Cognitive Technology - Technology Changes from an Enabler to an Adviser

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Abstract— Cognitive computing is an emerging research area. Cognitive technologies are products of the field of artificial intelligence. Cognitive technology refers to the ability of a machine to facilitate interactions with humans, by utilizing structured or unstructured data. It also refers to the process involving the application of self learning and machine learning models for prediction. Unlike traditional artificial intelligent systems, Cognitive systems can understand reason and learn. Cognitive computation has lead to the new world of innovation. This paper provides survey report on how Cognitive technology is used as a tool for business model transformation. How the business challenges are met by the business leaders by adapting to the cognitive technology. What enhancements are obtained from the past to the present. In this paper we also provide a number of real time examples that already has adapted cognitive technology and how they improved their performance and revenue. We also provide the research areas where the cognitive technology is used. We also provide some of the cognitive technology development plat forms used in the industry. The discussion leads us to conclude how the cognitive technology has changed the world from an enabler to an adviser.

Index Terms— Cognitive technology, Cognitive computation

I.INTRODUCTION

The amalgamation of human intelligence and computing powers has led to a new brand technology innovation called the cognitive technology. It is creating wonders for several industrial organizations across the world. The term cognitive technology refers to the ability of machine (particularly computers) to facilitate interactions with the humans by utilizing structured or unstructured data. The process also involves the application of self learning or machine learning models for prediction.

The definition of cognitive technology can be divided in three parts.

    a.   Interaction with the humans
    b.   Utilizing structured and unstructured data
    c.   Self learning and machine learning

Connecting the Cognitive technology with the Internet of things gives us the future of Cognitive technology. We have three kinds of relationships or interactions that exist in the world based on the definition of Cognitive technology:

- Interaction between person and person(Going on from the past)
- Interaction between the person and device(happening at the present)
- Interaction between the device and device(Big thing going to happen in the future)

II. HISTORY

Since the discovery and emergence of computers, they have been operated by the programmers and they lack thinking capacities. That is where human mind surpasses computing technologies. But by the invention of the cognitive technology has narrated a different story.

Computers may not have the cognitive abilities, but they are capable of executing operations which completely rely on human perceptions.

It is possible to utilize the power of automation in handwritten recognition, face identification and behavior pattern determination to any task requiring cognitive skills; computers are capable of providing the right solutions.

Cognitive technology is an outcome of Artificial Intelligence. Artificial Intelligence is defined as the theory and development of computer systems able to perform tasks that normally requires human intelligence. AI is not a new idea. It has begun in 1950s and proved in 1970s. In 1980s increased by Expert systems but in 1990s AI continues with lower profile.

By the late 2000s, a number of factors, particularly a few key technologies helped renew progress in AI. They are Moore's Law, Big data, new algorithms, the Internet and the Cloud.

Artificial intelligence still sounds more like science fiction than it does an IT investment, but it is increasingly real and critical to the success of the Internet of things. In the last several years, interest in artificial intelligence has surged. AI related products and technologies have exceeded.

Some of the most important cognitive technologies –those that are seeing wide adoption, making rapid progress, or receiving significant investment are machine learning, Image processing, Natural language processing, Speech recognition and Robotics.

III. REQUIREMENTS OF COGNITIVE SYSTEMS

Cognitive computing systems redefine the nature of the relationship between human beings and their increasingly pervasive digital environment. The

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boundaries of the processes and domains these systems will affect are still elastic and emergent. Their output may be prescriptive, suggestive, instructive or simply entertaining. In order to achieve this new level of computing, cognitive systems must be:

- Adaptive
- Interactive
- Iterative and Stateful
- Contextual

Cognitive systems differ from current computing applications. Cognitive computing systems make context computable. Cognitive systems can perform hypothesis, make considered arguments and prioritize recommendations to help business leaders make better decisions. In addition these systems can understand and communicate with users through natural language, in getting data and accumulating insight as they proceed.

IV. NEXT GENERATION OF HUMAN COGNITION

Cognitive technologies are delivering measurable value to enterprises across multiple industries. Now is the time to engage these technologies and to frame how best an organization will capture the value these technologies are creating. The cognitive technology empowers the IT infrastructure of an enterprise. As a result the business organizations are better equipped to make cost cut-downs by ensuring increased productivity and enhanced operational speed.

We must continue to shape the effect of cognitive computing on work and employment. Cognitive computing will change the nature of work done by people. It will help us to perform some tasks faster and more accurately. It will make many processes cheaper and more efficient. It will also do some things better than human beings. Given the exponential growth in knowledge, discovery and opportunity opened up by a cognitive era, there is every reason to believe that the work of humans will become ever-more interesting, challenging and valuable.

Cognitive systems are tools to deepen the relationship between humans and the world. In doing so we will pave the way for the next generation of human cognition, in which we think and reason in new and powerful ways. It is true that cognitive systems are machines that are inspired by the human brain. But it is also true that these machines will inspire the human brain, increase our capacity for reason and rewrite the ways in which we learn.

In the 21st century, someone's intelligence is not justified by knowing all the answers rather by the ability to ask better questions will be the mark of true genius.

V.IMPORTANCE OF COGNITIVE TECHNOLOGY

Cognitive technology successfully met the demands of various sectors. Business Analysts and thought leaders classify cognitive technology applications into three broad categories, namely process, product, and insight.

In process cognitive, process applications aim to integrate themselves into the organizational workflow. In this Cognitive technologies get embedded within existing business operations, thus automating or improving operations. Product cognitive refers to the integration of the technology into specific product or service, thus ensuring unparallel end benefits for customers. Cognitive technology also finds application in the identification, assessment and evaluation of these technologies in strategic and decisive business moves.

Technical innovations prepared the grounds for rapid innovation. Cognitive technology adds much power to the IT infrastructure of an enterprise. As a result, business organizations are better equipped with increased performance and decreased cost.

The significance, use and implementation of Cognitive technology by two organizations, namely IBM and Netflix can be illustrative examples for implying its importance.

Netflix is a movie rental service for movies and TV series online. Machine learning is used to understand what kind of content a user would like based upon his\her past experiences. Accordingly more content could be predicted and is suggested to users. This movie rental service on the virtual platform features a recommendation option that utilizes machine learning to predict customer preference. Since there is a sync between what user is expecting and what is being suggested , the users end up watching the recommended or suggested content. Netflix's 75% of the usage was only because of this.

IBM Healthcare is another brilliant example for Cognitive technology. The idea was to about reduce the number of readmissions in the hospital for chronic disorders. Started with COPD , IBM Healthcare made a predictive model for the risk readmissions so that intervention could be done at the right time. The accuracy of prediction is 85% and the readmissions are reduced significantly.

These two examples are only glimpse of what cognitive technology can do in the world.

VI COGNITIVE TECHNOLOGIES IN BUSINESS

The business and public sector leaders should focus their attention on cognitive technology. Some of the Cognitive technologies are widely adopted, making rapid progress, or receiving significant investments. The impact of cognitive technologies on business has grown significantly during the last seven years. Many companies are working to tailor and package cognitive technologies for a range of sectors and business functions, making them easier to buy and easier to deploy.

The most striking finding is that technology companies create new business units to increase volume and generate revenue by using cognitive technologies not only for product innovation but also for structural, operations, process, and business model innovation as well. These new units are also designed to transform the architecture of the parent company over time. Such restructuring underlines cognitive technologies potential

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to completely revolutionize the technology sector and take many vertical industries and markets along.

The importance of cognitive technologies in business has grown significantly. This is due to two important factors.

i. The performance of cognitive technologies has improved substantially, and there is a continued research and development efforts to extend this process.

ii. Billions of dollars have been invested by the technology organizations to commercialize cognitive technologies

VII APPLICATIONS OF COGNITIVE TECHNOLOGY

Cognitive technologies are already used widely. Organizations are already using cognitive technologies in different business functions in various economy sectors. Some of the applications are mentioned here

- In Banking, automated fraud detection systems us machine learning to identify behavior patterns that could indicate fraudulent payment activity, speech recognition technology to automate customer service telephone interactions, and voice recognition technology to verify the identity of callers.
- In Heath care, automatic speech recognition for transcribing notes dictated by the physicians. Computer vision systems automate the analysis of mammograms and other medical images.
- In Media and Entertainment, a number of companies are using data analytics and natural language generation technology to automatically draft articles and other narrative material about data focused topics such as corporate earnings or sports , game summaries
- In Public sector, cognitive technologies are adopted for a variety of purposes including surveillance, compliance , automation and fraud detection.
- Oil and gas producers use machine learning in wide range of applications, from locating mineral deposits to diagnosing mechanical problems with drilling equipment.
- Retailers use machine learning to automatically discover attractive cross sell offers and effective promotions.
- Technology companies are using cognitive technologies such as computer vision and machine learning to enhance products or create entirely new product categories.

The application of cognitive technologies shows that the potential business benefits of cognitive technologies are much broader than cost savings that may be implied by the automation. They include:

- Faster actions and decisions
- Better outcomes and Greater efficiency
- Lower costs and Greater Scale
- Product and service innovation

VIII INVESTMENTS IN COMMERCIALIZATION

Since the invention of cognitive technologies through till date, over $10 billon dollars in venture capital funds have flowed to companies building products and services on these technologies. During this same period, over 100 companies were acquired, some by technology giants such as Amazon, Apple, IBM, Face book, and Google. All of this investment has nurtured a diverse landscape of companies that are commercializing cognitive technologies. The following list gives a few of cognitive technology vendor categories:

- Data management and analytical tools that employ cognitive technologies such as natural language processing and machine learning. These tools use natural language processing technology to help extract insights from unstructured text or machine learning to help analysts uncover insights from large data sets. Eg. Context Relevant, Sky tree and Palantir Technologies
- Cognitive technology components can be embedded into applications or business processes to add features or improve effectiveness. Eg. Wise IO, Nuance
- Point Solutions provides a sign of maturation of cognitive technologies. Example application areas include advertising, marketing and sales automation, and forecasting and planning.
- Platforms are intended to provide a foundation for building highly customized business solutions. Examples include IBM Watson, ALPHABET INC.(GOOGLE)

IX CONCLUSION

The cognitive technology has lead to a new era of innovations. The human computer interactions enable men and computers to cooperate in making decisions and controlling complex situations without inflexible dependence on predetermined programs. The use of cognitive technology is not only to enable to do things with higher performance and reduced cost but is also to advise how to behave in complicated situations. Thus the new era lead by cognitive technologies not only leads to new innovations but also illustrates the concept technology changes from an enabler to an adviser.

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