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Acceleration of Technological Progress and Potential for “Big Data” in Personnel Management

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The article describes the possible prospects of Big Data and technology changing the world we live in. The authors foresee two vectors for development everything connected with Big Data, namely the emergence of a number of computing devices and corresponding power amplification. To illustrate these processes the authors used the term acceleration and Moore's law which says that as a result of technological progress power of computing devices will double every two years. As a consequence, the technology applying Big Data will be included in all spheres of our life, including HR.

Keywords: management, HR, big data, business, technology, computers, human resources, future, progress.

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Research area: sociology.

Introduction

In the modern world the technological progress is more like a snowball that gets bigger over time, gaining its mass, speed and circulation. Thanks to the latest scientific research, we can prepare and continuously update the map of future opportunities that will appear as a result of the mankind development and introduction of modern technologies. Obviously, we should understand that there are a number of technologies which are of no use for humanity to wait for. Our understanding of the world is constantly being turned upside down, and scientists discover facts which challenge already existing theories.

We ought to take into account the technologies that will change our world in the future. The major progress of the last 25-30 years has been based on the increasing power of computing devices, and with the introduction of the World Wide Web, computers and personal devices this trend is evolving more every day. All of these devices generate more and more personal data and, therefore, we can safely assume that the breakthroughs in the field of work with this data will not keep us waiting.

Peter Norvig, an expert on artificial intelligence at Google, first worked at NASA's Jet Propulsion Laboratory, likes to make the

analogy with images. To begin with, he offers to have a look at the rock paintings of horses in the Lascaux Caves in France made in the Paleolithic era (17 thousand years ago). Then he suggests looking at the photo of a horse or, what is better, at the work of Pablo Picasso's brush that is not too different from the rock painting. By the way, when Picasso was showed the images from Lascaux, he said sarcastically: "We have invented nothing since then". He was right, but only partly. Let us go back to the picture of a horse. In the past one had to spend a lot of time to draw a horse, but now it can be captured much faster. This is the change. Although it might seem not so important because the result is the same: the image of a horse. Now imagine how a picture of a horse is made, and then speed it up to 24 shots per second. The quantitative change has developed into a qualitative one in such review. The film is fundamentally different from a still image. That is the same with Big Data: by changing the quantity, we are changing the nature of the situation [8].

According to Mayer-Schoenberger: "Today, in the world 10 billion devices are connected to the Internet, this figure is growing very, very fast, while recently, in the year of 2000, the figure was only 200 million devices. As for predictions, there will be 50 billion devices connected by the year of 2020" [6].

And what opportunities arise through the use of Big Data analysis? Almost all the services on the Internet are based on Big Data. This applies to Internet search. All search systems are based on machine learning using Big Data; they show ten links that you need the most on the basis of the other users' behavior, i.e. when you ask a question, it is likely someone has already asked it and there is an answer already, as the system examines the responses of others to provide you with the correct answer. This reminds strongly of the case law, which is widely used in the United

States as a good means to review cases in various courts.

Let us turn to the translation system, when we translate from one language to another. Twenty years ago, the translation system was a complex linguistic structure, because there was no access to large amounts of data and to already existing arrays of translations, but 10 years ago the whole paradigm of translation changed. Today there are many parallel translated texts on the Internet. Using two parallel texts a machine can learn quickly enough to translate not only words but whole sentences. So, today such systems of translation as Google and Yandex have already had more than 30 pairs of languages to work with.

A good example of using data is traffic jams: we look at GPS Tracks, the machine learns to predict what will be there in the streets in 10 minutes and how the traffic will change. There are many similar examples: fighting spam in e-mail, etc. All these have become possible because the algorithms of machine learning that existed in the 1960-70s met with a huge amount of data, and it is much faster to learn using Big Data [6].

However, for some time the topic of Big Data was not connected with human resource management (hereinafter HR), because the specialists originally focused on local processes: staff development, wages and document management.

The acceleration of technological progress

Certainly we know what acceleration is. We meet it while the vehicle is in motion or an aircraft is taking off. Acceleration in everyday life is something that has a very short duration, within seconds. Perhaps for this reason it is not easy to understand the acceleration that has occurred over recent decades. It is difficult for us to understand its true meaning.

In 1965, Gordon Moore, a co-founder of Intel Corporation, found that the number of transistors on a silicon chip doubles for similar periods of time as a result of ongoing innovation. Moore theorized that in the foreseeable future such a growth rate will be maintained, and in subsequent years, his forecast was justified. Moore's observations were originally associated with the production of microchips, but gradually they evolved into a rule of thumb, which gives us food for thought about how our ability to perceive and process information increases over time. This rule is known as Moore's law, and it can be expressed as follows: "As a result of technological advances, power of computing devices will double every two years" [4, p. 42].

When something is doubling over the same period of time, we say that it is growing exponentially. To understand clearly the meaning of this tremendous acceleration, imagine that you have a cent and every day during the month the amount available is doubled, i.e. on the second day you have two cents, on the third day there are four and so on.

The first graph below (Fig. 1) shows an increase in the amount of cash for the first 15 days. You can see that the process begins very slowly and then goes to the acceleration. On the 15th day we have around 164 dollars that is

impressive, considering that the original capital was only 1 cent!

The next chart (Fig. 2) observes days from 15th to 30th. Here we had to broaden the graph considerably to show very large numbers. There can be seen that in the preceding table the last sum became \$164, but now the amount is so small in relation to the new scale that even its border is not visible. To notice at least a hint on the rise, one need to wait until 22nd day, where the amount is almost \$21,000.

From that moment the amount begins to grow at an accelerated pace. The point of \$1 million is achieved on the 28th day, and at the end, on the 30th the amount exceeds \$5 million. Not bad for a month work. If we are lucky and our experiment falls for the month in which there are 31 days, we would have had approximately \$11 million. Extending the process for another 30 days, we will get the sum of 5,764,607,523,034,235, or almost \$6 quadrillion, which would have surpassed all our expectations without any doubt [4, p 45].

The contrast with our everyday life is certainly striking. Let us take ordinary economic growth or, for example, the long-awaited pay rise. In this case we are really happy to get even a slight percentage increase. Is it possible? Whether or not the processing power of computers grows so fast?

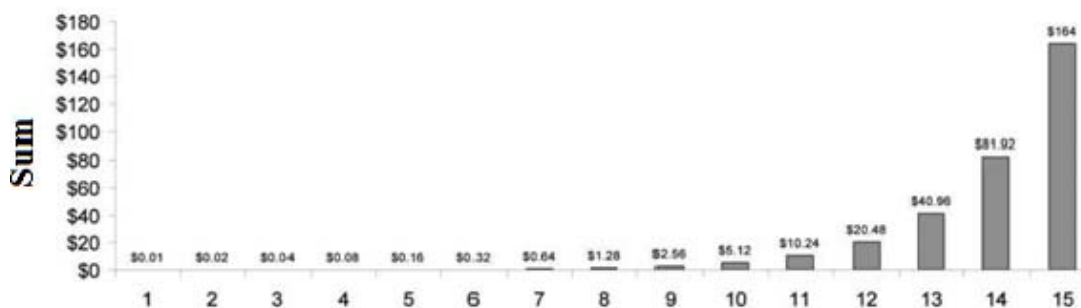


Fig. 1. Doubling cents: days 1-15

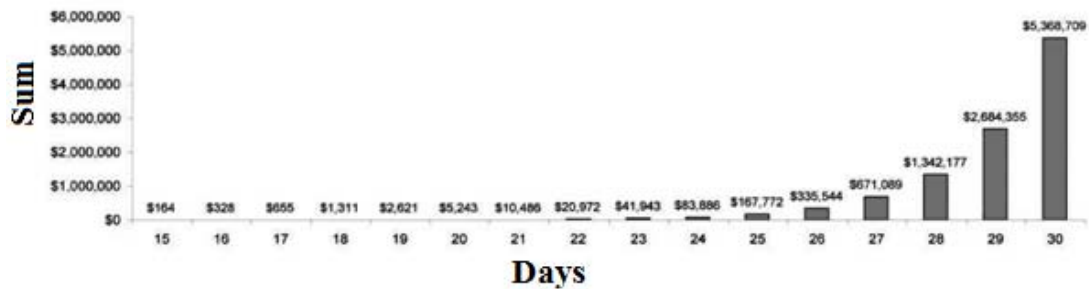


Fig. 2. Doubling cents: days 15-30

The first version of the Macintosh worked with a speed about 1 MIPS. In other words, the ratio of the speeds of the Macintosh PC and the electronic computing Amdahl machine was approximately 7 to 1, that it seemed very impressive. The compact size of the Macintosh PC allowed to place it on the table, while the bulky Amdahl, valued at \$2 million, occupied the whole room.

Now, let us see how things develop after 1985...

- In 1988, the Intel 386DX worked with 8.5 MIPS. This microprocessor was used in the first IBM personal computers to support earlier versions of Microsoft Windows. Thus, desktop computer exceeded the speed of the Amdahl electronic computing machine.

- In 1992, the Intel 486DX worked at about 54 MIPS, nearly eight times the speed of the Amdahl electronic computing machine. PCs based on processor 486 were the first computers, which gave the appropriate platform for Microsoft Windows. Windows 3.1, introduced in 1992, was a huge commercial success for Microsoft.

- By 1999, the Intel Pentium III processor speed was rated more than 1,300 MIPS. Our pianist is now vigorously fingering, making more than a billion keystrokes per second. It is almost 200 times faster than the ancient Amdahl electronic computing machine.

- In 2008, the Intel Core 2 Extreme processor produced up to 59,000 MIPS. This is 59,000,000

piano keystrokes per second, or 8,000 times faster than the rare and fabulously expensive Amdahl electronic computing machine [4].

- In 2013, the processor notebook Intel Core i7 4770K produced up to 125,000 MIPS.

This is 125,000,000 keystrokes per second, and bearing in mind that the weight of the laptop is 2 kg, it is perhaps a thousand times less than was the Amdahl electronic computing machine 470/V8 produced in 1976, which occupied the whole room and probably weighed no less than 2 tons.

As it can be seen, Intel 486DX worked at about 54 MIPS, while Intel core i7 4770K produced up to 125,000 MIPS, so it is 2,000 times more powerful.

Now let us go back to the thesis on the acceleration. There are 2 acceleration vectors:

- 1) Power progress of computing devices (in 1999 the Intel Pentium III processor speed was more than 1,300 MIPS, in 2013 a laptop with Intel core i7 4770K processor was up to 124,850 MIPS.) It is 100 times more powerful.

- 2) Progress of computing devices (in 2000 there were about 200 million units, in 2013 –10 billion devices connected to the network.) It is 50 times more.

Now we can return to our Big Data as it is a consequence of the progress of our two vectors, what in itself is a giant array of data in the network and amount of these data is growing exponentially really, so we need to realize that

the growth potential is truly limitless and any rational calculations cannot be done.

As for the effects of Moore's law, in the journal "Science" there was such an interesting comparison: "If the aviation industry over the past 25 years had evolved as rapidly as the industry of computer facilities, now Boeing 767 would cost \$500 and one could perform Earth flyby in 20 minutes, spending 5 gallons (~ 18.9 l) of fuel. The given figures really reflect the cost reduction, increase of speed and improved efficiency of computers" ["Science", 1983, No. 08, cited by Russian edition of "Scientific American").

Big data in HR

Serious strengthening of the social component of the IBM software was the last August acquisition (\$1.3 bln) of the company Kenexa which is specialized in consulting on "prudent personnel management" and the development of appropriate software tools.

A set of services and software was first introduced at the Moscow Conference; Glenn Dietrich, the Director on the IBM solutions for sound personnel management, described the funds of the Kenexa as an important extension for the "social" IBM portfolio to improve personnel management as regards recruiting, assessing their potential and talent development.

With the help of this software companies can tackle tasks such as the selection of candidates for the new jobs, identifying leaders in the team, providing feedback between employees and management, and many other important tasks of personnel management. According to Mr. Dietrich, these products are already used by representative offices of international companies, but right now the IBM is beginning their active promotion in Russia. He said that in the current year the Corporation thrice investment in the expansion of this trend in the fast-growing countries, including Russia. The work on the

software development is under way, in particular, there is the source Smarter HR Analytics (analysis for decision-making for the human resources department) and then there will be presented the Experience of the New Hire module, which should help new employees entering the company to learn the requirements of the manual and get to know their colleagues faster.

Developers of IBM Kenexa Talent Suite, proposed in the cloud (a virtual data store), according to the SaaS model, see the primary purpose of the product in the simplification and modernization of search and hiring new staff, improving staff productivity and assessing the compatibility of the staff to create effective teams. New solution analyzes large amounts of employee information, including work experience, involvement in social activities, social relations, different skills and personal interests to determine the qualities that may characterize a successful employee in a specific company.

The built model of successful employee serves as the basis for finding the best candidates for jobs, choices for new staff posts in which they will be able to reach their full potential. The solution helps to speed up the adaptation and integration of new employees.

More than that, IBM Kenexa Talent Suite integrates multiple solutions. Talent Acquisition for recruiting helps to determine what is the best variant among all candidates and how to hire and engage them into the work. Talent Optimization analyzes the data for management performance, career planning, as well as determines the wage levels for the employees. Social Networking makes the specific analytical work to combine compatible staff team with high performance.

Thanks to the analytical work, the leaders can better understand trends occurring in the development community, plan a career of each employee and determine the optimal size of remuneration. The human resource is the life force

of the organization. To succeed one requires not only professional, but also social skills to help trigger and foster self-fulfillment of each member of the team, said Craig Hayman, General Manager of IBM cloud computing industry. He added: "Combining social behavioral sciences and analytics in the cloud, we enable businesses to strengthen the most valuable asset – that is staff" [2].

According to IBM researchers, who have interviewed the directors of 342 Human Resource departments from 18 different industries, many companies do not use all of the features of Big Data analysis for staff management. According to the survey, just over half of the organizations use analytics on staff, and a much smaller number use predictive analytics to optimize decisions and get better results in the search and recruitment processes (7%), increase the involvement of employees (9%), the development of human capacities (10%) and retention of workers (13%). The study also found that heads of HR are still in the early stages of forming social relationships in the organization.

It was said in the IBM Russian Office that Kenexa joined the company as a result of the acquisition by IBM, so at the moment specialists are working on the Kenexa integration in the IBM product portfolio. The launch of this product into the Russian market took place during 2014. "We expect considerable interest from potential customers of the Kenexa product. So, nowadays heads of Human Resource departments pay great attention to solutions which help them to take a sensible approach to human resource management. This approach is based on mobile technologies, social interaction and analysis of large amounts of data", says Sergey Reutov, head of IBM Department for Collaboration and Social Business Solutions in Russia and CIS countries [2].

According to IBM, a number of companies use software for personnel management. For example, an American TV channel AMC uses the IBM's technology to analyze data and understand

what is necessary to improve in the organization. The AMC uses the results of the analysis to attract candidates who are more likely to achieve success within the company. "Data analysis helps us to draw a more accurate portrait of a successful employee in our industry. IBM solutions for HR management let use data in new ways, so that one is better informed when making important to the business decisions," said Heather Jacox, AMC Director for Diversification, Recruitment and Development [6].

According to experts, there are not so many aspects that require the actual use of Big Data technologies in the sphere of corporate management staff. There are enough traditional analytics tools for the most part of processes. But Big Data can be useful for analyzing the patterns and types of links in social networks of real or potential employees, in the process of hiring staff or regular verification of loyalty. Model employee profiles made on the basis of the social activity analysis are valuable for building sustainable teams.

The analysis of electronic communications of the staff gives the opportunity not only to identify the existing hackers or abusers of corporate rules and procedures, but also to pick out a group of people potentially prone to these offences.

Technologies around us are constantly developing, and this affects all areas of our lives, such as family life, work, business, and economy. It is increasingly becoming necessary for today's companies to monitor the innovations in the world of technology in order to remain competitive in the market. And we have to understand that technologies like Big Data can occupy a key place in the organization and human resources management, now we are able to spot the first made steps towards this, and as we know a long journey begins with a single step. Big Data can help us in hiring staff, assessing their capacity and developing talents, and taking into account

the fact that only by about 10-13% of the Big (according to the IBM analysts), the number of Data and their processing technology are used directions could increase tenfold in the future.

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Ускорение технологического прогресса и возможности применения «Больших данных» в управлении персоналом

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В данной статье рассмотрены возможные перспективы развития Big Data – как технологии, меняющей мир, в котором мы живем. В статье представлены два вектора развития, которые продвигают все, что связано с огромными массивами данных, вперед, это прогресс мощности и количества вычислительных устройств. Для иллюстрации этих процессов рассмотрен термин ускорения и закон Мура, говорящий о том, что в результате технологического прогресса мощность вычислительных устройств будет удваиваться каждые два года. Как следствие, технологии наподобие Big Data будут входить во все сферы жизни человека, в том числе и HR.

Ключевые слова: менеджмент, HR, большие данные, бизнес, технологии, компьютеры, человеческие ресурсы, будущее, прогресс.

Научная специальность: 22.00.00 – социологические науки.
