientific proposition* about the *digital nature* of the *business cycles*, which can be originated by the *discrete-time fluctuations* such as the *creative disruptive innovations* in the *economies of the scales and scopes*;

2. the *creation of the Ledenyov discrete time digital signals theory* to precisely characterize the *discrete time digital signals (the business cycles)* in the *macroeconomics*;

3. the *modeling of new types of the discrete-time digital signals generators* for the *business cycles origination* in the *macroeconomics*;

4. the *analysis the spectrum of discrete-time digital signals in the economies of scale and scope*;

5. the *demonstration of the technical differences between the new model of the discrete-time digital signals generator and the existing models of the continuous-time (continuous wave) signals generators in the macroeconomics*; and

6. the *development of the complex software program DNACode to forecast the business cycles, going from the spectral analysis of the discrete time digital signals and the continuous time signals in the nonlinear dynamic economic system over the selected time period.*

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