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# Designing And Implementation Of Technology In Higher Education

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**Abstract**— The present study focuses on technology integration with higher education in a modern way. It is observed that today technology has evolved a lot, and this adaption is also present in the education system. However, the utilization of technology in education systems has to be appropriately integrated to be higher. Using various vital models and other techniques will help in identifying the right approach and workflow. It provides evident depreciation of technical facts and other given specifications. This study addresses the importance of technology integration for higher education and presents the process's key challenges. The method is proposed based on the guideline principles, integrating cutting-edge digital technology with systems education. Identifying various key blocks will help address the issue more relative to the learning concept and make changes accordingly. Results generated from high schools with methodology integration and with another model are compared with the proposed model. It is observed that even though teacher's or coordinator efforts are increased a little bit, but the throughput of proposed integration is more. Teacher's problems using information technology (IT) include the associated scarcity of equipment, the lack of time to prepare teaching materials, and IT-integrated teaching subjects' incompatibility.

**Keywords:** Assessment, E-Learning, Higher Education, ICT, Technology Integration

## I. INTRODUCTION

Higher education instructors must tend to incorporate technology consistently into their core curriculum. It will help in conception, development, and critical thinking. With the expansion in foundation and innovation by schools across the nations, technology utilization in the education system is growing. It will be challenging to re-design this model. Hence, the higher education system must guarantee guidance around the dynamic utilization of technology. In the 21st century, learning technologies inside different types of learning environments have become increasingly prevalent. Under dispersed conditions, face-to-face or mixed, higher education institutions gradually turn to these technologies to resource and sustain

their teaching and learning environments [26]. A great deal is expected from teachers in every culture. To help students achieve their academic potential, they must also adapt adequately and proactively to the world's current changes and adjust their teaching methods and resources. Teachers are continually trying to find ways to meet the new generation of students in today's culture, probably the most globalized and tech-savvy to date [25]. Having a digital approach attracts many new students and investors.

Therefore, colleges in most parts have rushed to embrace new technologies regularly without even knowing the actual worth of adapting them. Since its beginning, higher education has adopted different mechanical technologies such as the writing board and computers. Few technological advancements have become intrinsic parts of the higher education endeavor. For example, progressively complex or more practical technologies have replaced the slide rule and the 16-millimeter film projector. Technology enables more active learning; you can increase participation by online polling or asking quiz questions during lectures [10]. Nowadays, technology has been used to both assist and improve language learning. Teachers have integrated various types of technology to help their teaching [17]. The education sector is regarded as one of the most critical sectors in any country. The education they take depends on where most people are directly or indirectly. Enhancing the standard of education at different stages of technology would benefit [20]. In their daily life, schools and teachers are invited to incorporate information and communication technology. It is also argued that educational technology can make schools more efficient and successful, enhance teaching and learning, provide genuine and engaging learning opportunities, and better prepare students for the workforce. While the availability of technology in schools is growing significantly, there is a great deal of evidence that teachers do not use technology as intended. Other than the mere absence of facilities, there are explanations for the restricted use of technology, and these reasons would probably be exceedingly difficult to resolve. Researchers also struggle with whether traditional teaching and learning can be strengthened by ICTs [29]. In solving problems and improving education systems efficiency, automation will play an essential role because computer technology will take care of it. High-security settings are often made available, such as solid passwords without which the authentic user cannot access the application [12].

## II. LITERATURE REVIEW

This systematic literature review focuses on longitudinal studies performed at higher education leaders, students, and technology between 2000 and 2020. Currently, learning is assumed to be a knowledge construction mechanism, and there is no knowledge recording scope. There are one trainer and one absorber or student in traditional education, but this scenario can be changed. Students can also contribute to the learning process, and they can store the knowledge and add it into a repository so that other students can have access to that data, which saves a lot of time. It created a need for a distributed learning process, where many people or students have access to one problem, and they can simultaneously work on the same problem. This process helps to share exciting knowledge [5]. As described by Csikszentmihalyi and Fischer, Learning is much affected by motivation. In learning, the reason is equally as important as knowledge [14]. That can collaborate with the distributed learning, and when a student solves or contribute to a problem, he should get awarded. Intelligent tutoring systems proposed by Fischer states that a model is built on the design time and then uses an Intelligent approach to present a specific problem at run time. Papert also Suggested an interactive process where the system is built on design time and run time. It helps a student with only abstract solutions, which help students apply their knowledge [24]. The Seeding,

Evolutionary Growth, and Reseeding Process Model is an approach with no static model; the student-teacher provides input about the model and keeps evaluating as needed. This system is known as an open system. There is no scope for real-time evaluations; hence the open method is mainly preferred. Arjuna I. Ranasinghe focuses on educators' duty to train students to reach the work market, both at the high school and college level. Thus, in the twenty-first century, educators must learn what they can to help their students excel [2].

One part of the training includes using the classroom of all possible forms of technology as a teaching instrument to inspire their students as they develop the critical thinking skills required to solve the problems they face [3]. Christense suggests, in enabling educational technologies to spread into the classrooms, teachers are the key gatekeepers. Therefore, teachers' adequate training in handling and managing these modern technologies in their everyday practice is one of the main factors for incorporating computers into the school curriculum. Wael Hamzeh observed that the process of technology integration is a significant element. Ten years ago, educational technology was a debatable subject in culture [20]. Everyone has their ideas on reforming the education system and promoting it with technology. With technology integration, educational institutions recognized the value of technology in education and how it profoundly enhances and revolutionizes education for the better. Marta Liesa-orus proposed a methodological revival in which the teacher plays a leading role in the teaching-learning processes. At the same time, putting them into practice the well-known active methodologies that focus on students, improving their engagement, promoting collaborative work, promoting autonomy in their learning, and promoting the development of skills and competencies to establish themselves in the face of education [15].

## III. BENEFITS OF TECHNOLOGY IN THE CLASSROOM

Educators may be wondering why it is necessary to incorporate technology in the classroom. The advantages extend far and wide for both teachers and students. The norms of communication have changed a lot with the rapid growth of information technology. Communication is a significant feature of any job; communication methods must be more resourceful and reliable [18]. Integrating computer technology into the school can help teachers facilitate and improve learning. It also provides opportunities to interact with students and inspires students to connect with knowledge in new and exciting ways. Students are armed with new skills as digital learners related to enhanced academic achievement and increased personal and career success [23] with supportive encouragement, clearly established goals and attentive instruction on using technology efficiently and responsibly. The benefits of incorporating technology into the classroom include;

a) **Preparing students for their lives: An increasingly vital skill in students'** lives after graduation is using technology effectively. More commonly, college classes are delivered online or as a combination of meetings in the classroom and online lessons. More e-learning software is also beginning to be used in conventional classrooms [28].
b) **Increased student participation:** Students are already enamored of personal and entertainment technologies. Students engage with enjoyable interactions for them, and there is no excuse for why it is not feasible and should not be fun to learn. Teachers can integrate them into lessons and make them more relaxed and enjoyable by studying pop cultural trends and current events that attract students' attention [19].

c) **Encouraging collaboration:** By getting involved in various online events, students can learn collaborative skills. They work on multiple projects, such as communicating on forums with others or exchanging documents about their simulated learning environments. In the same classroom, same school, and even with other classrooms worldwide, technology will promote cooperation with students [4].

d) **Connecting learners and educators:** You can not find a way to present complex concepts that make the idea understandable to each student in the class. Your learners will understand precisely how, in reality, the expertise is implemented. Students like technology because they think it makes learning more fun and interesting. They like laptops and tablets, particularly. With virtual lessons, via a film, or by using a tablet, subjects that students consider difficult or tedious may become more attractive [27].

e) **Improves knowledge retention:** It is predicted that students involved and interested in learning will have good knowledge retention. Technology integration always helps in facilitating and active engagement in the lecture.

f) **Technology lets you monitor students' progress:** You are no longer confined to a plain-old diary and any student's notes. It will just confuse you. You can rely on platforms and resources today that allow you to keep track of your student's achievements [16].

g) **Beneficial to the environment:** You should advise your students by email to take online tests and submit their papers and assignments. It would help if you also allowed them to use eReaders to study the literature assigned to you.

h) **Technology Interacts with Students:** In the lives of students, technology occupies a significant role. If the students are not in the organization is just about everything, they do the activities with the technologies [4].

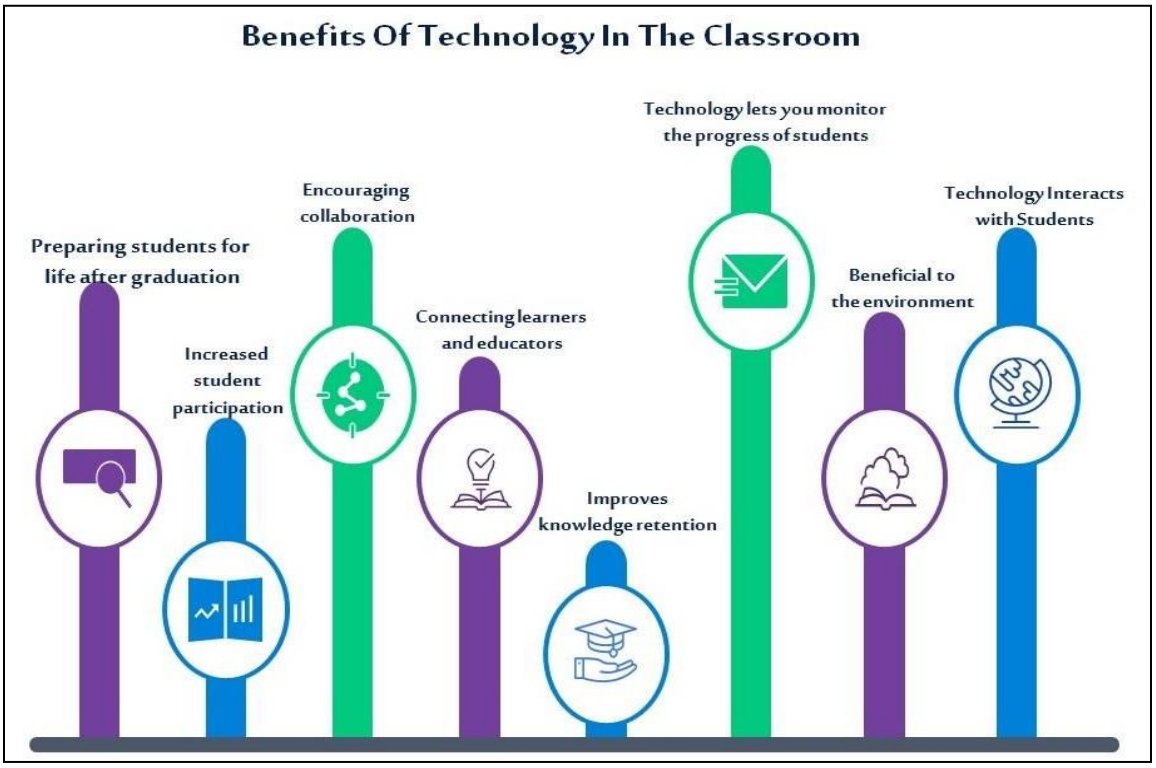


Fig. 1: Benefits of Technology in the classroom

## IV. CHALLENGES OF TECHNOLOGY INTEGRATION

The world is digitizing at an incredible pace, and it is difficult for higher-educational institutes and educators to arrange to remain on top of things. With the speed at which broadband drastically expands, the avenues for technology-based learning increase and require re-designing the whole curriculum. Digital technology will undoubtedly improve learning by accessing information, enhancing connectivity, and creating self-directed and collaborative learning opportunities. Technology brings challenges. A range of challenges may also emerge when integrating technology into the classroom. The first is to find the time required to incorporate modern technologies into courses [8]. ICT skills will also help build capable people who are ready for the future. Few significant key challenges are listed below:

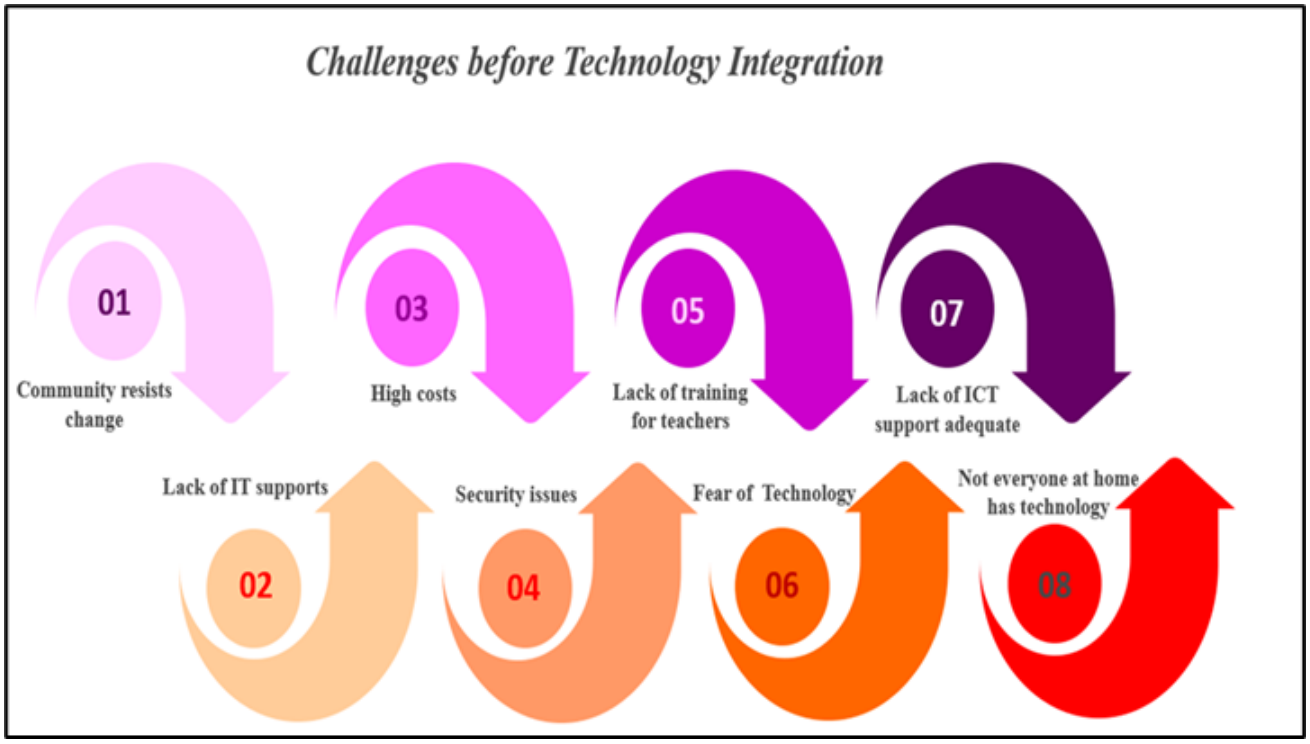


Fig. 2: Challenges before Technology Integration

a) **Community resists change:** There are great chances that high school or college can resist change. They must be following some methods or technology for a long time and don't want to risk their current teaching approach [22].

b) **Lack of IT supports:** In high school, a dedicated team for IT support should be present, or at least they should outsource such services. Lack of IT support is also one of the challenges in technology integration.

c) **High costs:** Digital resources and technology are very much expensive. For this, a college should discuss internally first and then with the community and investors. But again, this is also a crucial challenge [29].

d) **Security issues**: Whenever it comes with internet or online things, security concern is always there. There can be many things that are institute-specific and should be private. During gaining the active attention of higher education officials, information technology smashed through the silicon

ceiling. Technology has always acted as a back-burner operation in many institutions of higher education. Consequently, in both frequency and intensity, attacks against higher education are multiplying [7].

e) **Lack of training for teachers:** Teachers are very busy in many institutes, and both teachers should adapt to technology changes are students. Teachers need to understand all the operation which is going to be required. It can put extra pressure on teachers. Sufficient preparation and proper technical assistance are not provided to educators. There is a lack of time to learn modern and ever-changing technology, with many play positions [11].
f) **Fear of technology:** With emerging technology, educators have this fear of the unknown. We are scared of playing with new technology. This thought of trying to master it all at once often slips them away from the notion of technology adoption [9].
g) **Lack of adequate ICT support:** Major obstacles for teachers are sufficient to access technological resources, facilities, policies, and time devoted to integrating emerging technology.
h) **Not everyone at home has technology:** Not all students or teachers at home using a computer are regular users, have enough data, or access the internet. Students from lower socioeconomic or rural backgrounds have a digital gap with decreased computer literacy [21].

## V. RATIONALE FOR GUIDELINES

Curriculum planning services that hold independent agency accreditation must show whether they meet relevant technical requirements. Organizations can retain few guideline principles; they focus on the dynamic use of tech-world technologies to empower learning and teaching through conception, generation, and critical thinking. Develop manageable, program-wide expert learning systems for advanced education, enhance and continuously revive educators' ability to use inventive devices to empower transformative learning and guidance in higher education institutions. Identify research-based models, procedures, and accreditations seen in the field [6]. The successful use of technology enables more technology to be accommodated by students and educators. More concerted efforts between student organizations are incorporated into instances of successful use in colleges. This strategy would minimize the distance between teachers and students [30]. To maintain the teacher curriculum, it would make existing classes more comparable. Using technology, students can access different online journals and videos, interact with specialists in real-time, and associate with numerous students worldwide [1].

## VI. WORKFLOW OF THE SYSTEM

The system life cycle brings an improvement in technology integration with the higher education system. In this system life cycle, there are 5 phases. It involves requirement gathering, data analysis phase, planning, implementation, and proactive monitoring. It uses a feedback mechanism in which reports are prepared and maintained, which later on is utilized to measure the system's performance. It will help to evaluate the approach to the next level, where many previous issues get resolved. These phases are present below:

### Phase I: Initiation

It is the first phase of the proposed system lifecycle. In this phase, the problem is recognized, and a preliminary assessment is carried out. Initiation is considered to be a base for the system.

a) **Recognize the problem:** Many high schools or colleges integrate technology with education without actually knowing its use. It quite often leads to a more confusing solution rather than solving the actual problem. It can be resolved by studying the situation and find out the problem in the current system. A few of such issues are classrooms are overcrowded, Students showing less interest, and parents less involved by any factor.
b) **Preliminary assessment:** The initial evaluation is the procedure to analyze the problem and current situation; this step also involved problem recognition to some extend. This step-parents or students' interaction is carried out to understand their issues and compare them with problems. This step guarantees the problem situation, and it also helps to make sure that the problem definition is correct. Both of this step creates a base of technology integration in education.

**Phase II: Analysis and evaluation**

This phase mainly involves three steps, determining the course objective, data collection, and identification of potential course action.

a) **Determine Course objective:** Once problem recognition is done, the course objective where Determined. In this step, the problem is converted into the goal. This step optimized the problem statement into the aim. It may include one or more objectives from each module.
b) **Collect data:** Data is a next-generation fuel. From different streams and views. Various information is collected from studies and student-teacher conversations. This data can be used to create an action from the objective. It is used to find the required steps needed for the purpose determined in the previous step. This data can again use in report generation to Determine course objectives in the Monitor and adapt the integration phase.
c) **Identify the potential course of action:** After determining the course objective and final data collection, a story can be identified, an immediate action. It may include a gateway to a solution, but not the final one. Many action points were collected in this step, and then an optimized one is selected at a later stage. For example, many action points can be determined for less parent interaction, like weekly meetings at flexi-time, online communication, etc.

**Phase III: Selection of required technologies**

a) **Plan and design:** An optimized solution is selected in this step, and a plan is prepared. The required technology is designed according to the plan. For example, many action points can be planning an online source for less parent interaction, like going with a web portal or Android app. It will also include the futuristic approach.
b) **Acquire/arrange resources:** A required list is obtained from the plan and design step, which indicates that now a problem, objective, data, action, strategy, and design is ready. This step also makes sure that the necessary resources for model preparation are present. If it is not present, then it is arranged. For example, resource acquisition can acquire resources like database, server, developer team for less parent interaction. One resource is the ready model that can be prepared and can be tested.
c) **Re-evaluate model:** In this step, the model is prepared, and it is re-evaluated. In the later stages, it is realized for testing. This model is not an outcome and can be modified according to a future need. But it is prepared based on objective and data. For example, a re-evaluating model can be a

quick lookup of an android app developed for a parent, teacher, and student communication for less parent interaction.

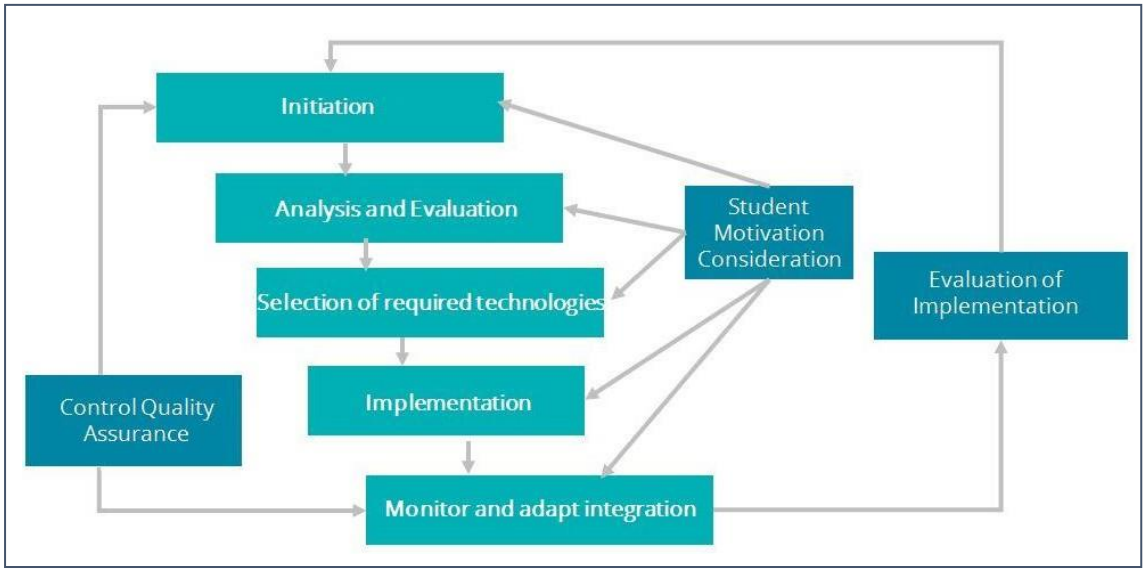


Fig. 3: Work Flow of the system

**Phase IV: Implementation**

This phase mainly involves three steps, including Train staff, Test adapted situation and student involvement. The implementation phase is carried out after the selection of required technologies.

a) **Training of staff:** In this step, plan, design, resources, and model are used to train them, and they will work as a moderator or administrator of the technology. They can have higher rights to the application than students and teachers. They can restrict things. For this, they should understand the model or design completely. They are trained to do so. Training staff is highly required because it will reduce the number of the third party cost-effectively.
b) **Test adapted situation:** This step is specifically for teachers and other faculty members. A model is proposed to teachers and then is available for testing to them. A model or system cannot directly be applied to the high Scholl or student. The teacher analyses it, test it. It can be like trying an android application and understanding its uses and drawbacks. Teachers and other faculty should be adopted enough for the new system or the proposed model.
c) **Student's involvement:** It is the final most step of implementation. Before this step model is highly evaluated and tested, the staff is well trained; hence, it is ready for students. Students were taught by some training programs so that they can show their involvement in the technology. It can include the digital board case; the student should learn things on a digital board or the specific forum where all study material is present.

**Phase V: Monitor and adapt integration**

a) **Continues evaluations:** It is continuously evaluated over time. Monitoring a task in which the model is observed, Students and teachers who use it are constantly under evaluation. Any problems which were faced are scanned, and then it is evaluated. The output of this phase is input to the next step, where it is recorded as documentation.

b) **Produce documentation**: It is the final stage of the system lifecycle. In this phase, the testing data and evaluation recorded are maintained and documented for further utilization.

c) **Control Quality assurance**: It is an essential phase in the technology integration life cycle that controls all model building phases. It ensures that the quality of all the stages is maintained.

d) **Evaluations of implementation**: It is a step that makes this model recursive. In this step, the input is taken from the Monitor and adapts the integration phase. This checks if any new methodology or module is required or any change is needed in the existing module. If it is so, then the module is evaluated, and it sends this information to the Initiation phase for the next iteration. By this way system always remain updated and newly formed required problem, or objectives are resolved over a time.

## VII. RESULT ANALYSIS

Five years of data are collected from high school without technology integration, technology integration, and the prosed model. The sector which was focused on in this study includes study, sports, technology, and extracurricular activity. The success rate of all this sector from a different system over five years is considered. The following observation is made based on this study. Investigate any model's output; it is necessary to carry out some test or survey and compare it with other systems or models proposed model is tested. In which the data of the previous five years were collected from various organizations. It is reached among the one who is not using this methodology or using different methods. Nearly 100 high schools with no technology integration with study and technology integration with proper model and technology integration with the proposed model are carried out. Their result in various sections like technology, sports, study, and extracurricular activity is compared among different time frames. After testing, it is observed that for high school with no technology integration with research, after five years of timeframe, result based on the syllabus is grown from 60% to 70%, for sports, it increases from 20% to 23%, for technology the growth was significantly less for this system. It is from 15.27% to 15.9%. Students' contribution to extracurricular activity increases from 29% to 33%.

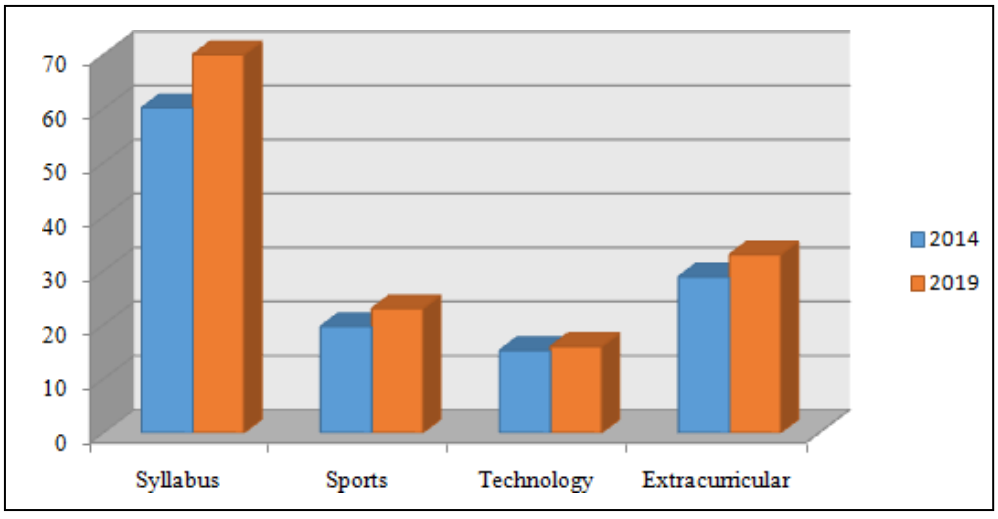


Fig. 4: Organization without technology integration

The same analysis is carried out with high school having technology integration with the proper model. after five years timeframe, result based on the syllabus is grown from 60% to 83.5%; for sports, it increases

from 20% to 54%, for technology, the growth was very high for this system. It is from 15.27% to 81%. Student's contribution to extracurricular activity increases from 29% to 53.5%.

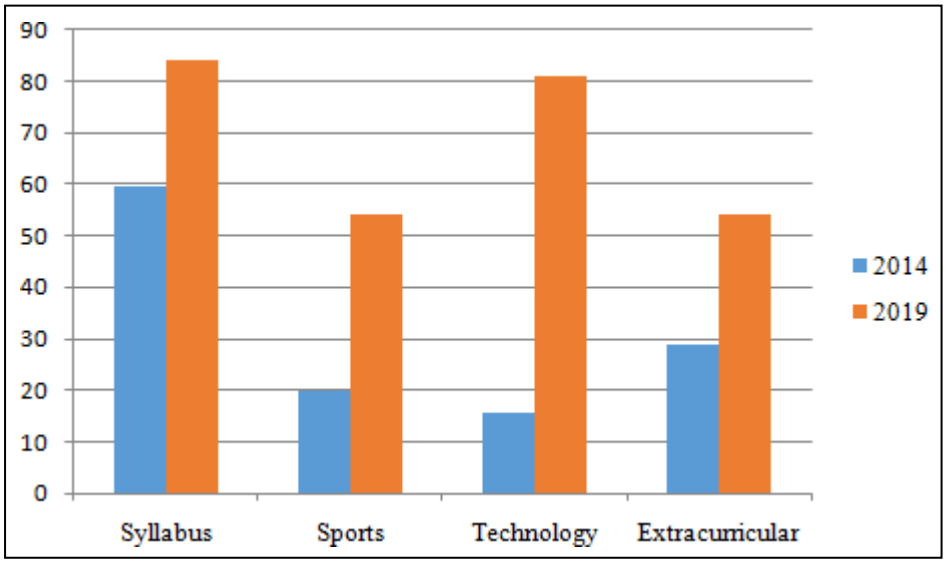


Fig. 5: Outcome of Technology integration to higher education with the current model

For an organization with technology integration with the proposed model, the syllabus's result is grown from 60% to 89.35% after five years. It increases from 20% to 57%; for technology, the growth was higher than technology integration with another model. It is from 15.27% to 92.5%. Student's contribution to extracurricular activity increases from 29% to 57.5%.

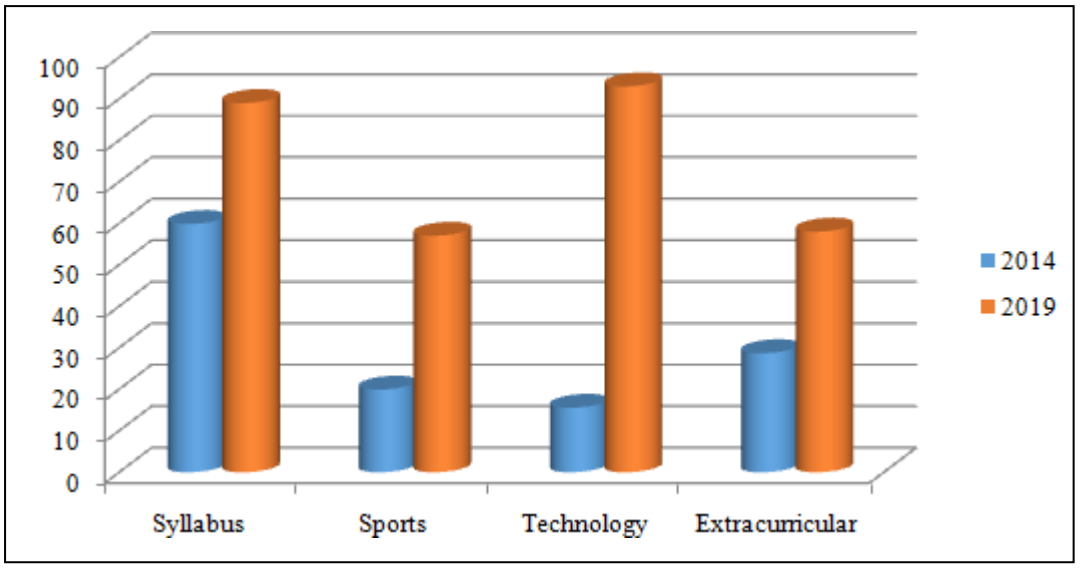


Fig. 6: Technology integration with the new model

## VIII. CONCLUSION

It is observed that growth in all the sectors is there without any technological integration, but the growth rate is too less on the counterpart. In technology integration, the change is too high; there is a significantly

essential for extracurricular activity. Technology also has a systemic character and is capable of adding and excluding. Therefore, technology is understood as more than machines that can be used, but it also means an attitude towards life. The findings of this analysis are parallel to those of previous studies. Their responses to technological tools in their classroom activities were ambiguous when teachers were asked what tools they needed or what services their organizations lacked related to technology integration. It is also observed that students are happier and more open-minded. With the proposed model, the growth is even higher than the other. This model tracks the issues and problems faced by the system, and it re-evaluates them.

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