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A NEW PARADIGM IN TEACHING & LEARNING BASED ON BIG DATA AND COGNITIVE COMPUTING SYSTEMS

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ABSTRACT

Development in technologies and new research in multiple disciplines lead to ever-changing world. Same is the case with information technology and education system. Previous developments in ICT have made the universities smart due to enhancements in digital communications and advanced learning techniques with multi-media and internet. But, now the time comes for knowledge technology. This technology can completely change the ways of teaching and learning. This paper discusses how cognitive computing in combination big data can provide a new paradigm called smarter university model. First, smart university model is discussed and analysed. Based on this analysis and big data exploitation as well as cognitive computing with IOT, a new paradigm in education is proposed. This paradigm also fulfils the needs of industry and labour market. So, it demands a major blend in curriculums of their courses in different disciplines and also new multi skilled persons with new designations in industry.

KEYWORDS: Knowledge technology, Internet of Things (IOT), Cognitive Computing, Data Scientists.

INTRODUCTION

Today, it is the era of communication and information driven eco system. Advancements in electronics result high power of microprocessors, more sophisticated memories at low costs and compelling miniaturization for multiple devices. New infrastructures including virtualization for data storage and computing are at the edge by this time in terms of cloud computing and IOT. Advancements in communication systems can well accomplish the needs of big data i.e. a high volume data springs can be transferred at dramatically high speed with reasonable charges. First machine era is over and world is living in second machine era by now [1]. Nowadays, machines are not human driven but these machines are laced with high quality and powerful sensors. These machines are not only guiding the humans but derive the whole world in such a way that humans are addicted to them. Things are replaced with new ideas, matter with minds, atoms with bits and transactions with interactions. Logic driven period has been passed away and big data analytics demands for sophisticated data driven technology. Artificial intelligence, knowledge engineering and expert systems with fuzzy logic introduce "*skill biased technical change*" [2]. So, a need arises for multiple skilled biased persons in industry which are not only engineers but data scientists also.

Due to the above need, universities curriculum should be organised in two dimensions, first dimension should be domain dependent which describe degrees in various disciplines while second dimension explore the curriculum to enhance the students capabilities in other domains e.g. project management, communication, organizational culture, critical thinking, teamwork, networks, etc. So, this paper proposes a paradigm in which universities curriculum should be L-based Structure where vertical stem of L represents student's skill enhancement in broad areas other than its own discipline whereas arm of L represents skill and deep knowledge in its own field as shown in Fig-1. This paradigm is further take advantage of recently used technologies and innovations to give a new shape to teaching-learning process and hence make universities smarter [3].

AN L STRUCTURE PARADIGM
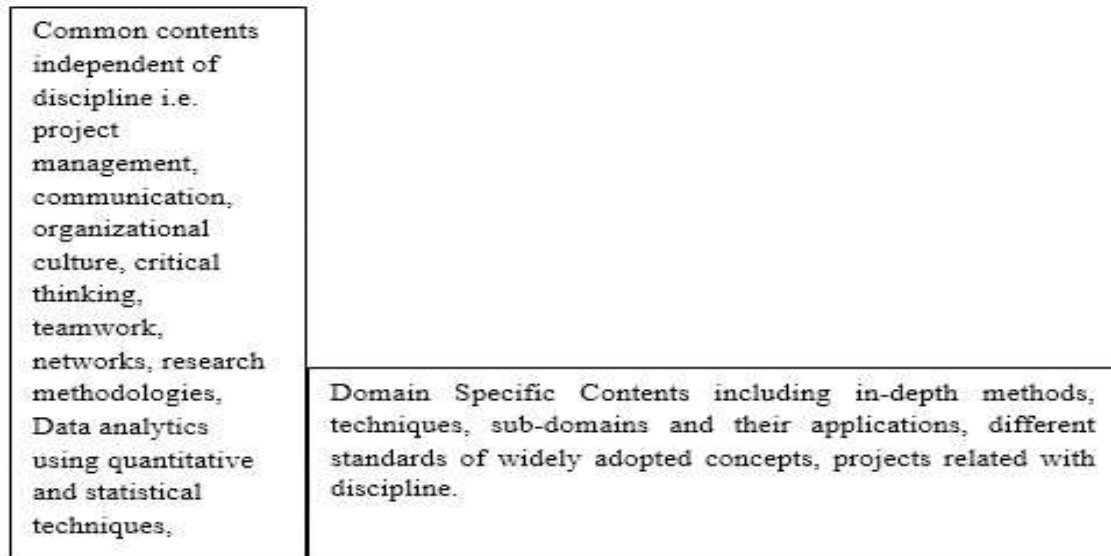
Fig. 1 L-based Curriculum

The L-based curriculum for smarter university model is shown in fig. 1. To decide the curriculum a systematic process is required which is explained as below:

- The first step involves recruiting or appointing the sufficient faculty for deciding the curricula of a particular discipline.
- The next step involves the selection of chairperson which leads or directs the whole process.
- It involves recognition of demand of persons with which type of skills in communities and organizations for the discipline. Then, an in-depth analysis is performed. The result of analysis gives strategic vision which can be translated into clear, ambitious and realistic objectives.
- Then, different opinions are collected from all members. The opinions are organized and structured.
- The structured opinions are translated into specifications and constraints for particular course in discipline.
- These specifications and constraints further analyse to result out the final goals and their key performance indicators i.e. Gi's and their KPi's.
- Priorities are set for above mentioned goals which are then ordered according to their measure of urgency.
- These goals along with priorities decide common contents, knowledge and skills that an individual must have in various disciplines and decide the stem of L.
- Now, the base of L is decided i.e. first of all various courses in the discipline are recognized and after that their domain specific contents are decided by taken into account the common contents also.
- Then, competencies are described i.e. to develop the required personnel which teaching skills should be needed.
- This is the most difficult step as in this step curriculum is matched with the needs of industry and required teaching capabilities with the teachers available. It can happen the required skilled teachers are not available at that time.
- So, final part comes for monitoring and analyzing the implementation of process in various disciplines. Specific disciplines can acquire the structure of the process according to their need. During monitoring specific simulation and data collection tools can be used whereas analysis require forecasting and analytic tools. Finally, adjustments can be made into the process according to the results of analysis.

NEW PARADIGM WITH NEW INNOVATIONS
To implement L structure curriculum, analysis of needs of organizations and different teaching skills are needed as shown in fig 2.
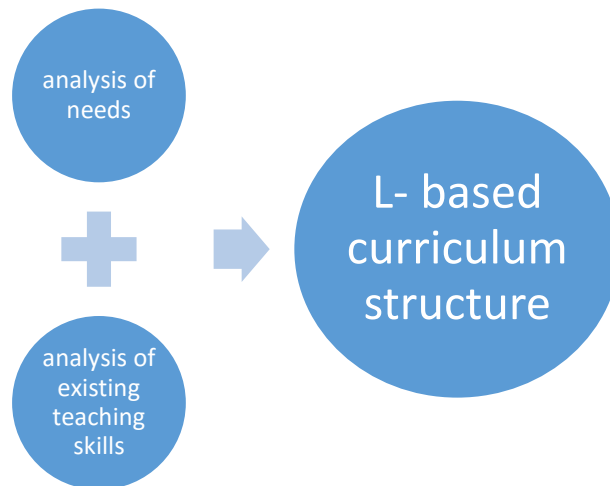
Fig 2 Requirements for L –structure

There are certain new issues that have very significant role in this new paradigm as it provides new tools, new methods and techniques to enhance teaching-learning aids.

- The big open data is available at everywhere in world which makes the world a small data ecosystem. So, students can collect data from anywhere which is coming from software and sensors. Also, a large variety of tools are available to manage this data and variety of algorithms is available to process it.
- Implementation of cognitive computing principles diffused the different systems at wide aspect. Machines can interact with humans in an innovative way which makes new innovations in decision strategies in wide range of applications.
- Cloud based computing provides the endless infrastructure and anyone need not to worry about machines, platforms and services.
- As data is used from social sites so the need arises for solution of security and privacy issues which are described in [4] [5].
- Satellite communications can provide the material and videos to the students of rural areas in developing countries. So, students can avail any type of education that they deserve [6].
- ICT infrastructures [7], Wi-Fi, IOT [8] [9] and cloud technologies make the students not only digital but smarter also as they can reach high-frequency strategic areas such as laboratories, libraries, seminars and on-line conferences.

As shown in fig 3 this new paradigm due to these innovations will give birth to smarter university.
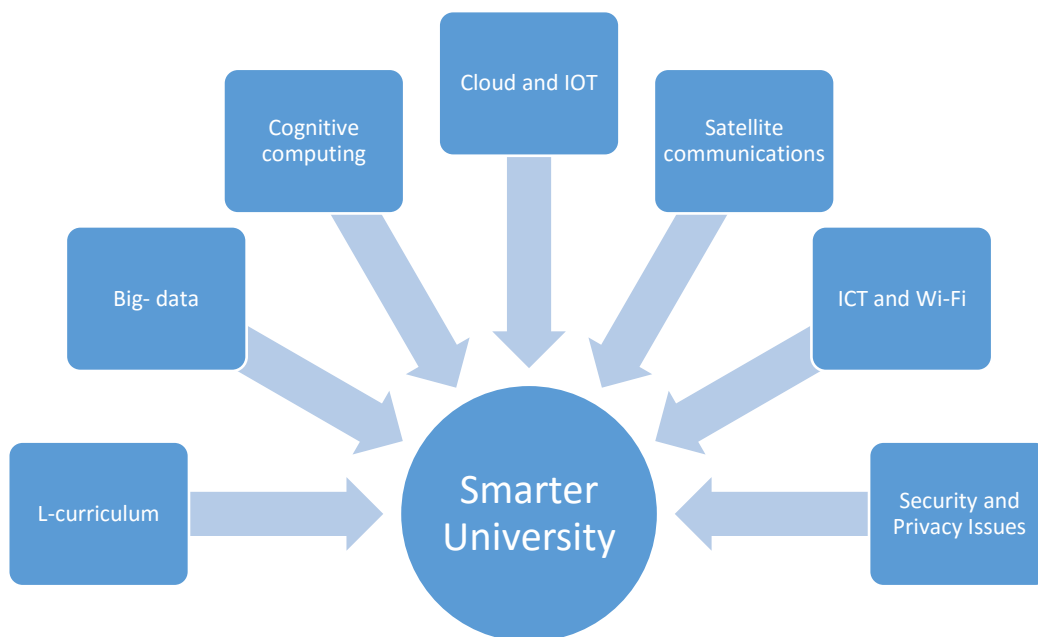

Fig 3 A new paradigm in Teaching-Learning

VARIATIONS IN UNIVERSITY ENVIRONMENT

This model results in numerous changes in universities culture:

- Information Technology has been enhanced and become Knowledge Technology.
- To compete with the demand pace of industry, Professors are no longer Knowledge generators through research but they become Generators of Knowledge generators i.e. Knowledge managers who with the help of cognitive systems will generate the knowledge via involvement of third parties.
- Syllabi should be multidisciplinary oriented so that students can attain multi-skills to serve the industry needs.
- Due to availability of open and big data, the need of new professionals which are designated as data scientists arises. They can develop data department where data analysts, knowledge engineers, knowledge managers work together to control big data giant.
- Need of new cognitive systems which can extract the knowledge from big data via the algorithms developed by data scientists.

So, university has to provide multi-disciplinary, multi-domain, multi-empathic, multi-channel oriented students. These students do not only skilled data hacker, analyst, communicator but they must be trusted advisor in a realistic need. University has not only introduce new skills but some professional skills have to be reshaped, communication, teamwork, problem solving, creativity are few among them.

CONCLUSION

This paper has described the current scenario of the world in the field of information technology. Data is generated at very fast pace and in big volume everywhere. To compete it, there is a need of data scientists, data analysts, knowledge engineers who extract knowledge from this big data. Based on this situation, universities have to change their curricula. This paper first of all has presented this L-based curriculum, then further suggested a process for deciding this curricula and at the end it has been discussed how universities have to be shifted towards a new paradigm due to this knowledge technology era. In future, universities have to make new data scientists to cope with big data.

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