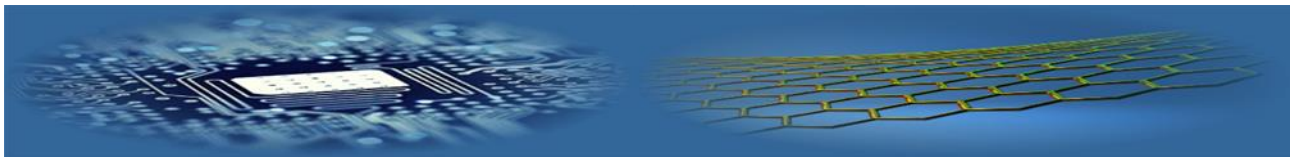

Artificial Intelligence technologies in human resource development

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Abstract

An essential part of modern management is computing, particularly, Artificial Intelligence technologies. The Artificial Intelligence technologies which are based on reproduction of principles of human intelligence functioning. The Rising of General Artificial Intelligence is impossible without the acquisition of elements of self-consciousness and self-cultivation. But for the solution of applied problems we need applied Artificial Intelligence which performs particular tasks particularly in management. The most difficult task in Human Resource Development is to determine the effectiveness of training costs due to its branching and sophisticated feedback given by improved production results of staff who was involved in the process. To determine the impact of the performance of the company (labour costs, labour costs per person, income, profit, profit per person) based on indicators, characterizing the personnel training on the example of ALC "Severodonetsk factory of chemical non-standard equipment" we use cognitive system IBM Watson Analytics. Found that the main factor influencing the amount of training in the company is the net income of the company for the previous year. Considering this analysis, it could be argued that decisions on financing of Human Resource Development are carried out on the basis of income of the enterprise from the past period.

Keywords:

artificial intelligence
human resource development

1 Introduction

An essential part of modern management is computing. Rapid changes in business environment requires quick responses. In these conditions traditional approaches to developing of information systems through programming on Turing machines should be replaced by creation of continuous adapting systems with natural interface. Artificial Intelligence technologies meet these requirements. Especially The Artificial Intelligence technologies that are focused on the reproduction of principles of human intelligence functionning.

In our opinion, the rise of Artificial Intelligence is impossible without the acquisition of elements of self-consciousness and self-cultivation. The realization of such elements through the Luhmann's system approach provides the independence of artificial intelligence and will simplify its training.

2 Artificial Intelligence as a reproduction of self-consciousness

The intelligence (particularly, artificial) forms the experience on the basis of past events and creates certain expectations concerning the future. The mediator between experience and expectations is the sense. According to Niklas Luhmann, the sense is formed on the basis of experience and "empowers ever actually doable experiences with the redundant features" [1]. The phenomenon of the sense itself "is presented in the form of surplus guidance on further opportunities action experience" [1], i.e. the sense shapes intelligence expectations. The aim is to determine the intelligence expectations, as a result of free will of a intelligence, and these are not amenable to formalization and foresight according to [1]. They form structures, particularly in the form of institutions such as relations between the the ones responsible for system creation, preservation and restoration of these relations, and their means of interpretation and evaluation.

On the other hand, Friedrich Hayek affirms that "the passing of our cumulative knowledge in time" is the culture [2]. Thus, the form and content of the institutions are defined by cultural backgrounds. The institutions functioning also has an impact on the culture (Figure 1).

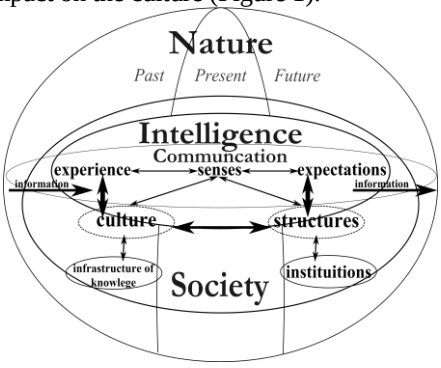

FIGURE 1 Interaction of economic reality fundamental components

Intelligence activities can be divided into the subconscious mind and consciousness. Desires of subconscious related to time period can be divided into: connected with the past (building a picture of the world), modern (satisfaction) and future (future certainty). In the intelligence these desires create the knowledge that formalize the information obtained in the past, the innovations as new ways to meet the needs and plans for future actions. Reflection as a method and form of identity is a fundamental intelligence capacity and allows to analyze the thoughts and actions. According to Immanuel Kant, free will is possible because of the freedom of thought from the time determinism [3].

Due to the unpredictability of intelligence behaviour through free will, the proposed ontology contains uncertainty in shaping the experiences and expectations of senses. And thus its actions, in particular, cultural and economic institutions, make it impossible to build a closed system that intends to give an opportunity to obtain pre-defined result of intelligence activity (including artificial). Preconditions of intelligence being is self-consciousness.

3 Self-consciousness fundamentals

As Plotinus stated "The Intellectual-Principle is a Seeing, and a Seeing which itself sees; therefore it is a potentiality which has become effective. This implies the distinction of Matter and Form in it– as there must be in all actual seeing – the Matter in this case being the Intelligibles which the Intellectual-Principle contains and sees. All actual seeing implies duality; before the seeing takes place there is the pure unity [of the power of seeing]. That unity [of principle] acquires duality [in the act of seeing], and the duality is [always to be traced back to] a unity" [4].

As Hegel stated in "Phenomenology of Spirit", "but the distinction between the in-itself and knowledge is already present in the very fact that consciousness knows an object at all. Something is *for it* the *in-itself;* and knowledge, or the being of the object for consciousness, is, *for it*, another moment. Upon this distinction, which is present as a fact, the examination rests" [5, 85]. By Donald Verene, to put it simply:

1. a consciousness of something (something that is not a product of consciousness is there in itself before consciousness), and
2. a consciousness that this something is an object for consciousness (a consciousness of the consciousness of the object)" [6, 16].

As Niklas Luhmann stated "observations occasion the emergence of the systemic medium consciousness. Self-observation is the introduction of the system/environment distinction within the system, which constitutes itself with the help of that distinction; self-observation is thus the operative factor in autopoiesis, because for elements to be reproduced, it must be guaranteed that they are reproduced as elements of the system and not as anything else." [1, 36-7].

Accordingly, mandatory components of intelligence are:

1) communication with external environment by means of information;
2) feedback in form of self-consciousness.

Present in most successful realizations of Artificial Intelligence based on Artificial Neural Networks (ANN) as systems of elements – "neurons". These connections have numeric weights that can be tuned based on experience, making neural nets adaptive to inputs and capable of learning. ANNs are related to cognitive modeling because in human brain cognition emerges from the activity of neural networks that carry information from one cell assembly or brain region to another. Training a neural network model essentially means selecting one model from the set of allowed models that minimizes the cost criterion. Supervised learning can be considered as learning with a "teacher" (particularly, as a specialized teaching ANN) in the form of a function that provides continuous feedback on the quality of solutions obtained so far.

According to above developed functional scheme of Artificial Intelligence (Figure 2).

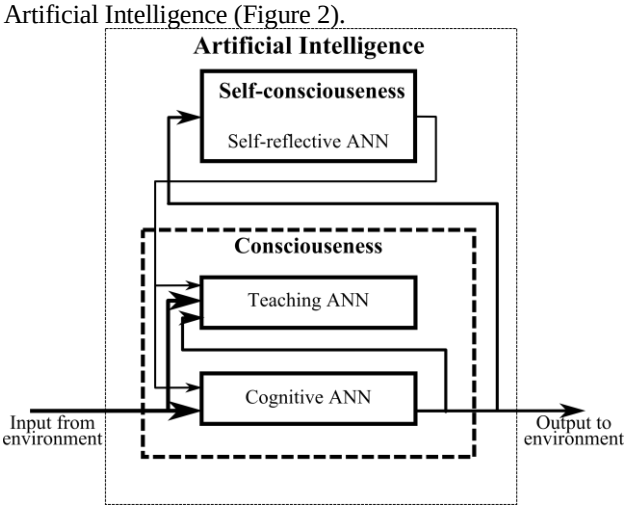

FIGURE 2 Functional scheme of Artificial Intelligence

It is in the basics of forming of strong Artificial Intelligence which has human-like (general) intelligence. This task is not yet solved. But we can use possibilities of applied Artificial Intelligence which perform particular tasks inter alia in management.

4 Artificial intelligence technologies in human resource development

Artificial intelligence technologies enable the prompt analysis (cleaning, investigating and making conclusions) of data by people that do not have special skills in data analysis. By Stefan Sfrohmeier and Franca Piazza, "potential or Artificial Intelligence in Human Resource (HR) Management is explored in six selected scenarios:

– -turnover prediction with artificial neural networks,
– -candidate search with knowledge-based search engines,
– -staff rostering with genetic algorithms,
– -HR sentiment analysis with text mining,
– -resume data acquisition with information extraction,
– -employee self-service with interactive voice response" [7, 149].

The most difficult task in HR Development is to determine the effectiveness of training costs [8] due to its branching and sophisticated feedback caused by improved production results of staff who took part in it. The aim of the HR Development system is to make the knowledge, skills and experience of the staff correspond to the desired indices at different levels: enterprise strategy, branch activity, work duties. The specification of employees who need this train-

ing, its content and duration is the supposition of the effective work of HR Development system [9]. The period during which learning outcomes have an impact on the performance of the company depends on many external factors regarding the company. Considering that the disclosure of financial opportunities for training and implementation of training going on for some time, changes in the financial situation of the enterprise affecting some delay on parameters that characterize training.

5 Finding the dependance between performance of the company and indicators characterizing the personnel training using Artificial Intelligence technologies

As an example of Artificial Intelligence used for HR Management we consider determining the impact of performance of the company (labour costs, labour costs per person, income, profit, profit per person) on indicators characterizing the personnel training, the analysis of this relationship for ALC "Severodonetsk factory of chemical non-standard equipment" (Table 1).

TABLE 1 Financial results, labour costs and share of employees trained in ALC "Severodonetsk factory of chemical non-standard equipment" in 2007-2014

Index	2007	2008	2009	2010	2011	2012	2013	2014
Number of employees	231	274	272	272	273	314	321	286
Labour costs, ths. UAH	4254,0	5849,6	2718,2	5044,5	6078,6	7109,6	6849,8	3640,0
Labour costs per person, ths. UAH per person	18,42	21,35	9,99	18,55	22,27	22,64	21,34	12,73
Income, ths. UAH	25740	49752	46250	47233	76628	70137	96649	98151
Profit, ths. UAH	-959	6022	1823	-6825	5711	7036	10766	14098
Profit per person, ths. UAH per person	-4,15	21,98	6,70	-25,09	20,92	22,41	33,54	49,29
Number of trained employees	49	46	36	25	43	42	21	14
Share of trained employees, %	21,2	16,8	13,2	9,2	15,8	13,4	6,5	5,0

This analysis is performed on the basis of cognitive system IBM Watson Analytics (Figure 2). This is a technology platform that uses natural language processing and machine learning. IBM Watson Analytics is an easy-to-use service for finding answers in data without downloading software. Discovery of visualization and smart solution available on the cloud, it guides data exploration, automated predictive analytics and makes creating dashboards and infographics almost effortless.

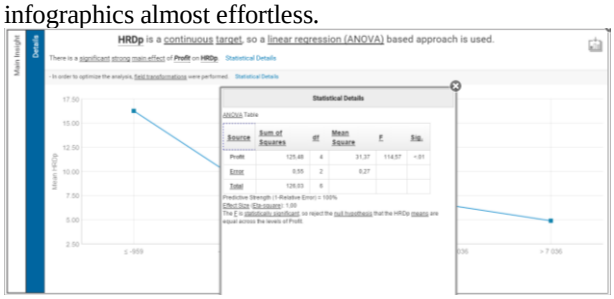

FIGURE 2 Results of IBM Watson Analytics [10] analysis of data set

Found that the main factor influencing the amount of training the company is the net income of the company for the previous year. Considering this analysis could be argued that decisions on financing of HR Development carried out on the basis of income of the enterprise in the past period.

6 Conclusions

Transition from discrete paradigm of information processsing (programming for Turing machines) to continuous paradigm (learning of artificial intelligence) allows faster and more accurate adapting to environmental requirements. In the modern conditions of business, it becomes more relevant to use the artificial intelligence technologies for decision making.

Acknowledgments

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