Applying Lean for Effective Implementation and Governance of Education in Future Cities

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Abstract: ***Innovations in Science and Technology has led to drastic changes in the methods, means and people involved in education. Right from the place where education was sought to the people who used to give education, technology has changed everything. The scenario is further changing and this change has brought the need to change the education system. This paper tries to cope the needs of education system which would be the need of future cities by using lean as a tool for quality management and making a sustainable education system for the future.***

Keywords: Lean Education, Future cities, Education

I. INTRODUCTION

The time has come for those born in this millennium to enroll in universities and it is necessary to rethink and redefine the way education system should be changed. The curriculum and the system followed by the institutes are being reconstructed to various questions to alter the educational system. The older system focused on what is taught rather than to whom it was taught, or the method of teaching and this system is getting outdated. Due to the rise of the technological advancement, the learning style is being altered by the students to internet based learning since the last decade. This has created problems since the educational institutes haven't kept up with the changing technology.

If the educational institute does not change with the demands, this will lead to the following wastages:

• The institute will not be able to give a world class education.
• The educators cannot contain the students in the current curriculum.
• The educator will not be able to deliver the necessary learning objectives.
• The objective cannot be achieved as desired.

On the other hand, not much time will be taken where every city will be termed 'smart city' and have a futuristic impact on education. The term 'Smart Cities' has started being used commonly worldwide and it basically suggests that a smart city makes use of the various digital and smart technologies to improve achievement, performance, fulfillment and well being, to decrease budgets and reserve consumption, and to get involved efficiently and energetically with its inhabitants. Even though this may be correct to some extent, it has convinced me to discover more. I toss around smart city know-hows to embody various types of things which outlines this fact as, "city is made conscious by the technology engraved in it". This gives the capability to know locations of different individuals, their needs and requirements, and how a flawless experience can be implemented for that inhabitant.

Impelling most of this is location based technologies which range from WiFi, RFID, GPS and Bluetooth to a few other advanced substitutes.

I will mention here the most frequently used example that can make us easily understand the positive impact of smart city technology in education. Example: It's University's first day when the new student, John, reaches the vast campus, it's his main stint away from home, and he's busy with mixed feelings a bit excited, perplexed, maybe lost as well. Well, maybe using the University app on his smartphone can help, it shows him exactly where his campus location is, along with instructions to get to the induction room, how long it takes and how far he needs to walk. As he has logged in to use his profile, the app also shows John the schedule for the entire day and suggests stopping over the University cafeteria for a social lunch with the other students as the induction program has yet to start.

Once the induction is complete, the app will notify you of a suggestion that a freshers meet in the common hall where they can introduce themselves to others, and in turn the app will also show you the amount of time taken and the distance covered to reach it on foot. The automatic attendance system marks him present for the period as soon as John arrives at the teaching space, which updates his daily attendance and sums it up. The app will notify the lecture schedule, the staff details that will deliver the lecture, and additional links that will be synchronized with your computer as soon as it becomes comfortable with the smart environment. From the perception of teaching, Prof. Mehta is a skilled teacher in computer and academic behaviour. He has devoted much of his time to gathering data to understand the number of students present during his teaching, the numbers remaining throughout the day, and how they use the digital platform to interact that is offered to the students as a resource.

Prof. Metha gives a sequence of responsibilities to make the lectures more understanding and interactive, requiring students to manage different campus locations where they can decipher specific content that will benefit them with the next phase of the assignment. Students also receive certificates which make completing the assignments even more fascinating.

All these data are fed into a research report that enables Prof. Metha to understand student outcomes effectively, improve his references and future lectures, and encourage student participation. The next day, while on campus, John picks up his phone to search for his practical mechanics room, when he gets notified on the app that the book "Operating Systems" is due to be returned by 14:00.

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He also gets notified within the chat of his' Mechanics Practical' group that he needs to pick up a book from the library, so he accesses the book section within the app and gets to the book the detailed directions in the library. John scans the book with his phone and the expected return date will be automatically added to his account before returning to his practical room for mechanics.

In education, smart city technologies have already begun to create the future, but it is seldom allocated, meaning that the above-mentioned scenarios and technologies exist and are achievable, but are still to become an intrinsic part of many campuses. As per one of a researcher's handled projects, it was observed that respected technical colleges are facing student attrition challenge. Students initially register, but then drop out in the semester's first few weeks. This leads to a loss of income for a college that is hundreds of thousands of student attrition per year, and this within well run and managed colleges. Getting onboard and inducing is as important in any institution as it is in businesses. In both sectors, attrition prevails.

Smart City technologies can play a major role in making a difference, and help in solving these problems, as well as enhance user engagement in education. Also, lean is a tool which can increase the quality and reduce the educational waste and hence the various techniques can be studied to improve the educational system.

This paper further aims to study lean as a tool for improving educational value, reducing waste and reviewing the need of education in future cities.

II. LEAN BASED EDUCATION

Initially adopted for the manufacturing industry, the concept was known worldwide as ‘lean production’. In later years, experts and researchers recognized the important values of these concepts associated with lean production and tried to implement it in other sectors like service industry, health care, education. Thus application of these concepts was called ‘lean thinking’ based on the strong impact it had in the betterment on the applied sectors. [1]

Lean thinking basically revolves around the thought of, how value can be added to the applied industry to extract positives from it with minimal or negligible negatives? The lean principles have proven to be cost effective with constant improvement of the processes whenever required. After its successful implementation in the manufacturing industry, the associated lean thinking concepts prove relatively applicable to education as well by making reasonable changes and eliminating unrelatable steps within these processes. In comparison with the manufacturing organizations even educational institutions our facing challenges related to higher competition, affordable pricing and delivering quality service to all the requested demands. The requirement of new steps and techniques is of utmost importance in order to find efficient and proactive resolutions to the different challenges faced. [2]

By teaching Lean principles to engineering students will help them to be more proficient and perform well in their respective professions. This is one of the main reasons why Lean Education should be included in the engineers modules. The lack of this proficiency will have a significant impact on job interviews and further employment career. Engineering based organizations have also highlighted the hardships endured by engineers during the initial phase of their career, in various research published by them. These hardships are primarily the results of the unnoticed gaps in the current professional practice which includes struggle with certain technical content areas like risk management, but mostly with competent areas, like systems shrewdness. Lean Education can be considered as an approach to blend content as well as competency into engineering disciplines.[3]

Prior studies and different works presented by researchers notify that increased burden on finances for higher education will ultimately need a change such as to challenge the traditional teaching practices and increase the online courses that can imply the factors and purpose accommodated in the learning systems. Various technological platforms can be utilized as a medium to deliver knowledge by reducing the cost on the facility and multiple instructors required for that matter. Thus teaching processes can be given an improvisation with the help of Lean concepts and methods in accordance with the budgeted technology required by the instructors as per the learning management systems.

III. EDUCATION AND THE FUTURE CITIES

One of the Uttarakhand-related case studies had shown clear signs that science and technology not only play a vital role in producing and verifying knowledge, but also in limiting and exercising their knowledge for educational content and infrastructure. But ensuring sustainability and implementing the outcomes from the existing setup to surrounding districts and states would be a step forward towards enhanced and efficient linkages between the governance of education and science and technology. It stated that curriculum and textbooks needed a periodical check and update based on the latest study from the science. Thus, the next action that needs to be taken is that Science & Technology is seriously analyzing whether the sources of knowledge from tie-ups such as textbook and teaching materials are efficient and appropriate, and regularly improving them. Those improved products should then be transferred by direct researchers intervention to different institutions in other districts and states. Here intervention refers to researchers leaving their laboratory and conducting the training, seminars, conferences, and so on in coordination with the government, so that the transfer is not only the product but also its scientific understanding.[4]

Another review indicated that most of the results of the study were consistently related to the lower level of effectiveness of simulation, such as satisfaction, and/or gaining skills and knowledge. What was also evident is that, despite being difficult to design and regulate, there has been an increase in studies characterized as translational science showing results with definite changes in clinical behaviors and improved patient outcomes. Therefore, further research on clinical behaviors and patient outcomes is needed to capitalize on this fact. Such studies should use various methods of simulation and be part of a thematic, sustained and advancing research. [5]

As mentioned in one of the research papers, urbanization has given rise to major societal challenges in the present world, but on the other hand it has also created a market for smart city technologies. The Internet of Things plays a key role in shaping the future of smart cities as a networking paradigm among various enabling technologies. Smart cities and Internet of Things are balanced to create new standards in urban living, improving the safety, livability, and comfort of citizens, and enabling more efficient and smart city services and administrations. Extensive studies have been conducted to explore the' Internet of Things ' exceptional features in the fields of technology and application. The technology domain literature focused on introducing the Internet of Things-enabled technologies, protocols, challenges and benefits. The application domain projects were carried out on various aspects of urban operation such as cyberville, digital city, electronic city, flexicity, information city, and wired city. As it related to the sustainable development of smart cities, it also surveyed the state-of - the-art Internet of Things research. A case study was also presented in order to understand the development challenges of the monitoring systems based on the Internet of Things and based on the analysis of publications, much research was still needed to focus on the Internet of Things related challenges such as privacy, participatory sensing, energy efficiency, visualization, cloud computing and edge computing.

This requires ongoing and effective collaboration among public authorities, private firms and academics. It also clearly mentions that to support the Internet of Things, more focus should also be placed on developing smart city infrastructures. It is therefore very important to consider the social impacts on citizens and communities of the Internet of Things - based Technologies as part of planning, design and execution.[6]

A comprehensive overview of the field of smart (and) sustainable cities with respect to its fundamental foundations and assumptions, research and development, research circumstances and horizons, emerging science and technology trends, and future planning practices was provided in one research paper. This work resulted in the exploration of a broad and comprehensive literature perspective from and involving various disciplinary areas. Thus, he recognized it as a medium for facilitating collaborative understanding between and among different academic disciplines of urban planning and design, feasible development, sustainable science, and ICT for the main purpose of creating interactional knowledge that is essential for a more unified understanding of the subject of smart sustainable cities.[7]

It has shown, according to a scientific literature published in a paper, that becoming a future or a smart city is certain to maintain a strong position on the global market. Infrastructure forms the basis for conventional city functioning in both present and future cities and plays a vital role in shaping future city characteristics. Although, the scientific literature lacked researches on future city infrastructure specifics which are crucial analysing the change from present city to future. Research conducted concluded that the future or smart city embraces well-developed and excellent infrastructure that forms the core features of the future or smart city: international accessibility, economic stamina, innovation, safety, healthy environment and citizens, responsible society. Authors also demonstrated that the future or smart city is not only based on the growth of infrastructure, but also on the efficiency that can only be achieved by installing the latest technologies and implementing strategic management. The future or smart city phenomenon requires timely maintenance of urban infrastructure to meet the changing needs of citizens and businesses.[8]

Exploration of methodical writings revealed that in order to maintain a position in international arcade, becoming a future city is inevitable. Infrastructure is the basis for city functioning in both modern and future city systems and plays an essential role in the creation of future city features. Logical writing needs examine the specifics of the future city framework that are noteworthy in breaking down the shift from present to future city. Performed inquiry about presumed future city typifies highly created and quality framework that shapes future city's primary attributes: global availability, monetary imperative, creativity, well-being, engaging quality, sound condition and residents, capable society. Creators have also shown that the future city is no longer built in terms of foundation development yet on its viability, which can only be achieved by introducing the most up-to-date data innovations and executing key management. Future city specifics require convenient city foundation support with the ultimate goal to fit changing residents and business part needs. Adaptable and manageable urban improvement processes will ensure feasible financial issues, high living conditions and quality engagement for future urban communities. [9]

In the survey, creator had linked both inductive and deductive examination methods to feature the primary directions of research and subjects in the GCE grant in connection with the expert improvement programs of pre-benefit educators and in-benefit instructors. Their goals were double. First, they set out to distinguish the most basic points in the grant and to feature changes in the connections between these subjects after a while, using NLP and nearby system perception procedures, an integral subjective substance investigation tended to more nuanced parts of the writing. Second, we looked at the articles that most specifically coordinated our survey center (GCE and educator preparation) with existing typologies from these fields to inspect the degree to which these typologies were useful and identified holes that could exist between the hypothetical and experimental writing collections. In reality, these discoveries cannot be said to delineate how GCE is verbalized and used in the preparation of instructors, on the grounds that our examination is auxiliary; therefore, we can only reach determinations as to how the grant on these matters has progressed after some time and ponder the condition of the exploration's flow. [10]

IV. DESIGNING A SUSTAINABLE FUTURE

Education will certainly simplify in the coming years and LEAN will play a major role in making it efficiently sustainable. With ongoing competition on the market where end-users have multiple choices, only the one who collaborates with a balanced expense on technological advances in their annual curriculum will attract more students and their interest. Learning ease and easy education can be achieved with the principles based on LEAN where future cities are still a wonder to be built and discovered. It is truly evident that while being implemented in higher educational institutions, Lean education has a significant impact. If Learn Principles are adopted by industries and Lean Education in a higher education forum as a strategic procedure, then industries and instructors will be regulated for the same purpose as the Lean Concepts. Thus the industries in return will benefit by getting more planned and groomed people to take over a system-based thinking and a mindset of entrepreneurship while the higher educational institutions will benefit from the improvement of the material of the course and the overall quality of the learning experience.

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