Quantum strategy synthesis by Alphabet Inc

Ledenyov, Dimitri O. and Ledenyov, Viktor O.

James Cook University, Townsville, Queensland, Australia

8 February 2016
Quantum strategy synthesis by Alphabet Inc

Dimitri O. Ledenyov and Viktor O. Ledenyov

Abstract – We make the business at the time of great transition from the digital disruption to the quantum disruption, when the multiple quantum inventions in the natural/social sciences lead to the quantum leaps realization by the modern firms in the hi-tech industries in the quantum creative economies of the scales and scopes in the quantum disruption age. At this opportunities/challenges time period, a chairman of the board of directors must take a personal responsibility for the creation and execution of the quantum strategy - a most effective winning virtuous organizational strategy - toward the optimal business model design/discovery for the prosperous effective organization in the quantum creative economies of the scales and scopes in the quantum disruption century. The quantum strategy uses the quantum strategy search algorithm, applying the quantum logic (the probabilistic logic) on the top of the inductive, deductive and abductive logics (the value based logics) with the purpose to create the most effective optimal winning virtuous organizational strategy by the chairman of the board of directors with the interlocking interconnecting directors in the modern firms in the quantum creative economies of the scales and scopes in the quantum disruption time. We study the case on the quantum strategy formulation and execution by a chairmen of the boards of directors with the interlocking interconnecting directors in the modern firms such as Alphabet Inc, expressing a great confidence that the quantum strategies will continue to be implemented by the prosperous organizations to increase their valuations in the quantum creative economies of the scales and scopes in the quantum disruption century.

JEL code: C0, G21, G24, G30, G34, L1, L4, M2 .
PACS numbers: 89.65.Gh, 89.65.-s, 89.75.Fb .

Keywords: fundamental strategy theory, classical philosophical views on the fundamental strategy theory, digital philosophical views on the fundamental strategy theory, quantum philosophical views on the fundamental strategy theory, quantum strategy, quantum strategy search algorithm, quantum (probability)/inductive/deductive/abductive strategy selection logics, strategy decision/optimization problems, most effective strategy search, chairman of board of directors, composition / interlocking directors networks / seats accumulation number at boards of directors, Centrality, Freeman degree, Betweenness, destructive coordination, information flows measurements, information absorption, theory of firm, microeconomics, Schrodinger wave function, quantum mechanics, quantum physics, probability, econophysics.
Introduction

The **fundamental strategy theory** - a *pink diamond*, which shines brightly and colorfully in a *spectrum of illuminating lights* of the *business administration science*, the *microeconomics science*, and the *macroeconomics science* – continues to attract a *considerable scientific interest* among the *leading strategy thinkers* and undergoes a *natural evolution* by making a *chain* of the *scientific evolutionary visions transitions/transformations* in the *best minds* of the *leading strategy thinkers* from:

1. The **classical philosophical views on the fundamental strategy theory**, which consider the *continuous-time processes* in the *analogue economies of the scales and scopes* in the *analogue disruption century* in Chandler (1962, 1998; 1977, 1993; 1994; 2001; 2005); further to

2. The **digital philosophical views on the fundamental strategy theory**, which deal with the *discrete-time processes* in the *digital creative economies of the scales and scopes* in the *digital disruption century* in Ledenyov D O, Ledenyov V O (2015b); and further to

3. The **quantum philosophical views on the fundamental strategy theory**, which focus on the *discrete-time quantum processes* in the *quantum creative economies of the scales and scopes* in the *quantum disruption century* in Ledenyov D O, Ledenyov V O (2015b, n, o).

At present time, one of the most interesting research problems to understand in the fundamental strategy theory is: Why do a chairmen of the boards of directors with the interlocking interconnecting directors in the modern firms need to change their approaches to the creation of the most effective optimal winning virtuous organizational strategies in the frames of the fundamental strategy theory, shifting their focus from:

1. The classical philosophical views on the fundamental strategy theory, which consider the continuous-time processes in the analogue economies of the scales and scopes in the analogue disruption century in Chandler (1962, 1998; 1977, 1993; 1994; 2001; 2005); further to

2. The digital philosophical views on the fundamental strategy theory, which deal with the discrete-time processes in the digital creative economies of the scales and scopes in the digital disruption century in Ledenyov D O, Ledenyov V O (2015b); and further to

3. The quantum philosophical views on the fundamental strategy theory, which focus on the discrete-time quantum processes in the quantum creative economies of the scales and scopes in the quantum disruption century in Ledenyov D O, Ledenyov V O (2015b, n, o)?

The most significant problem is that the process of the strategies creation and execution by a chairmen of the boards of directors with the interlocking interconnecting directors in the modern organizations takes place in the time of constant introduction of the disruptive innovations in the natural/social sciences, including the market-creating innovations, sustaining innovations and efficiency innovations, in the modern economies of the scales and scopes on a global scale in Christensen, Raynor, McDonald (December 2015), Christensen, Denning (December 2015), Rodin (2015), Dobbs, Woetzel, Flanders (2015), Barber (2015).

The disruptive innovations, having a considerable impact on the economy of scale and scope, are introduced at the certain moments of time in the time domain sharply, hence the disruptive innovations can be classified as the discrete – time processes. In agreement with the
business administration science, we think that these disruptive innovations may divided into the two big classes in Ledenyov D O, Ledenyov V O (2015b, n, o):

1. The natural sciences disruptive innovations, which trigger the multiple abrupt changes in the different industrial processes, because of introduction of the new advanced discoveries and technologies to design/develop the new products/services in the modern economies of the scales and scopes globally;

2. The social sciences disruptive innovations, which trigger the multiple sharp changes in the different social processes, because of introduction of the new advanced discoveries and technologies to manage the social interactions/processes in the modern economies of the scales and scopes globally.

Considering the natural/social sciences disruptive innovations, we would like to explain that the natural/social sciences disruptive innovations relate to a group of the discrete – time processes. Presently, we can observe that there are the great transitions from

1. a period of the analog natural/social sciences disruptive innovations, when the multiple analog inventions in the natural/social sciences lead to the analog devices/technologies introduction and the subsequent analog leaps realization by the modern firms in the hi-tech industries in the analog creative economies of the scales and scopes, further to

2. a period of the digital natural/social sciences disruptive innovations, when the multiple digital inventions in the natural/social sciences lead to the digital devices/technologies introduction and the digital leaps realization by the modern firms in the hi-tech industries in the digital creative economies of the scales and scopes, and further to

3. a period of the quantum natural/social sciences disruptive innovations, when the multiple quantum inventions in the natural/social sciences lead to the quantum devices/technologies introduction and the subsequent quantum leaps realization by the modern firms in the hi-tech industries in the quantum creative economies of the scales and scopes.

Researching the quantum strategy synthesis by the chairman of the board of directors at modern firm in the quantum creative economy of scale and scope in the quantum disruption century, we would like to concentrate our attention on the following propositions:

1. We think that, at this opportunities/challenges transition period, a chairman of the board of directors with the interlocking interconnecting directors must take a personal responsibility for the creation and execution of the quantum strategy - a most effective winning virtuous organizational strategy - toward the optimal business model design/discovery for the prosperous effective organization in the quantum creative economies of the scales and scopes in the quantum disruption century.
2. We believe that, at this opportunities/challenges transition period, a chairman of the board of directors with the interlocking interconnecting directors must understand that the disruptive quantum innovations may have multiple direct/indirect impacts on an professional ability/capacity by the chairman’s of the board of directors with the interlocking interconnecting directors to synthesis the quantum strategy - a most effective winning virtuous organizational strategy - toward the optimal business model design/discovery for the prosperous effective organization in the quantum creative economies of the scales and scopes in the quantum disruption century.

In this research article, we would like to discuss a process of the quantum strategy synthesis by the chairmen of the boards of directors with the interlocking interconnecting directors at the modern firm in the quantum creative economy of scale and scope in the quantum disruption century comprehensively. More clearly, we would like to focus on the following key research points toward the quantum strategy creation and implementation in details:

1. The quantum strategy synthesis, which is an organizational strategy, which can be formulated with the use of the quantum strategy search algorithm (QSCA) in the fundamental strategy theory by the chairman of the board of directors with the interlocking interconnecting directors in the modern firms at the time of quantum disruption;

2. The quantum strategy search algorithm, which applies the quantum logic (the probabilistic logic) on the top of the inductive, deductive and abductive logics (the value based logics), aiming to create the most effective optimal winning virtuous organizational strategy by the interlocking interconnecting directors in the board of directors in the modern organization in the quantum creative economy of scale and scope in a quantum information century in Ledenyov D O, Ledenyov V O (2015n).

We hope that our research will formulate and greatly improve the quantum strategy theory, which was proposed for the first time in Ledenyov D O, Ledenyov V O (2015n, o), moving the frontiers of the business administration science and the microeconomics science forward. At the same time, we would like to comment that our innovative research on the strategy creation and implementation in Ledenyov D O, Ledenyov V O (2015b, n, o), attracted a considerable scientific interests among the academicians and the practitioners at the leading universities / corporations in the World, namely a statement that the knowledge is a new currency by Faust (2015) was made, and a new course on the disruptive strategy by Christensen (2015) for the senior executives at Harvard Universities in the USA was compiled.

In this connection, we think that the innovations can be disruptive, because of their disruptive nature. At the same time, we believe that it is better to say that the quantum strategy
is a most effective winning virtuous organizational strategy, because of its quantum nature. However, we think that the term: “the disruptive strategy” by Christensen (2015) is not scientific, because any strategy must be aimed to create something rather than to disrupt something. In other words, the disruptive innovations can cause the disruptive events to occur, however the strategy must be synthesized to overcome these objective obstacles (the disruptive events) and increase the modern firm’s market valuation and add the social value to the local community, where the modern firm operates. In our opinion, a chairman of the board of directors with the interlocking interconnecting directors works to create and execute the quantum strategy - a most effective winning virtuous organizational strategy - toward the optimal business model design/discovery for the prosperous effective organization in the quantum creative economies of the scales and scopes in the quantum disruption century.

Completing a short insightful introduction, let us begin a more detailed scientific discussion and present our original research thoughts on the subject of scientific interest in this research article.

Quantum strategy synthesis by chairman of board of directors at modern firm in quantum creative economy of scale and scope in quantum disruption century

We prefer to begin our scientific discussion by stating that the quantum strategy synthesis has to be performed by a chairman of the board of directors at the modern firm in the quantum creative economy of scale and scope in a quantum disruption century.

As we know the chairman chairs the board of directors in the modern firm at a certain time moment could be mathematically represented as a two dimensions matrix in Ledenyov D O, Ledenyov V O (2015b, n, o):

\[
\text{Chairman}_{e,t} = \begin{bmatrix}
   d_{1,1} & d_{1,2} & \cdots & d_{1,j} \\
   d_{2,1} & d_{2,2} & \cdots & d_{2,j} \\
   \vdots & \vdots & \ddots & \vdots \\
   d_{i,1} & d_{i,2} & \cdots & d_{i,j}
\end{bmatrix},
\]

where \(d_{ij}\) is the position of a director’s seat in the matrix.

The change of the composition of the board of directors in the modern firm over the time could be mathematically described as an integer in Santella, Drago, Polo (November 11 2007), Ledenyov D O, Ledenyov V O (2015b, n, o):

\[
\text{Chairman}_{e,t} = \text{board}_{e,t} = \text{board}_{e,t-1} + \int_{t}^{t+1} (en-ex) dt
\]
where

\[ en(t) = \frac{de}{dt}\cdot n = en, \quad ex(t) = \frac{de}{dt}\cdot x = ex, \]

\(en(t)\) is the number of directors entrants at time \(t_i\),
\(ex(t)\) is the number of directors exits at time \(t_i\),
\(board_{c,t}\) is the board of directors size at time \(t_i\),

\(c\) is the company,
\(i\) is the director.


The Quantum Strategy Search Algorithm in the business administration science / the microeconomics science for the first time has been proposed in Ledenyov D O, Ledenyov V O (2015n): “The Quantum Strategy Search Algorithm: The Ledenyov theory postulates that the director with the highest information absorption capacity, who experience the phenomenon of resonant - type absorption of information, is able to create the winning virtuous strategies through the decision making process on the available business choices in the diffusion - type financial economic system with the induced nonlinearities, applying the econophysical econometrical analysis techniques in Schumpeter (1906, 1933), Bowley (1924), 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),

The inductive logic, deductive logic, abductive logic, quantum logic (the probability logic) have been described in Ledenyov D O, Ledenyov V O (2015n):

1. **Inductive logic** – the logic of what is operative — reasons from the specific to the general. Induction allows inferring $a$ entails $b$ from multiple instantiations of $a$ and $b$ at the same time.

2. **Deductive logic** – the logic of what must be — reasons from the general to the specific. Deduction allows deriving $b$ as a consequence of $a$. In other words, deduction is the process of deriving the consequences of what is assumed.
3. **Abductive logic** – the logic of what could possibly be true – reasons through successive approximation. Abduction allows inferring \( a \) as an explanation of \( b \), because of this, abduction allows the precondition \( a \) to be inferred from the consequence \( b \).

4. **Quantum logic (Probability logic)** – the logic of what may occur – reasons through computing of events probabilities distributions. Quantum logic allows \( a \) and \( b \) to be realized, depending on \( a \) and \( b \) events probabilities distributions equal to square of the Schrödinger’s wave function.

The practical realization of the **Quantum Strategy Search Algorithm** has been discussed for the first time in *Ledenyov D O, Ledenyov V O* (2015n):

1. the interlocking interconnecting director absorbs the information of interest on the particular business events/processes/ecosystems,

2. the interlocking interconnecting director applies the creative imperative integrative intelligent conceptual co-lateral adaptive logarithmic thinking process to analyze the particular business events/processes/ecosystems,

3. the interlocking interconnecting director uses the inductive, deductive and abductive logics (the value based logic, the binary logic) to come to a certain logical conclusion on the desirable corporate strategy of the choice during the strategic choice structuring process in *Ledenyov D O, Ledenyov V O* (2015b),

4. the interlocking interconnecting director applies the quantum logic (the probability logic) to evaluate the corporate strategy of the choice, with the ultimate purpose to create the quantum strategy or to disregard the corporate strategy of the choice during the strategic choice structuring process, and then

5. the chairman of the board of directors with the interlocking interconnecting directors in the board of directors thinks on a set of the proposed strategies by the directors and creates / implements the quantum strategy in the quantum creative economies of the scales and scopes at the selected time period.

**Quantum strategy synthesis by Alphabet Inc in quantum creative economy of scale and scope in quantum disruption century**

The *Alphabet Inc* has a governing organizational structure, including a chairman of the board of directors with the interlinking interlocking directors, which can be closely approximated by the above formulas.

The *Alphabet Inc* organization includes the following divisions in *Grant (2016)*:
“•Google, which would comprise search, advertising, maps, YouTube, and Android;
•Calico, an anti-aging biotech company;
•Sidewalk, a company focused on smart cities;
•Nest, a maker of Internet connected devices for the home;
•Fiber, high speed Internet service in a number of American cities;
•Investment arms such as Google ventures and Google capital;
•Incubator projects, such as Google X, which is developing self-driving cars and delivery drones.”


For example, Reeves (2015) writes: “Page’s distinction brings to life the idea of strategic ambidexterity: a company’s ability of exploring new practices, products and business models while exploiting existing ones at the same time—a capability which is both remarkably valuable and equally hard in practice. As we write in Your Strategy Needs a Strategy, successful companies in today’s diverse and dynamic business environments do exactly that: they select right approach to strategy and execution for each part of the business—and animate the resulting collage of approaches as circumstances change or each businesses evolves.”

In addition, Reeves (2015) states that the Alphabet Inc organizational transformation makes it possible to realize the three main things:

1. “Allows each unit to deploy the right approach to strategy and execution
2. Makes it easier to build the required capabilities in each business.
3. Lowers the hurdles to acquiring and growing companies.”

In this connection, we think that Reeves (2015) makes the misleading mistaken incorrect conclusions in view of lack of practical experience of intensive work at the boards of directors in the modern firms presumably. We would like to express a research opinion that an ability to select a right approach to the strategy creation and execution for each line of the business cannot be considered as a unique identifier of Alphabet Inc business success, because every chairman of the board of directors with the interlinking interlocking directors in the modern firm has enough knowledge and human/financial/technical capabilities to do exactly the same things in other modern firms. Moreover, the organizational transformation into the conglomerate can add/subtract a certain value to/from the firm’s total market valuation, depending on many factors beyond this discussion. In other words, the organizational transformation into the conglomerate
does not mean an automatic increase of the modern firm market valuation, because there are many examples, when the conglomerate companies went bankrupt in view of various reasons/circumstances.

In our opinion, the quantum strategy synthesis by Alphabet Inc means that a set of most innovative successful unrelated research and development (R&D) strategies has been created and implemented by a chairman of the board of directors at Alphabet Inc in the quantum creative economy of scale and scope in the quantum disruption century.

The quantum strategy synthesis by Alphabet Inc means that a number of new superior products and services have been delivered to the customers due to the fact that a set of most innovative successful unrelated research and development (R&D) strategies has been created and implemented by a chairman of the board of directors at Alphabet Inc in the quantum creative economy of scale and scope in the quantum disruption century.

The Alphabet Inc transformation into some kind of conglomerate can be merely considered as the optimization efforts, aiming to successfully execute a set of most innovative successful unrelated R&D strategies, by a chairman of the board of directors at Alphabet Inc in the quantum creative economy of scale and scope in the quantum disruption century.

We think that the quantum strategy synthesis by a chairman of the board of directors at Alphabet Inc in the quantum creative economy of scale and scope in the quantum disruption century resulted in a situation, when the Alphabet Inc became a most valuable company with the market valuation of about US$533.4 billion in the World in La Monica (February 1 2016), of about $546.50 billion at the selected time periods in Ghosh, Mukherjee (February 2 2016).

We would like to state that the chairmen of the boards of directors with the interlinking interlocking directors in the modern firms will greatly benefit by creating and by implementing the quantum strategies, pursuing the ultimate goal to build the prosperous organizations in the digital creative economies of the scales and scopes at the time of the disruptive changes and opportunities by the globalization.

**Conclusion**

We live and make business at the time of great transition from the digital disruption to the quantum disruption, when the multiple quantum inventions in the natural/social sciences create all the necessary conditions for the quantum leaps realization by the modern firms in the hi-tech industries in the quantum creative economies of the scales and scopes in the quantum disruption age.
We think that, at this opportunities/challenges time period, a chairman of the board of directors must take a personal responsibility for the creation and execution of the quantum strategy - a most effective winning virtuous organizational strategy - toward the optimal business model design/discovery for the prosperous effective organization in the quantum creative economies of the scales and scopes in the quantum disruption century.

The quantum strategy uses the quantum strategy search algorithm, applying the quantum logic (the probabilistic logic) on the top of the inductive, deductive and abductive logics (the value based logics) with the purpose to create the most effective optimal winning virtuous organizational strategy by the chairman of the board of directors with the interlocking interconnecting directors in the modern firms in the quantum creative economies of the scales and scopes in the quantum disruption time.

We study the real-life cases on the quantum strategy formulation and execution by the chairman of the board of directors with the interlocking interconnecting directors in the modern firm such as Alphabet Inc in the quantum creative economies of the scales and scopes in the quantum disruption period.

We express a great confidence that the quantum strategies will continue to be created and implemented by the prosperous organizations with the aim to increase the modern firms’ valuations and outperform the competitors in the quantum creative economies of the scales and scopes in the quantum disruption century.

**Acknowledgement**

The scientific thinking school in Bunyakovksy (1825a, b, c, 1846) influenced the authors’ strategic scientific vision creation and helped to develop the authors’ tactical approaches to the scientific problems solutions search. The authors acknowledge the multiple scientific discussions on the quantum strategy with Oleg P. Ledenyov in Kharkiv, Ukraine in 1988 – 2016. The first author appreciates many hours of the research discussions on the computing modeling techniques for the accurate characterization of the scientific phenomena with Janina E. Mazierska at James Cook University in Townsville, Australia in 2000 - 2016.

*E-mails: dimitri.ledenyov@my.jcu.edu.au, ledenyov@univer.kharkov.ua.*
References:

Economics Science, Finance Science, Economic History Science:

7. Menger C 1871 Principles of Economics (Grundsätze der Volkswirtschaftslehre) Ludwig von Mises Institute Auburn Alabama USA
8. Bagehot W 1873, 1897 Lombard Street: A description of the money market Charles Scribner's Sons New York USA.
10. von Böhm-Bawerk E 1884, 1889, 1921 Capital and interest: History and critique of interest theories, positive theory of capital, further essays on capital and interest Austria; 1890 Macmillan and Co Smart W A (translator) London UK
13. Schumpeter J A 1906 Über die mathematische methode der theoretischen ökonomie ZfVSV Austria.
15. Schumpeter J A 1911; 1939, 1961 Theorie der wirtschaftlichen entwicklung; The theory of economic development: An inquiry into profits, capital, credit, interest and the business cycle Redvers Opie (translator) OUP New York USA.
19. Slutsky E E 1915 Sulla teoria sel bilancio del consumatore *Giornale degli economisti e rivista di statistica* 51 no 1 pp 1 – 26 Italy.
21. von Mises L 1912 The theory of money and credit *Ludwig von Mises Institute* Auburn Alabama USA
27. Ellis H, Metzler L (editors) 1949 Readings in the theory of international trade *Blakiston* Philadelphia USA.
28. Friedman M (editor) 1953 Essays in positive economics *Chicago University Press* Chicago USA.

34. Minsky H P 2015 Minsky archive The Levy Economics Institute of Bard College Blithewood
   Bard College Annandale-on-Hudson New York USA
   http://www.bard.edu/library/archive/minsky/.


41. Scornick-Gerstein F May, 1996 Private communications on economics strategies by the
   European governments, the financial strategies by European governments, and the land value
   taxation theory by Henry George Royal Automobile Club London UK.

42. Scornick-Gerstein F 1999 The future of taxation: The failure of the poll tax in the UK


46. Stiglitz J E 2015 The great divide Public Lecture on 19.05.2015 London School of
   Economics and Political Science London UK
   http://media.rawvoice.com/lse_publiclecturesandevents/richmedia.lse.ac.uk/publiclecturesan
devants/20150519_1830_greatDivide.mp4.


49. Dodd N 2014 The social life of money Princeton University Press NJ USA

Juglar Economic Cycle in Macroeconomics:

50. Juglar C 1862 Des crises commerciales et de leur retour périodique en France en Angleterre
    et aux États-Unis Guillaumin Paris France.


**Kondratiev Economic Cycle in Macroeconomics:**

53. Tugan-Baranovsky M 1894 Industrial crises in contemporary England: Their causes and influences on the life of the people *St Petersburg/Moscow* Russian Federation.


56. Kondratieff N D 1925 The big cycles of conjuncture *The problems of conjuncture* 1 (1) pp 28 – 79.


60. Kondratieff N D 1984 The Long wave cycle *Richardson & Snyder* New York USA.


64. Kowal L 1973 The market and business cycle theories of M I Tugan-Baranovsky *Revista Internazionale di Scienze Economiche e Commercial* vol 20 part 4 Padova Italy.


73. Van Duijn J J 1981 Fluctuations in innovations over time Futures 13(4) pp 264 – 275.

74. Van Duijn J J 1983 The long wave in economic life Allen and Unwin Boston MA USA.


78. Tinbergen J 1981 Kondratiev cycles and so-called long waves: The early research Futures 13 (4) pp 258 – 263.


83. Wallerstein I 1984 Economic cycles and socialist policies Futures 16 (6) pp 579 – 585.


87. Freeman C, Louçã F 2001 As time goes by: From the industrial revolutions to the information revolution *Oxford University Press* Oxford UK.

88. Goldstein J 1988 Long cycles: Prosperity and war in the modern age *Yale University Press* New Haven CT USA.


90. Berry B J L 1991 Long wave rhythms in economic development and political behavior *Johns Hopkins University Press* Baltimore MD USA.


96. Modelski G, Thompson W R 1996 Leading sectors and world politics: The co-evolution of global politics and economics *University of South Carolina Press* Columbia SC USA.


100. Perez C 2002 Technological revolutions and financial capital – The dynamics of bubbles and golden ages *Edward Elgar* Cheltenhem UK.


http://www.eolss.net.


http://www.escholarship.org/uc/item/9jv108xp .

108. Wikipedia 2015a Kondratieff *Wikipedia* USA


**Kitchin Economic Cycle in Macroeconomics:**


**Kuznets Economic Cycle in Macroeconomics:**

110. Kuznets S 1924 Economic system of Dr. Schumpeter *M. Sc. Thesis under Prof. Wesley Clair Mitchell* Columbia University NY USA.

111. Kuznets S 1930 Secular movements in production and prices *Ph. D. Thesis under Prof. Wesley Clair Mitchell* Columbia University NY USA.
112. Kuznets S 1930 Secular movements in production and prices. Their nature and their bearing upon cyclical fluctuations *Houghton Mifflin* Boston USA.


118. Kuznets S 1968 Toward a theory of economic growth, with reflections on the economic growth of modern nations.

119. Kuznets S 1971 Economic growth of nations: Total output and production structure.


Accurate Characterization of Properties of Economic Cycles in Macroeconomics:


158. Sussmuth B 2003 Business cycles in the contemporary World *Springer* Berlin Heidelberg Germany.


164. Jourdon Ph 2008 La monnaie unique Europeenne et son lien au developpement economique et social coordonne: une analyse cliometrique Thèse Universite Montpellier France.


173. Uechi L, Akutsu T 2012 Conservation laws and symmetries in competitive systems
Progress of Theoretical Physics Supplement no 194 pp 210 – 222.

174. Central Banking Newsdesk 2013 Swiss board member supports counter-cyclical capital buffer

175. Union Bank of Switzerland 2013 UBS outlook Switzerland

176. Da Costa 2015 Weak first-quarter growth due to seasonal issues after all, SF Fed says
The Wall Street Journal New York USA.

177. Federal Reserve Bank of St Louis 2015 US Federal Reserve Economic Data (FRED)
Federal Reserve Bank of St Louis
http://research.stlouisfed.org/fred

178. Desai M, King St, Goodhart Ch 2015 Hubris: why economists failed to predict the crisis and how to avoid the next one Public Lecture on 27.05.2015 London School of Economics and Political Science London UK

179. Desai M 2015 Do we need a new macroeconomics? Public Lecture on 09.07.2015 London School of Economics and Political Science London UK (the presentation was made after the publication of an initial version of our research article at the MPRA and SSRN)

http://projects.wsj.com/econforecast/#ind=gdp&r=20

http://projects.wsj.com/econforecast/#ind=gdp&r=28

182. Wikipedia (English) 2015c Business cycle Wikipedia California USA

Firm Theory Science, Business Administration Science:
183. Babbage Ch 1832 On the economy of machinery and manufacturers Charles Knight 13 Pall Mall East London UK.
189. Ohlin B 1933 Interregional and international trade Harvard University Press Cambridge Massachusetts USA.
208. Stigler G 1968 The organization of industry Richard Irwin Inc Homewood USA.


238. Perrow C 1986 Complex organizations Random House New York USA.


Board of Directors Science, Interlocking Directors Networks Science, Firms Networks Science, Social Networks Science;

250. Brandeis L D 1933 Other people’s money-and how the bankers use it *Jacket Library* Washington National Home Library Foundation USA.


255. Hopkins T K 1964 The exercise of influence in small groups *Bedminster Press* Totawa New Jersey USA.


260. Harary F 1969 Graph theory *Addison-Wesley* Reading MA USA.


263. Mace M L 1971 Directors: Myths and reality *Harvard University Press* Cambridge Massachusetts USA.


283. Tukey J W 1977 Exploratory data analysis Addison-Wesley USA.


285. Freeman L 1979b Visualizing social networks School of Social Sciences University of California Irvine California USA.
directorates involving American manufacturing *Administrative Science Quarterly* 25
pp 557 – 582.
289. Burt R S 1997 The contingent value of social capital *Administrative Science Quarterly* 42
291. Radcliff R 1980 Banks and corporate lending: An analysis of the impact of the internal
structure of the capitalist class on the lending behavior of banks *American Sociological
Review* 45 pp 553 – 570.
292. Boje D M, Whetten D A 1981 Effects of organizational strategies and constraints on
centrality and attributions of influence in interorganizational networks *Administrative
293. Mintz B, Schwartz M 1981 Interlocking directorates and interest group formation
294. Mintz B, Schwartz M 1985 The power structure of American business *University of
Chicago Press* Chicago Illinois USA.
measures *Administrative Science Quarterly* 26 pp 475 – 489.
Beverly Hills California USA.
297. Stearns L B, Mizruchi M S 1986 Broken-tie reconstitution and the functions of
interorganizational interlocks: A reexamination *Administrative Science Quarterly* 31
pp 522 – 538.
298. Mizruchi M S, Schwartz M (editors) 1987 Intercorporate relations: The structural
analysis of business *Cambridge University Press* Cambridge UK.
299. Mizruchi M S, Stearns L B 1988 A longitudinal study of the formation of interlocking
300. Mizruchi M S 1992 The structure of corporate political action *Harvard University Press*
Cambridge USA.
301. Mizruchi M S, Stearns L B 1994 A longitudinal study of borrowing by large American
corporations *Administrative Science Quarterly* 39 pp 118 – 140.
306. Barnes J A 1983 Graph theory in network analysis Social Networks vol 5 pp 235 – 244.
312. American Bar Association 1984 Section on Antitrust Law Monograph 10 Interlocking Directorates under Section 8 of Clayton Act. Task force on interlocking directorates Washington USA.
313. American Bar Association 2011 Interlocking directorates Handbook on Section 8 of the Clayton Act Washington USA.
317. Useem M 1984 The inner circle Oxford University Press New York USA.


361. Demb A, Neubauer F F 1992 The corporate board: Confronting the paradoxes Oxford University Press NY USA.


421. Park S, Rozeff M 1996 The role of outside shareholders, outside boards, and management entrenchment in CEO selection *Working Paper* SUNY Buffalo NY USA.


426. Williamson O E 1996 The mechanisms of governance *Oxford University Press* New York USA.


444. Miller G T March 26 1997 Interlocking directorates and the antitrust laws Colorado Lawyer 53.


475. Watts D J 1999a Small worlds *Princeton University Press* Princeton New Jersey USA.


481. Borgatti S P 2002 Basic social network concepts AoM PDW Denver CO USA.


494. Maman D 2001 The organizational connection: Social capital, the career expansion of directors of business groups in Israel Social Science Research 30 pp 578 – 605.

503. Fich E 2000 Do directors who are CEOs of other firms enhance firm performance? UNC Working Paper University of North Carolina NC USA.


507. Miwa Y, Ramseyer M 2000 The value of prominent directors: Lessons in corporate governance from transition Japan University of Tokyo, Harvard University Japan, USA.


511. Ferri G, Masciandaro D, Messori M 2001 Corporate governance, board turnover and performance: The case of local banks in Italy Paolo Baffi Centre Working Paper no 01-150 Italy.


525. Tomka B 2001 Interlocking directorates between banks and industrial companies in Hungary at the beginning of the twentieth century Business History 43 (1) pp 25 – 42.


532. Carver J 2002 Corporate boards that create value: Governing company performance from the boardroom Jossey-Bass USA.


568. Stablein R, Cleland P, Mackie B, Reid D 2004 New Zealand exchange limited (nzx) boards and directors: It is a small world after all Working Paper.
572. Charan R 2005 Boards that deliver: Advancing corporate governance from compliance to competitive advantage Jossey-Bass USA.
574. Hanneman R A, Riddle M 2005 Introduction to social network methods University of California Riverside California USA http://faculty.ucr.edu/~hanneman/.


580. Aguilera R V 2006 National state differences and patterns of directorship interlocks: A comparative study of Italy and Spain MIT USA


582. Batagelj V, Mrvar A 2006 *Pajek University of Ljubljana*.

583. Bertoni F, Randone P A 2006 The small-world of Italian finance: Ownership interconnections and board interlocks amongst Italian listed companies


http://mpra.ub.uni-muenchen.de/4420/.

http://mpra.ub.uni-muenchen.de/8299/.

588. Farina V 2008 Banks' centrality in corporate interlock networks: Evidences in Italy Sefemeq Department University of Rome “Tor Vergata” Italy *MPRA Paper no 11698 Munich University Germany pp 1 – 31
http://mpra.ub.uni-muenchen.de/11698/.

590. Chhaochharia V, Grinstein Y 2006b Executive compensation and board structure Working Paper Cornell University USA.


604. Prinz E 2006 Corporate governance and the uncertain role of interlocking directorates
613. Ibarra H 2007 What you know or who you know? INSEAD Knowledge-casts INSEAD France.
www.ft.com/cms/s/e5406470-860a-11dc-b00e-0000779fd2ac.html .
615. Ledenyov V O 2007b Think like a leader The Globe and Mail Toronto Canada
616. Malloy Chr 2007 Social networks Public Lecture London School of Economics and Political Science London UK.
617. Murray A S 2007 Revolt in the boardroom: The new rules of power in corporate America Collins USA.
http://www.tinbergen.nl.


http://ssrn.com/abstract=971189,
http://mpra.ub.uni-muenchen.de/2288/.

http://mpra.ub.uni-muenchen.de/2265/,

624. Santella P, Drago C, Polo A, Gagliardi E 2009 A comparison among the director networks in the main listed companies in France, Germany, Italy, and the United Kingdom *MPRA Paper no 16397* Munich University Germany pp 1 – 19
http://mpra.ub.uni-muenchen.de/16397/.


630. Vermeulen Fr 2008 How companies can get lucky and succeed Public Lecture London School of Economics and Political Science London UK.


632. Tutelman H 2008 The balance point: New ways business owners can use boards Famille Press USA.


649. Schifeling T, Mizruchi M S August 27 - 28 2012 The decline of the American corporate network 1960-2010 Corporate Networks in the 20th century Conference University of Lausanne USA.


Whitehead Ch K December 22, 23 2014 Private communications on the boards of
directors overlap in publicly traded and non-traded firms in the USA V N Karazin Kharkiv
National University Kharkiv Ukraine.

Ferreira D January 15 2015 Corporate boards: Facts and myths Public Lecture on
15.01.2015 Department of Finance & Financial Markets Group London School of Economics
and Political Science London UK
20150115_1830_corporateBoardsFactsMyths_sl.pdf
http://media.rawvoice.com/lse_publiclecturesandevents/richmedia.lse.ac.uk/publiclecturesan
devents/20150115_1830_corporateBoardsFactsMyths.mp4.

Wikipedia January 15 2015 Board of directors USA


Ledenyov D O, Ledenyov V O 2015b Winning virtuous strategy creation by interlocking
interconnecting directors in boards of directors in firms in information century MPRA Paper
no 61681 Munich University Munich Germany, SSRN Paper no SSRN-id2553938 Social
Sciences Research Network New York USA pp 1 – 108
http://mpra.ub.uni-muenchen.de/61681/ ,

Ledenyov D O, Ledenyov V O 2015n Quantum strategy creation by interlocking
interconnecting directors in boards of directors in modern organizations at time of
globalization MPRA Paper no 68404 Munich University Munich Germany, SSRN Paper no
SSRN-id2704417 Social Sciences Research Network New York USA pp 1 – 104
http://mpra.ub.uni-muenchen.de/68404/ ,

Strategy Science, Strategic Governance Science, Management Science:

Chandler A D Jr 1962, 1998 Strategy and structure: Chapters in the history of the
1587981982 pp 1 – 480.

Chandler A D Jr 1977, 1993 The visible hand: The managerial revolution in American

Chandler A D Jr, Daems H 1980 Managerial hierarchies: Comparative perspectives on
the rise of the modern industrial enterprise Harvard University Press ISBN 9780674547414 .


664. Andrews K R 1971a The concept of corporate strategy Richard D Irwin Homewood USA.


models and economics Taylor T H (editor) North-Holland Publishing Company Amsterdam The Netherlands.


678. Porter M E 1983 Analyzing competitors: Predicting competitor behavior and formulating offensive and defensive strategy in Policy, strategy, and implementation Leontiades M (editor) Random House USA.


682. Porter M E May 1987a The state of strategic thinking Economist London UK.


696. Porter M E 2001b The technological dimension of competitive strategy in Research on technological innovation, management and policy vol 7 Burgelman R A, Chesbrough H (editors) *JAI Press* Greenwich CT USA.


706. Yelle L E 1979 The learning curve: Historical review and comprehensive survey 

   group membership and organizational performance *Academy of Management Journal* **27** (3) 
   pp 467 – 488.

708. Schwenk C R 1984 Cognitive simplification processes in strategic decision making 


710. Palepu K G 1985 Diversification strategy, profit performance and the entropy measure 

711. Barney J B 1986 Strategic factor markets: Expectations, luck, and business strategy 

712. Barney J B 1991 Firm resources and sustained competitive advantage *Journal of 
   Management* **17** (1) pp 99 – 120.

   pp 37 – 55.

   empirical examination with American data, Part II: Performance implications *Organization 

715. Miller D 1988 Relating Porter’s business strategies to environment and structure: 

716. Huff A S, Reger R K 1987 A review of strategic process research *Journal of 
   Management* vol **13** no 2 p 211.

717. Hill C W L, Snell S A 1988 External control, corporate strategy, and firm performance in 

718. Baysinger B D, Hoskisson R E 1989 Diversification strategy and R&D intensity in large 

   *McGraw-Hill* Singapore; *Sage* Beverly Hills California USA.

   and innovation *Administrative Science Quarterly* **35** pp 128 – 152.


726. Yip G 1992 Total global strategy: Managing for worldwide competitive advantage *Prentice Hall* NY USA.


734. McKiernan P 1997 Strategy past, strategy futures *Long range planning* vol 30 no 5 p 792.


739. Moldoveanu M, Martin R L 2001 Agency theory and the design of efficient governance mechanisms *Joint Committee on Corporate Governance Meeting* Rotman School of Management University of Toronto Ontario Canada pp 1 – 57.

740. Martin R L 2004 Strategic choice structuring: A set of good choices positions a firm for competitive advantage *Rotman School of Management* University of Toronto Canada pp 1 – 14


746. Martin R L 2013 Strategy award *Thinkers50* London UK
www.thinkers50.org.


748. Laffont J-J, Tirole J 1999 Competition in telecommunications *MIT Press* USA.


753. Drejer A 2002 Strategic management and core competencies 1st edition *Quorum Books* Westport Connecticut USA.

754. Sadler P 2003 Strategic management 1st edition *Kogan Page* Sterling VA USA.


765. Murphy T, Galunic Ch 2007 Leading in the age of talent wars INSEAD Leader-casts INSEAD France.


769. Sull D 2007c Closing the gap between strategy and execution: Making hard choices
*Public Lecture* London School of Economics and Political Science London UK.

770. Sull D 2007d Closing the gap between strategy and execution: The strategy loop in action
*Public Lecture* London School of Economics and Political Science London UK.

771. Sull D 2008 An iterative approach to the strategy *Public Lecture* London School of Economics and Political Science London UK.


http://www.lse.ac.uk/collections/LSEPublicLecturesAndEvents/events/2008/20080819t1316z001.htm
http://richmedia.lse.ac.uk/publicLecturesAndEvents/20081013_1830_japansGrandStrategy.mp3

774. Chamberlain G P 2010 Understanding strategy *Create Space* Charleston South Carolina USA.


776. Heracleous 2013 Quantum strategy by Apple Inc *Organizational Dynamics* 42 pp 92 – 99
www elsevier.com/locate/orgdyn .

777. Ive J, Foulkes N March 6 2015 The man behind the Apple watch *How to Spend It Financial Times* London UK

http://mpra.ub.uni-muenchen.de/61681/ ,

http://mpra.ub.uni-muenchen.de/68404/ ,
Disruptive Innovation in Technology, Economics and Finances:


796. Christensen C M April 1999c Teradyne: The Aurora project & Teradyne: Corporate management of disruptive change, TN *Harvard Business School Teaching Note 399 - 087*.


800. Christensen C M 1999b Impact of disruptive technologies in telecommunications in Bringing PC economies to the telecommunications industry *PulsePoint Communications*.


813. Christensen C M June 2002 The rules of innovation *Technology Review*.


817. Shah Ch D, Brennan T A, Christensen C M April 2003 Interventional radiology: Disrupting invasive medicine.

818. Christensen C M March April 2003 Beyond the innovator's dilemma *Strategy & Innovation* 1 no 1.


833. Christensen C M, Denning St December 2015 Disruptive innovation Forbes New York USA


837. Rodin J 2015 Managing disruption, avoiding disaster and growing stronger in an unpredictable World Public Lecture on 19.01.2015 London School of Economics and Political Science London UK
1244. Dobbs R, Woetzel J, Flanders St 2015 No ordinary disruption: The four global forces breaking all the trends Public Lecture on 08.06.2015 London School of Economics and Political Science London UK


839. Reeves M 2015 Google couldn’t survive with one strategy Harvard Business Review Cambridge USA

840. Rosoff M 2015 What is Alphabet, Google's new company? Business Insider USA


842. Faust D G 2016 Proposition that the knowledge is a new currency World Economic Forum Davos Switzerland.

843. Ghosh S, Mukherjee S February 2 2016 Alphabet overtakes Apple in market value - for now Reuters USA
http://www.reuters.com/article/us-apple-alphabet-research-idUSKCN0VB1KD.


845. La Monica P R February 1 2016 Alphabet, aka Google, briefly worth more than Apple CNN Money USA
http://money.cnn.com/2016/02/01/investing/google-apple-most-valuable-alphabet/.

Information Absorption in Economics, Finances, Business Administration Sciences and Information Asymmetry in Economics, Finances, Business Administration Sciences:


854. Farina V 2008 Network embeddedness, specialization choices and performance in investment banking industry *University of Rome Tor Vergata* Italy MPRA Paper no 11701 Munich University Munich Germany pp 1 – 26 http://mpra.ub.uni-muenchen.de/11701/.

**Selected Research Papers in Macroeconomics, Microeconomics & Nanoeconomics Sciences:**


873. Ledenyov D O, Ledenyov V O 2014f MicroLBO software program with the embedded optimized near-real-time artificial intelligence algorithm to create winning virtuous strategies toward leveraged buyout transactions implementation and to compute direct/reverse leverage buyout transaction default probability number for selected public/private companies during private equity investment in conditions of resonant absorption of discrete information in diffusion - type financial system with induced nonlinearities ECE James Cook University Townsville Australia, Kharkov Ukraine.


878. Ledenyov D O, Ledenyov V O 2015e On the spectrum of oscillations in economics
     MPRA Paper no 64368 Munich University Munich Germany, SSRN Paper no SSRN-
     id2606209 Social Sciences Research Network New York USA pp 1 – 48
     http://mpra.ub.uni-muenchen.de/64368/ ,
879. Ledenyov D O, Ledenyov V O 2015f Digital waves in economics MPRA Paper no 64755
     Munich University Munich Germany, SSRN Paper no SSRN-id2613434 Social Sciences
     Research Network New York USA pp 1 – 55
     http://mpra.ub.uni-muenchen.de/64755/ ,
880. Ledenyov D O, Ledenyov V O 2015g General information product theory in economics
     science MPRA Paper no 64991 Munich University Munich Germany, SSRN Paper no SSRN-
     id2617310 Social Sciences Research Network New York USA pp 1 – 54
     http://mpra.ub.uni-muenchen.de/64991/ ,
881. Ledenyov D O, Ledenyov V O 2015h Quantum macroeconomics theory MPRA Paper no
     65566 Munich University Munich Germany, SSRN Paper no SSRN-id2627086 Social
     Sciences Research Network New York USA pp 1 – 55
     http://mpra.ub.uni-muenchen.de/65566/ ,
882. Ledenyov D O, Ledenyov V O 2015i Wave function in economics MPRA Paper no
     66577 Munich University Munich Germany, SSRN Paper no SSRN-id2659054 Social
     Sciences Research Network New York USA pp 1 – 71
     http://mpra.ub.uni-muenchen.de/66577/ ,
883. Ledenyov D O, Ledenyov V O 2015j Quantum microeconomics theory MPRA Paper no
     67010 Munich University Munich Germany, SSRN Paper no SSRN-id2667016 Social
     Sciences Research Network New York USA pp 1 – 71
     http://mpra.ub.uni-muenchen.de/67010/ ,
884. Ledenyov D O, Ledenyov V O 2015k Quantum theory of firm MPRA Paper no 67162
     Munich University Munich Germany, SSRN Paper no SSRN-id2672288 Social Sciences
     Research Network New York USA pp 1 – 73
     http://mpra.ub.uni-muenchen.de/67162/ ,


890. Ledenyov D O, Ledenyov V O 2015q MicroID software program with the embedded optimized near-real-time artificial intelligence algorithm to create the winning virtuous business strategies and to predict the director’s election / appointment in the boards of directors in the firms, taking to the consideration both the director’s technical characteristics and the interconnecting interlocking director’s network parameters in conditions of the resonant absorption of discrete information in diffusion - type financial economic system
with induced nonlinearities *ECE James Cook University* Townsville Australia, Kharkov Ukraine.

891. Ledenyov D O, Ledenyov V O 2015*r MicroITF* operation system and software programs: 1) the operation system to control the firm operation by means of the information resources near-real-time processing in the modern firms in the case of the diffusion-type financial economic system with the induced nonlinearities; 2) the software program to accurately characterize the director’s performance by means of a) the filtering of the generated/transmitted/received information by the director into the separate virtual channels, depending on the information content, and b) the measurement of the levels of signals in every virtual channel with the generated/transmitted/received information by the director, in the overlapping interconnecting interlocking directors networks in the boards of directors in the firms during the Quality of Service (QoS) measurements process; and 3) the software program to create the winning virtuous business strategies by the interlocking interconnecting directors in the boards of directors in the modern firms in the case of the diffusion-type financial economic system with the induced nonlinearities, using the patented recursive artificial intelligence algorithm *ECE James Cook University* Townsville Australia, Kharkov Ukraine.

892. Ledenyov D O, Ledenyov V O 2015*s MicroIMF* software program: the *MicroIMF* software program to make the computer modeling of 1) the interactions between the information money fields of one cyclic oscillation and the information money fields of other cyclic oscillation(s) in the nonlinear dynamic economic system, 2) the interactions between the information money fields of cyclic oscillation and the nonlinear dynamic economic system itself, and 3) the density distributions of the information money fields by different cyclic oscillations (the economic continuous waves) in the nonlinear dynamic economic system *ECE James Cook University* Townsville Australia, Kharkov Ukraine.

893. Ledenyov D O, Ledenyov V O 2015*t MicroSA* software program 1) to perform the spectrum analysis of the cyclic oscillations of the economic variables in the nonlinear dynamic economic system, including the discrete-time signals and the continuous-time signals; 2) to make the computer modeling and to forecast the business cycles for a) the central banks with the purpose to make the strategic decisions on the monetary policies, financial stability policies, and b) the commercial/investment banks with the aim to make the business decisions on the minimum capital allocation, countercyclical capital buffer creation, and capital investments *ECE James Cook University* Townsville Australia, Kharkov Ukraine.
Ledenyov D O, Ledenyov V O 2015 *DNACode* software program 1) to model the Digital DNA’s complex knowledge base structure for the selected economy of the scale and scope in the case of the G20 nations; 2) to 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) *ECE James Cook University* Townsville Australia, Kharkov Ukraine.

**Probability Theory, Statistics Theory, Spectrum Analysis Theory, Brownian Movement Theory, Diffusion Theory, Chaos Theory, Information Communication Theory in Econometrics and Econophysics Sciences:**

894. Huygens 1657 *De ratiociniis in aleae ludo* (On calculations in games of chance).

895. Bernoulli J 1713 *Ars conjectandi* (The art of guessing).


897. De Moivre 1730 Miscellanea analytica supplementum (The analytic method).


901. Bunyakovsky V Ya 1825 Rotary motion in a resistant medium of a set of plates of constant thickness and defined contour around an axis inclined with respect to the horizon *Ph D Thesis no 1* under Prof. Augustin - Louis Cauchy supervision *École Polytechnique* Paris France.


Connor J J, Robertson E F (July) 2000 Viktor Yakovlevich Bunyakovsky (December 16, 1804 - December 12, 1889) School of Mathematics and Statistics University of St Andrews Scotland UK
http://www-history.mcs.st-andrews.ac.uk/Biographies/Bunyakovsky.html.


Chebyshev P L 1846 An experience in the elementary analysis of the probability theory Crelle's Journal fur die Reine und Angewandte Mathematik.


Markov A A 1900, 1912, 1913 Calculation of probabilities St Petersburg Russian Federation; Wahrscheinlichkeits-Rechnung Teubner Leipzig-Berlin Germany; 3rd edition St Petersburg Russian Federation.

Markov A A 1906 Extension of law of big numbers on variables, depending from each other Izvestiya Fiziko-Matematicheskogo Obedhestva pri Kazanskom Universitate 2nd series vol 15 (94) pp 135 – 156 Russian Federation.


Markov A A 1908, 1912, 1971 Extension of limit theorems of calculation of probabilities to sum of variables, connected in chain Zapiski Akademii Nauk po Fiziko-Matematiceshkomu
Otdeleniyu 8th series vol 25 (3); Ausdehnung der Satze über die Grenzwerte in der Wahrscheinlichkeitsrechnung auf eine Summe verketteter Grossen Liebmann H (translator) in Wahrscheinlichkeitsrechnung Markov A A (author) pp 272 – 298 Teubner B G Leipzig Germany; Extension of the limit theorems of probability theory to a sum of variables connected in a chain Petelin S (translator) in Dynamic probabilities systems Howard R A (editor) vol 1 pp 552 – 576 John Wiley and Sons Inc New York USA.


930. Slutsky E E 1915 Sulla teoria sel bilancio del consumatore *Giornale degli economisti e rivista di statistica* 51 no 1 pp 1 – 26 Italy.


932. Slutsky E E 1922b To the question of logical foundations of probability calculation *Statistics Bulletin* 9 - 12 pp 13 – 21.


939. Slutsky E E 1927a The summation of random causes as sources of cyclic processes *Problems of Conjuncture (Voprosy Kon’yunktury)* vol 3 issue 1 pp 34 – 64 Moscow Russian Federation.


944. Slutsky E E 1937b The summation of random causes as the source of cyclical processes *Econometrica* 5 pp 105 – 146.


950. Kolmogorov A N 1947 The contribution of Russian science to the development of probability theory *Uchenye Zapiski Moskovskogo Universiteta* no 91.


957. Cramer H 1946 Mathematical methods of statistics *Princeton University Press* USA.


970. Mandelbrot B B 1967a The variation of some other speculative prices *Journal of Business* vol 40 pp 393 – 413.


980. Mandelbrot B B 1977 Fractals: Form, chance and dimension *W H Freeman* San Francisco USA.

981. Mandelbrot B B 1982 The fractal geometry of nature *W H Freeman* San Francisco USA.

982. Mandelbrot B B 1997 Fractals and scaling in finance *Springer* New York USA.

983. Gnedenko B V, Khinchin A Ya 1961 An elementary introduction to the theory of probability *Freeman* San Francisco USA.


990. Shiryaev A N 1967 Two problems of sequential analysis *Cybernetics* 3 pp 63 – 69.


1011. du Toit J, Peskir G, Shiryaev A N 2007 Predicting the last zero of Brownian motion with drift Cornell University NY USA pp 1 – 17


1018. Karatzas I, Shiryaev A N, Shkolnikov M 2011 The one-sided Tanaka equation with drift Cornell University NY USA


1025. Lamperti J 1966 Probability Benjamin New York USA.


1031. Breiman L 1968 Probability Addison-Wesley Reading MA USA.


1038. Box G E P, Jenkins G M 1970 Time series analysis: Forecasting and control Holden Day San Francisco California USA.


1059. Taylor S 1986 Modeling financial time series *John Willey and Sons Inc* New York USA.

1060. Tong H 1986 Nonlinear time series *Oxford University Press* Oxford UK.


1067. Lancaster T 1990 The econometric analysis of transition data *Cambridge University Press* Cambridge UK.


1071. Cleveland W S 1993 Visualizing data *Hobart Press* Summit New Jersey USA.

1072. Pesaran M H, Potter S M (editors) 1993 Nonlinear dynamics, chaos and econometrics *John Willey and Sons Inc* New York USA.


1074. Peters E E 1994 Fractal market analysis: Applying chaos theory to investment and economics *John Wiley and Sons Inc* New York USA.

1075. Enders W 1995 Applied econometric time series *John Willey and Sons Inc* New York USA.
1079. Moore G E 2003 No exponential is forever – but we can delay forever *ISSCC*.
1083. Campbell J, Lo A, MacKinlay C 1997 The econometrics of financial markets *Princeton University Press* Princeton NJ USA.
1088. Hubbard B B 1998 The world according to wavelets *A K Peters* Wellesley MA USA.
1089. Mallat S A 1998 Wavelet tour of signal processing *Academic Press* San Diego CA USA.
1090. Teolis A 1998 Computational signal processing with wavelets *Birkhauser* Switzerland.


Quantum Physics, Quantum Electronics, Quantum Computing, Quantum Mechanics:


http://adsabs.harvard.edu/abs/1901AnP...309..553P,
https://dx.doi.org/10.1002%2Fandp.19013090310,

1123. Planck M 1903 Treatise on thermodynamics Longmans, Green & Co London UK
http://archive.org/stream/treatiseonthermo00planuoft#page/n7/mode/2up,
http://openlibrary.org/books/OL7246691M.

1124. Planck M 1906 Vorlesungen über die Theorie der Wärmestrahlung JA Barth Leipzig Germany
http://lccn.loc.gov/07004527.

1125. Planck M 1914 The theory of heat radiation 2nd edition P Blakiston's Son & Co
http://openlibrary.org/books/OL7154661M.


1127. Planck M 1943 Zur Geschichte der Auffindung des physikalischen Wirkungsquantums
Naturwissenschaften 31 (14–15) pp 153 – 159
http://adsabs.harvard.edu/abs/1943NW.....31..153P,
https://dx.doi.org/10.1007%2FBF01475738.

http://onlinelibrary.wiley.com/doi/10.1002/andp.19053221004/pdf,
http://adsabs.harvard.edu/abs/1905AnP...322..891E),
http://dx.doi.org/10.1002%2Fandp.19053221004.

1129. Einstein A 1917 Zur Quantentheorie der Strahlung On the quantum mechanics of radiation Physikalische Zeitschrift (in German) 18 pp 121 – 128
http://adsabs.harvard.edu/abs/1917PhyZ...18..121E.

http://echo.mpiwg-berlin.mpg.de/MPIWG:DRQK5WYB.

http://journals.aps.org/pr/pdf/10.1103/PhysRev.47.777,
http://adsabs.harvard.edu/abs/1935PhRv...47..777E,

http://www.cond-mat.physik.uni-mainz.de/~oettel/ws10/bks_PhilMag_47_785_1924.pdf,
https://dx.doi.org/10.1080%2F14786442408565262 .


1136. de Broglie L 1926 Ondes et mouvements Waves and motions Gauthier-Villars Paris France.

1137. de Broglie L 1927 Rapport au 5e Conseil de Physique Solvay Brussels Belgium.

1138. de Broglie L 1928 La mécanique ondulatoire Wave mechanics Gauthier-Villars Paris France.

https://www.worldcat.org/oclc/1871779 .

1140. Compton A; Allison S K 1935 X-Rays in theory and experiment D Van Nostrand Company Inc New York USA
https://www.worldcat.org/oclc/853654 .

1141. Schrödinger E 1926 Quantisierung als Eigenwertproblem Annalen der Phys 384 (4) pp 273 – 376
http://adsabs.harvard.edu/abs/1926AnP...384..361S ,
https://dx.doi.org/10.1002%2Fandp.19263840404 .


1143. Fermi E 1934 Radioattività indotta da bombardamento di neutroni La Ricerca scientifica 1 (5) p 283 (in Italian)
http://adsabs.harvard.edu/abs/1934RSPSA.146..483F ,
https://dx.doi.org/10.1098%2Frspa.1934.0168 .

1145. Townes Ch 1939 Concentration of the heavy isotope of carbon and measurement of its nuclear spin *PhD thesis* Caltech California USA


http://adsabs.harvard.edu/abs/1955PhRv...99.1264G ,
https://dx.doi.org/10.1103%2FPhysRev.99.1264 .


http://adsabs.harvard.edu/abs/1956PhRv..102.1308S ,
https://dx.doi.org/10.1103%2FPhysRev.102.1308 .

1150. Townes Ch H 1964 Nobel Prize in Physics Stockholm Sweden

1151. Townes Ch H 1966 Obtaining of coherent radiation with help of atoms and molecules *Uspekhi Fizicheskikh Nauk (UFN)* vol **88** no 3.

1152. Townes Ch H 1969 Quantum electronics and technical progress *Uspekhi Fizicheskikh Nauk (UFN)* vol **98** no 5.


1169. Schawlow A 1963 Modern optical quantum generators Uspekhi Fizicheskikh Nauk (UFN) vol 81 no 12.


1179. Petersen A 1968 Quantum physics and philosophical tradition MIT Press Cambridge USA.


Wave Function in Schrödinger Quantum Mechanical Wave Equation in Quantum Mechanics:


1189. Mygind J 1997 Private communications on the new sources of noise in the single electron transistors Department of Physics Technical University of Denmark Lyngby Denmark.


*Artificial Intelligence Science, Computer Science:*


1247. Nilsson N 2010 The quest for artificial intelligence: A history of ideas and achievements
1248. Poole D, Mackworth A, Goebel R 1998 Computational intelligence: A logical approach
  intelligence, automated reasoning, and symbolic computation Springer-Verlag Berlin
  Germany.
1251. Luger G, Stubblefield W 2004 Artificial intelligence: Structures and strategies for
  complex problem solving 5th edition The Benjamin Cummings Publishing Company Inc
1252. Bach J 2008 Seven principles of synthetic intelligence in Artificial general intelligence

Continuous Time Signal, Analog Signals, Discrete Time Signal, Digital Signals, Spectrum of
Signals, Electromagnetic Field, Gravitation Field, Calibrating Field, Information Field

Theories in Physics and Engineering Sciences:
1254. Maxwell J C 1890 Introductory lecture on experimental physics in Scientific papers of
  J C Maxwell Niven W D (editor) vols 1, 2 Cambridge UK.
1255. Walsh J L 1923a A closed set of normal orthogonal functions American J Math 45
  pp 5 – 24.
1256. Walsh J L 1923b A property of Haar’s system of orthogonal functions Math Ann 90
  p 3845.
1257. Wikipedia 2015d Joseph L Walsh Wikipedia USA
  Eng 93 pp 429 – 441.
1259. Shannon C E 1948 A mathematical theory of communication Bell System Technical
  http://cm.bell-labs.com/cm/ms/what/shannonday/paper.html .
1260. Bose R C, Shrikhande S S 1959 A note on a result in the theory of code construction 
CiteSeerX: 10.1.1.154.2879
http://dx.doi.org/10.1016%2FS0019-9958%2859%2990376-6


http://dx.doi.org/10.1109%2FT-C.1972.223524.


1265. Orfanidis S J 1995 Introduction to signal processing *Prentice-Hall* Englewood Cliffs NJ USA.


1292. Ledenyov D O, Ledenyov V O 2015a Nonlinearities in microwave superconductivity
8th edition Cornell University NY USA pp 1 – 923