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Strategic Growth Plan for Developing Indian Engineering Educational Institutes in the era of Emerging Areas of Science and Technology

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Abstract:

Strategic growth plan is a road map of an institute looking for its continuous and sustainable development over certain time duration. Measuring the constant and sustainable growth of any higher and technical educational institute, the strategic goal plan is the blueprint focused towards achieving the vision and mission of the institute. The strategies in terms of short and long term goals, measured through performance indicators of academics, administration, finance, research and extension activities need to be identifies, defined, worked on it and should be monitored and evaluated against target settings. This article presents the Strategic Educational Growth Plan of K J Somaiya Institute of Technology, Mumbai, Maharashtra, India an higher and technical engineering institute in the era of Emerging Areas of Science and Technologies. The comprehensive suggestions and involvement of all the stakeholders of institute for realizing strategic growth plan has showed that the use of emerging areas of science and technologies, if incorporated in the development of the institute, can contributing at large, the growth of the nation. The proved practices of working on nationwide initiatives in healthcare, education, agriculture etc under the

targeted sustainable growth of the institute has set a remark in the education sector which can adopted as a guideline by other developing engineering institutes in India.

Introduction: New and emerging technologies are powering nationwide initiatives in healthcare, education, energy, environment, agriculture, strategic cum security, Industry 4.0 etc in India [2]. Thus it is the prime responsibility of every sector of the country to contribute in some or other way for the growth of the nation by working on the emerging areas of science and technologies. Higher and technical education sector in India has the strength [3] to play an important role looking at the sustainable growth of the nation to become a developed country from a developing nation. K. J. Somaiya Institute of Technology (KJSIT), Sion, Mumbai [4], affiliated to Mumbai University (UoM) [5], approved by All India council for Technical Education (AICTE) and Directorate of Technical Education (DTE), Government of Maharashtra (GoM) [6] was established in the year 2001 providing undergraduate engineering education in the most attractive disciplines of Computer Engineering (CE), Information Technology (IT), Electronics and Telecommunication Engineering (EXTC) and Electronics Engineering (ETRX) with a limited 300 student intake and around 1300 total student strength, 70 plus faculties and 65 plus non-teaching support staff over last 2 decades. Since KJSITs inception, institute is constantly working on of improving the engineering education system through incremental or fundamental changes in Institutional profile through innovative and sustainable educational initiatives under teaching- learning processes and pedagogies, research, development, consultancy and collaborative practices, trainings through workshops, development, curricular, co-curricular and extension activities, internships and placements, value addition courses in engineering, technology, social, ethical and civic responsibilities targeting new ideas, creativity, innovations towards all-round growth of student learners

serving the society, nation and world at large [7,8].

With 2 decades of KJSITs existence, institute has reached great height and created a mark in the higher and technical education of India with the award of accreditation to the institute and academic programs through the assessment of qualitative and quantitative competence of the institute processes and its programs by Indian accreditation regulatory bodies viz. National Assessment and Accreditation Council (NAAC) [9] and National Board of Accreditation (NBA) [10] resp., Rankings by National Indian Ranking Framework [11] and Atal Rankings of Institutions on Innovation Achievements [12], Academic Autonomy by UGC [13] Recognitions, achievements and awards by universities, government funding agencies, national regulating bodies, professional societies to the institute, faculty, staff and students [14]. Observing till date accomplishments of the institute, it was observed that faculty and students have achieved the expertise to actively learning new technologies and applying technology's advantages for solving societal and need based problems under the Project Based Learning (PBL) initiative of the institute. Thus it was advantageous for KJSIT to revise its growth plan concentrating on capturing the benefits of technical advancements.

This article presents the Strategic Growth Plan Goals (SGPG) of K J Somaiya Institute of Technology in the era of Emerging Areas of Science and Technologies. The comprehensive suggestions and involvement of all the stakeholders of higher and technical educational institute for realizing strategic targeted constant long term overall growth of the institute, students and employees in the ever growing competitive automated world by achieving the vision and mission of the institute under the measurable performance indicators of academics,

pedagogies, administration, financial self-sustenance, skill based, activity based, project based and experiential learning through research and extension activities, making use of state of the art technologies and emerging areas are targeted for achieving the outcomes. The efforts showed that the use of emerging areas of science and technologies, if incorporated in the development of the higher and technical engineering educational institute, can contributing at large, the growth of the developing India. The proved practices of working on nationwide initiatives in healthcare, education, agriculture etc under the targeted sustainable growth of the institute has also set a remark in the education sector which can adopted as a guideline by other developing engineering institutes in India.

Preparing the short term and long term Strategic Growth Plan in (SGP) the era of emerging areas of science and technologies, KJSIT's administration has conducted multiple rigorous rounds of discussions with all stakeholders of the institute including governing council, academic council, Board of studies, alumni, employers, faculty and students. The focus was given on utilization of knowledge and skills of technological up gradation, creating the ecosystem for targeted sustainable nationwide growth in the directed areas by empowering young engineering graduates contributing to change the status of developing country into the developed India. KJSITs SGP is prepared under two time categories as short term development plan for 5 calendar year duration and long term development plan for next 5 years i.e. total 10 years duration. The Strategic Growth Plan Goals (SGPG) under the emerging areas of science and technologies are identifies, defined in detailed with the set of measurable attributes under current context and plan of action for implementing new goals, worked on it rigorously with continuous monitoring and evaluation of target settings which are recurring in nature as shown in the table 1.

Table 1.

Strategic Growth Plan Goals (SGPGs) for KJSIT

Sr. No.	Strategic Growth Plan Goals (SGPGs)	Timeline and Duration
SGPG1	Creating a Trained Manpower of Faculty and Students in the merging areas of technologies such as Artificial Intelligence (AI), Machine learning (ML), Data Science (DS), Cyber Security (CS) and Internet of Things (IoT).	06 months to 1 year (Continuous activity)
SGPG 2	Applying Learned Knowledge in technologies For Developing Small Systems For Testing Purpose	2 nd year and onwards (continuous activity)
SGPG 3	Applying Information Technology (IT) solutions for (a) Healthcare (b) Agriculture and (c) Rural and Outreach Education	2 nd year and onwards (Continuous Activity)
SGPG 4	Train “AI to School Children”	2 nd year and onwards (Continuous Activity)
SGPG 5	Learning and Earning through research (Train the trainer concept)	3 rd Year and onwards (Continuous Activity)
SGPG 6	Establishing one on one “Centre of Excellences in AI, ML, Data Sciences, IoT, Cyber Security”	3 rd Year and onwards (Continuous Activity)
SGPG 7	Creating Collaborative Research Platforms, consultancies and research sources for earning through learning	3 rd Year and 4 th Year onwards (After creating trained manpower)
SGPG 8	Establishing International Center for exchange of knowledge and information	5 th Year and onwards

Strategic Growth Plan Goal 1 (SGPG 1).

Creating a Trained Manpower of Faculty and Students in the emerging areas of science and technology

Acquiring knowledge, skills and expertise into emerging areas of technologies, its necessary to train institute faculty and students under the selected domain of their interest targeting the strategic planning against expected outcomes to be achieved. The planning strategy to achieve Strategic Growth Plan- Goal 1 and the expected outcomes which are to be initiated and executed in initial 06 months to 1 year time duration and further it will become a continuous activity every year are as listed in table 2.

Table 2.

SGPG1 Planning and Expected Outcomes

Strategic Growth Plan Goal1	Goal Planning Strategy	Expected Outcomes
Creating a Trained Manpower of Faculty and Students in the merging areas of technologies such as Artificial Intelligence (AI), Machine learning (ML), Data Science (DS), Cyber Security (CS) and Internet of Things (IoT).	<ul style="list-style-type: none"> i. Provide training to faculty and students in the selected technologies. ii. Collaborate with various training agencies for online or offline training iii. Faculty and students will undergo training and complete value addition certification courses through institutional memberships of initiatives such as AICTE’s [15] ATAL FDPs [16], NPTEL [17], Swayam [18], Coursera [19], IBM-ICE [20] Spoken Tutorial [21], Udemy [22], and few other training development programs conducted by academic institutions and industry. iv. Institute will organizes regular FDPs/Conference/Training Programs/Internship Programs/Expert Talks/Seminars/Webinars etc providing platforms for trained manpower creation. 	<ul style="list-style-type: none"> i. Faculty will get motivated through the institute support and on completion of training on emerging areas of technologies to register themselves for PhD programs, upgrading their qualifications. ii. Faculty and students together or individually are encouraged and supported to write good research papers in their area of expertise and submit for various reputed journals journal and conferences. iii. Faculty and students together or individually are encouraged and supported to write research proposals for various funding agencies in India and across world.

Existing Context

Beginning of any initiative requires the detailed study of the existing setup inclusive of support resources, finances and infrastructure.

Working towards SGPG 1, the existing context is analyzed to reach further plan of action.

I. Financial Support

- i. KJSIT currently runs 4 UG & 1 PG program with the support of 80 full time faculty and around 10-15 faculty required on adhoc basis depending on the academic load.
- ii. Every department allocates a budget of Rs 2 lacs annually as a faculty development fund.
- iii. Besides this funds institute allocates Rs 10 Lacs for overall upgradation of faculty, staff, and students under R&D fund.
- iv. Every department faculty individually has allotted faculty development fund of Rs 15,000/-
- v. Besides these i-iv point provisions, faculty along with the students can utilize additional R& D fund for participation & development of projects/products, registration for national/international events/conferences/competitions including the travelling expenses etc.
- vi. All the winning, runner-up, special prize/recognition teams of faculty and students are reimbursed all the expenses towards the events/conferences/competitions etc.

II. Leaves & duty load adjustment

- i. Outdoor leaves are available for faculty to participate at national/international events/conferences/competitions including the travelling days.
- ii. Sabbatical leaves are provided to faculty for R&D/consultancy project/product developments.
- iii. For the R&D/consultancy project/product developments the consultancy financial scheme of 70:30(faculty : institute) and 90:10 out of earned consultancy amount is provided as per GR besides all other support as OD/sabbatical leave/concession in academic/departmental load/responsibility reduction.

III. Infrastructural/Lab support/online membership support

- i. Institute provides all Infrastructural, Laboratory support by purchasing R&D equipment /software/ interfaces/ server support required for R&D/consultancy project/product developments.
- ii. Institute renews and invests for membership of online certification portals such as NPTEL 8TB hard disk/server, Coursera, Spoken Tutorial or any other educational membership to undergo up gradation programs.

IV. Preparing plan of action

- i. With all above available support, every department faculty and students are informed to undergo online certification training courses to learn and upgrade themselves in the emerging area of technologies like Artificial Intelligence, Machine learning, Data Science, Internet of Things, Cyber Securities, AR-VR and Cloud Computing.
- ii. Faculty and students need to register themselves at the end of every semester for Faculty Development Programs/Short Term Development Programs//Training Programs/Internship programs on emerging area of technologies or the areas of expertise/interest as per the need of program curriculum to get them trained/upgraded in their field at various ATAL FDPs, national/international programs.

Expected outcomes

The detailed implementation and deployment of SGPG1 has set few targets over initial 1 year duration and then this shall become the continuous activity for upcoming batches of faculty and student learners.

- i. Faculty will get motivated through the institute support and on completion of training on emerging areas of technologies to register themselves for PhD programs, upgrading their qualifications.
- ii. Faculty and students together or individually are encouraged and supported to write good research papers in their area of expertise and submit for various reputed journals and conferences.
- iii. Faculty and students together or individually are encouraged and supported to write research proposals for various funding agencies in India and across world.

Strategic Growth Plan Goal 2 (SGPG 2).

Applying Learned Knowledge for Developing Small Systems for Testing Purpose

Once KJSITs faculty and student manpower will be trained on emerging areas of technologies, applying the learned knowledge for developing small projects and systems for testing purpose is achieved by planning the strategy, SGPG2. The expected outcomes to be achieved by initiating and implementing SGPG2 from second year of time duration and further it will become a continuous activity every year as listed in table 3.

Table 3.

SGPG2 Planning and Expected Outcomes

Strategic Growth Plan Goals 2	Goal Planning Strategy	Expected Outcomes
Applying Learned Knowledge For Developing Small Systems For Testing Purpose	i. Approach student parents, alumni and other contacts working in industries for mini and minor problem statements under any sectors. ii. Collaboration parent Somaiya Trust organizations like K J Somaiya Hospital [23] and research Centre, K J Somaiya College of Physiotherapy [24], Somaiya Centre for Experiential Learning [25], Somaiya Institute for Research and Consultancy (SIRAC) [26], Nareshwadi Centre for Learning, GBL and KIAAR for getting case studies in the focused sector areas of 1. Healthcare 2. Agriculture	i. Faculty will get motivated through the institute support and on completion of training on emerging areas of technologies to register themselves for PhD programs, upgrading their qualifications. ii. Faculty and students together or individually are encouraged and supported to write good research papers in their area of expertise and submit for various reputed journals journal and conferences. iii. Faculty and students together or individually are encouraged and supported to write research proposals for various funding agencies in India and

	3. Rural and 4. Outreach Education to apply trained knowledge in emerging areas for testing the outcomes	across world.
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Existing Setup

Project based learning (PBL) initiative has been introduced in KJSIT since last few years, wherein faculty and students together are working on developing hardware and software projects as a part of curriculum. Till date good exposure of developing mini, minor and major projects/products based on the requirements/needs of society have been provided to students and faculty wherein few successful deployments have been achieved as shown in table 4 [27].

Table 4.

Successful Deployment of PBL initiatives

Sr No	Domain	Type of Project	Deployed at/Developed for
1	Medical and Healthcare	Early Prediction of Severe Acute Respiratory Infections/ Illnesses through Smart Survey Mobile Application facilitating ASHA Workers-“SARI-ASHA”	District Health Office, Solapur , Maharashtra, India
2		Aarogya Patrika-Mobile App for ASHA Workers	
3		Personalized Risk Prediction using Artificial Intelligence, Big Data and Cloud Computing	K J Somaiya Hospital and Research Centre, Mumbai, India
4		Pneumonia Diagnosis Mobile App and Reference Manual for Pneumonia	
5		Artificial Intelligence and Deep Learning for Prediction of COVID-19	
6		COVID-19 detection from Chest CT using weakly supervised approach of Deep Learning.	
7		Chronic Obstructive Pulmonary Disease (COPD) Diagnosis Mobile App & Reference Manual for COPD	
8		Asthma Diagnosis	
9		Detection of facial affected area on skin using machine learning (Version 1,2)	
10		Prediction and Recommendation of Precision Medicine for Cancer using Machine Learning	

		Techniques	India
11		Medical Health Card Portal	Somaiya Schools, Mumbai, India
12		Divyaang Aadhaar – A Cognitive Approach	POSAT Foundation, Mumbai, India
13		Learning aid for Autistic Students	Neurogen Brain & Spine Institute, Navi Mumbai, India
14		Path Planning And Navigation of Medical Robot	Institute level, in house-need based software development
15		Real Time Sign Language Detector	
16		ICU Morality Prediction	
17		IOT based General Examination of Patient	
18		Classification of Diabetic Retinopathy using Machine Learning Algorithms	
19		Development and Validation of Deep Learning Algorithm for Detection of Diabetic Retinopathy	
20		Detection of Skull Fracture Using CT	
21		Bone Age Estimation for Forensic Applications	
22		Image forgery detection and localization	
23		Early Detection Of Breast Cancer Using Microstrip Patch Antenna	
24		Design and development of Textile Antenna for Biomedical applications	
25		Disinfectant Robot	
26		A low cost and small size Health Band for Measurement of Pulse Rate, Oxygen saturation and Body Temperature	
27		Age Related Macular degeneration(ARMD) Home Monitoring System	
28	Agriculture	Kisan Khazana- Mobile Application for Framers version1,2	K J Somaiya Institute for Applied Agriculture and Research, (KIAAR) [28] and Godavari Boirefineries Ltd [29] Baglkot, Karnataka, India
29		Soil Health Monitoring System	
30		IoT based Remote Monitoring and Controlling for Farm Field Irrigation- Nareshwadi Farm Lands.	
31		Hybrid Growth Room Monitoring & Control for Tissue Culture Lab	
32		Media Preparation Room's Autoclave Controller for Tissue culture Lab	
33		Android Application for Soil Analysis using OCR Techniques	
34		Fertiliser Calculator (version 1 and version 2)	
35		Classification of Crops	
36		Crop Health through NDVI	
37		IoT based Air Quality monitoring system with Machine Learning analysis	
38	Education	Exam Paper Upload System (EPUS)	Institute Level, In House Project Development
39		Admission Process Software- KJSIEIT	
40		Examination Process Management -K J Somaiya Commerce & Science College, Vidyavihar	
41		Student Information Management System & Parents' Portal- KJSIEIT	
42		Event Management System-KJSIEIT	

43		Attendance Software-KJSIEIT	
44		Feedback collection Software-KJSIEIT	
45		Inventory Management System-KJSIEIT	
46		Online Transcript Generation System-KJSIEIT	
47		E-notice Board-KJSIEIT	
48		Training and Placement Portal-KJSIEIT	
49		Result Analysis Portal-KJSIEIT	
50		Faculty Information Management System-KJSIEIT	
51		e-Deadstock:Online Laboratory Stock/Maintenance Register-KJSIEIT	
52		Student Progress Management System (SPMS)	
53		Generation of Letter of recommendation, Letter of Appreciation and No objection Certificate for students	
54		Academic Progression	
55	Need Based and Societal Initiatives	Weather-Based Short-Term Electrical Load Demand Forecasting	Tata Power, Mumbai, India
56		Weather Prediction Model and Mobile Application	RMC Mumbai, India IMD Mumbai, India
57		Help Flare Mobile App- available on playstore for pandemic times	Need Based and Societal Initiative
58		Upper Air Sound System (UASS)	Databytes Systems and Solutions
59		Pocket Qube Standard Pico-satellite Bus and Deployer	Pvt. Ltd, India
60		Farmers Wallet- A to Z mobile Application for Farmers	Michigan State University Global alliance, RMC Mumbai

I. Plan of Action

- i. With all above available background knowledge and learning experiences of developing mini, minor, major projects, every department faculty and students will select a problem statement from the societal or need based areas to be developed under Project Based Learning (Mini/Minor/Major)- a compulsory course under curriculum from semester III till Sem VIII .

- ii. Department HODs shall approach parent and trust based organizations like K J Somaiya Hospital and research Centre, K J Somaiya Physiotherapy hospital, Somaiya Centre for Experiential Learning, SIRAC, Nareshwadi Centre for Learning, GBL and KIAAR for getting case studies in the focused sector areas of 1. Healthcare 2. Agriculture 3. Rural and Outreach Education 4. Societal and need based areas, getting real time problem statements.
- iii. The knowledge learned through online certification courses/ FDPs/Conference/Training Programs/Internship Programs/Expert Talks/Seminars/Webinars etc in the emerging areas will be applied for testing the outcomes.

Strategic Growth Plan Goal 3 (SGPG 3).

Applying Information Technology (IT) solutions for A. Healthcare B. Agriculture C. Rural and Outreach Education and 4. Need Based and Societal Problem Areas

Once confident on solving case studies, providing sustainable solutions for real-world problems through gained knowledge of emerging technologies in **only focused sector areas of 1. Healthcare 2. Agriculture 3. Rural and Outreach Education and 4. Need based and Societal**. The experience of developing IT solutions can be utilized for the benefit of the society by joining hands with NGOs on solving problems through AI, ML, DS, IoT, Cloud Computing, etc. The targeted time duration was 2nd year onwards and a continuous activity.

I. Sector focus areas

The shortlisted sector focused domain areas of

1. Healthcare

2. Agriculture

3. Rural and Outreach Education and

4. Societal and need based are also the sector focused development areas identified worldwide. Working on these areas will provide the opportunity for faculty and students to contribute to the current and future needs.

i. Project based learning (PBL- Mini/Minor/Major) initiative as a part of compulsory course under autonomy curriculum from semester III till Sem VIII, will develop the culture amongst faculty and students to work on real world/ground level societal /need based problems.

ii. While collecting and studying the problems in the forms of case studies, will create the IT learning experience of analyzing the problem from the point of Software development life cycle, minimizing the risks of incomplete requirement gathering which leads towards failed projects/product development.

II. Plan of Action

To apply the experiences of developing IT solutions, departments will contact to outside world like NGOs, government organizations, Education sector, Police departments etc to work and provide help for the benefit of the society.

i. For collecting domain area problem statements, currently institute is associated with and closely working with various organizations as,

a. Healthcare-

1. K J Somaiya Hospital and Research Centre, Mumbai, India
2. Aditya Jyot Eye Hospital Mumbai, India [30] and
3. Various Doctors and hospital's personal contacts through faculty and students.

b. Agriculture-

1. K J Somaiya Institute of Applied Agriculture and Research (KIAAR)
2. Nareshwadi Learning Centre and Agricultural Fields, Nareshwadi, Dahanu, Maharashtra Thane [31]
3. Farming field lands of various faculty and students.

c. Rural and Outreach Education-

1. Somaiya Schools at Kopargaon, Samirwadi, Nareshwadi, Vidyavihar and various Brihanmumbai Municipal Corporation (BMC) schools
2. Somaiya Centre for Experiential Learning

3. Department of Lifelong Learning & Extension, UoM

d. Need based and Societal-

1. Industries, organization and institutions with whom departments and institute has signed MoUs and NDAs.
 2. Collecting the problems available around the society, region, state and at national level and gathering the requirements for developing IT solutions through support of Artificial Intelligence, Machine learning, Data Science, IoT, Cyber Security, Cloud Computing, etc technologies.
- ii. Few more contacts will be built up regularly and in coming years with NGOs, Societal, environmental and educational organizations to work closely with the real world problems faced by them and providing the working solution by detailed understanding of the problems and developing mini, minor and major project/products under these areas.

Strategic Growth Plan Goal 4 (SGPG 4).

Train “AI to School Children”

Educating school students on the fundamentals of AI to empower them. It is required that children don't misconceptualize the AI-based tools they use, and at the same time embrace the technology, KJSIEIT will start this through the initiative **Train "AI to School Children"** concept. The targeted time duration –for this SGPG shall be summer and winter vacation period of schools and will be a continuous activity.

I. Social Contribution

Being part of a valued based Somaiya Trust, KJSIEIT not only imparts quality education in engineering but always tries to disseminate and share the learned knowledge to the society in multifold through various initiatives.

- i. Institute has initiated hands on training on Robotics technology of Basic and advanced level to Primary and Higher secondary school children for developing small robots. At the next level, arranged competitions among various school children to present their working bots performing the assigned tasks.
- ii. Institute has initiated multiple training sessions for Junior college students on Cyber security and Ethical hacking.
- iii. Institute has initiated engineering education awareness drives, elaborating the benefits of engineering education, career and research opportunities after engineering etc. This has helped aspirants to join engineering education by their own choice. As many students cancel admission after 1 or 2 semesters or join engineering education with the pressure by their parents, society or as their friends were joining it.

- iv. A next level step, towards contribution to society will be creating awareness, educating on and training on fundamentals and pros and cons i.e. benefits and impacts of Artificial Intelligence technology to school and junior college students through “AI for Children” initiative to empower them.
- v. The need for training on AI to school children is despite the growing interest in AI, little attention is paid to how it will affect children. It is required that children don’t misconceptualize the AI-based tools they use, and at the same time embrace the technology.

II. Plan of Action

- i. To start training the children on emerging areas of technology in Artificial Intelligence, in the first stage, Somaiya Schools at Kopargaon, Samirwadi, Nareshwadi will be contacted.
- ii. In the second stage Brihanmumbai Municipal Corporation (BMC) schools shall be contacted.
- iii. Simultaneously junior colleges will also be contacted to provide training to junior college students on AI
- iv. The need for training AI to school children will first be elaborated to school authorities with the plan of action of training in summer and winter vacation duration of our students and with identified time duration of schools.

- v. Looking at the growing interest of school children in AI based tools, games, platforms etc, training modules will be created in the forms of ppts, videos, audios, short films, showing them how this the use these technologies will affect children due to the misconceptualization towards the AI-based tools they use.
- vi. The main focus will be to empower school children on AI and at the same time embrace the technology.
- vii. Once the training sessions on AI technology will create proper awareness about pros and cons of using AI amongst school children, the next level will be to increase children interest in participating for AI relevant competitions increasing the use of AI technology benefits to society at large.
- viii. The AI based competitions shall focus more on the aspects of societal benefits through various levels covering
 - a. AI Awareness
 - b. Prons, cons and impacts
 - c. Uses and societal benefits
 - d. Security concerns
 - e. Reducing human efforts at the same time how to create multiple job avenues
 - f. How to increase interested and trained manpower in AI field.
 - g. Higher Education opportunities in AI
- ix. Training “AI to children” initiative will provide a platform to collaborate with schools and junior colleges to initiate much such

creativity, contributing towards society, education and lifelong learning for institute faculty and students.

Strategic Growth Plan Goal 5 (SGPG 5).

Learning and Earning through Research

Once the students and faculty of the institute will be rigorously trained on AI, ML, Data Science ,IoT and Cyber security platforms, **“Train the trainer (T3)”** concept will be initiated wherein KJSIEITs trained manpower will provide training to others (industry, institutes, schools, other aspirants) by designing **certificate courses/ small modules/ internships/hands-on/need based project developments etc**, and thus learning and earning through research will be initiated. The targeted time duration for the same is 3rd year of the SGP.

I. Training Initiatives

KJSIEIT team of faculty and students have the experience of providing training on various areas of technologies under various initiatives such as,

- i. 1 day drives about engineering education at various junior colleges through training on various disciplines of engineering, benefits of engineering education, role of an engineer, career and research opportunities after engineering etc.

- ii. Robotics technology training on Basic and advanced level to Primary and Higher secondary school children for developing small robots.
- iii. Training on Artificial Intelligence and Big Data Analytics to Indian Navy officers at multiple occasions and through multiple sessions.
- iv. Training on Data Analytics with Power BI to Indian Navy officers at Material Organization Bombay, MOMB, INS Hamala, Ghatkopar
- v. Cyber security and Ethical hacking multiple training sessions for Junior college students.
- vi. Sessions by various faculties as session experts/speakers under Faculty Development Programs, Short Term Development Programs, Student Development Programs, Sessions under Internships, workshops, seminars, webinars etc.
- vii. Looking at the growing interest of learners in the emerging fields of AI, ML, Data Science, IoT, Cyber security etc technologies through various gaming tools and devices, online platforms, automated systems, e-finance, e-education, etc training modules and courses will be created in the forms of ppts, videos, audios, short films, documentations, certification courses, case studies, hands on trainings, internships, workshops etc to embrace the benefits of the technology by minimizing the affecting misconceptualization towards the AI-based tools they use.

II. Plan of Action

For the initial first two years duration, creating trained manpower in the field of emerging areas of technology will be mainly focused and completed.

- i. Once the students and faculty of the institute will be rigorously trained on AI, ML, Data Science ,IoT and Cyber security platforms, **“Train the trainer (T3)”** concept will be initiated.
- ii. Under T3 initiative, trained manpower of faculty and students will provide training consultancies to outside world.
- iii. The beneficiaries under T3 initiatives will be industry, other engineering or science institutes, junior colleges, primary and secondary schools and other interested aspirants.
- iv. For executing T3, small modules/certificate courses/ internships/hands-on/need based project developments, etc course contents will be designed based on the requirements of the learners or beneficiaries.
- v. The training sessios will involve the financials in terms of consultancy, honorarium, training fees, etc.
- vi. The training fees/consultancy amount will be decided based on the course contents, level of training, organization, beneficiaries, level of learners and time required to complete the training course, travel and accommodation expenses, if any (for other than outside region organizations).

- vii. T3 will also initiate mini, minor and major level project or product development requirements of institutes, organizations, society or based on needs to start with learning and earning through research.
- viii. This will not only create the proper awareness of using AI, ML, Data Science, IoT, Cyber security, etc platforms amongst the society at large but also boost up confidence level of users of these technologies to be alert of its pros, cons, uses, societal benefits, impacts and security concerns.
- ix. This will be a continuous activity for coming future by adopting all the up gradations happening in these emerging areas of technologies and the same will be continued for years, one stage ahead being self-financed, learn and earn status for the institute.

Strategic Growth Plan Goal 6 (SGPG 6).

Establishing One on One “Centre Of Excellences in AI, ML, Data Sciences, IoT, Cyber Security, Etc.

Designing an open ecosystem to enhance collaborative cutting-edge research by students, faculty, and corporates by establishing one on one “Centre of Excellences in AI, ML, Data Sciences, IoT, Cyber Security”, etc over the coming years. The targeted time duration for this initiative shall be from the 3rd year of the SGP.

I. Need of an Hour

- i. KJSIEIT team of faculty and students will be consistently trained on various emerging areas of technologies like AI, ML, Data Sciences, IoT, Cyber Security, etc, through various platforms as mentioned under point1 of this 8 point leadership agenda so as lead and contribute being an engineering educational institute.
- ii. The learned knowledge will be applied for developing small systems under mini, minor, major project based learning initiatives which is also the part of compulsory course curriculum.
- iii. Once confident on solving case studies, providing sustainable solutions for real-world problems through gained knowledge of emerging technologies in only focused sector areas of 1. Healthcare 2. Agriculture 3. Rural and Outreach Education and 4. Need based and Societal. Then the experience of developing IT solutions shall be utilized for the benefit of the society by joining hands with NGOs on solving problems through AI, ML, DS, IoT, Cloud Computing, etc.
- iv. As a part of our social initiative, school students will be educated on the fundamentals of AI to empower them and at the same time embrace the technology. This initiative of **Train “AI to School Children”** will help school children to minimizing the affecting misconceptualization towards the AI-based tools they use.
- v. On successful execution of “Train the Trainer” initiative, it will be need of an hour for designing an open ecosystem to enhance collaborative cutting-edge research by students, faculty, and corporates by establishing one on one “Centre of Excellences in AI, ML, Data Sciences, IoT, Cyber Security”, etc over the coming years.
- vi. The benefits and facilities and expected outcome will be identified for every CoE.

II. Plan of Action

For the initial first two years duration, creating trained manpower in the field of emerging areas of technology will be mainly focused and completed.

- i. Once the manpower will be trained, for hands on experience, Applying learned knowledge in emerging areas of technologies will be applied for developing small systems for testing the knowledge purpose.
- ii. On successful testing of learned knowledge on AI, ML, Data Science, IoT and Cyber security platforms, “Train the trainer (T3)” concept will be initiated, providing training consultancies to outside world like industry, other engineering or science institutes, junior colleges, primary and secondary schools and other interested aspirants.
- iii. The training sessions through T3 will provide financials earnings in terms of consultancy, honorarium, training fees, etc.
- iv. The next level for becoming leader in the field of engineering education using the strength of emerging areas of technologies will be creating and designing an open ecosystem to enhance collaborative cutting-edge research by students, faculty, and corporates.
- v. For these industries will help institute to establish one on one “Centre of Excellences (CoEs) in AI, ML, Data Sciences, IoT, Cyber Security”, etc over the coming years.
- vi. Sufficient budget will be earmarked for establishing CoE and its services every year.
- vii. The main focus of establishing CoEs will be to

- a. Make all the students employable
- b. Creating the trained manpower as per requirement of industry.
- c. Prepare students industry ready in the resp. areas of technologies.
- d. Avenues and platforms for increased salary package
- e. Position students in the industry not as fresher but as experienced certified consultants.
- f. Bring in industry stalwarts to the college to impart experiences.
- g. Bring industry requirement/projects from which students can learn and faculty members can up skill with current technologies in the market
- h. Creating the collaborative opportunities between industry and academia for various research initiative
- i. Research initiatives will include collaborative research paper writing and publishing
- j. Writing and applying for various research proposals and funding grants.

Strategic Growth Plan Goal 7 (SGPG 7).

Creating Collaborative Research Platforms, consultancies and sources for earning through learning and research

Writing major Collaborative research proposals and submitting to granting agencies, reputed research publication houses, developing and deploying sustainable solutions for public and private organizations in the domain of AI, Data Science, IoT, Cyber security by

removing barriers to open collaboration across the boundaries, a world-leading research ecosystem can be created that leverages the varied strengths of individuals generating consultancies and becoming source for earning for the development of the institute. The targeted time duration for the same shall be 3rd and 4th year after creating trained manpower.

I. Current Scenario

KJSIEIT has focused till date on making its foundation strong in academics and providing avenues for faculty and students to be a part of and getting all round growth through curricular, co-curricular, extracurricular and extension activities.

The current scenario is, since the institute has shown its continuous growth and mark in academics and extension activities by getting recognitions across nation, now the focus is working on & improving research, development and consultancy culture in the institute.

- i. For creating a culture of research, development and consultancy in the institute, many experts in these areas have visited institute, guiding faculty and students on what is research, innovations and consultancies.
- ii. Atmosphere and support systems has been created to pursue research through enrolling to higher education PhD degrees at reputed universities and institutes.
- iii. Faculty and student groups together are working on mini, minor, major project and/or product developments and consultancies.
- iv. While developing mini, minor, major project and/or product developments, groups have started documenting what innovation or creativity is introduced by them.

- v. This innovation/creativity was documented to be presented to outside world.
- vi. These research documents are presented and published at national ,international level conferences and journals by participating at these events
- vii. Institute has created its own platform for presenting, calling and publishing research at international level by organizing International conference on Advances in Science and Technology i.e ICAST annually.
- viii. The papers received and shortlisted through rigorous review process have been published at reputed publication houses.
- ix. Writing and submitting minor research proposals for University of Mumbai have been practiced by institute faculty since few years.
- x. At the next higher stage, the focus has been given on learning on how to write and submit major research proposals, how to prepare for national, international and collaborative funding agencies.

II. Plan of Action

- i. Research, development and consultancy (RD&C) culture has been increasing in the institute under the guidance, mentoring and regular interactions, contributions and involvement of committees and bodies such as Research Advisory Committee, Institution Innovation

Cell, National Innovation Startup Policy, Industry Advisory Boards and with the support of Somaiya Institute for Research and Consultancies (SIRAC).

- ii. Institute is continuously inviting and arranging expert sessions, interactions, meeting of faculty and students with researchers, scientists, innovators and research wings of industries like Government organizations, IITs, IISc, NITs, KIAAR, etc to encourage, motivate, guide and work on excelling in RD&C areas.
- iii. Faculty and students' collaborative research articles have been accepted for Scopus indexed/SCI/Web of Science research publication houses.
- iv. Faculty and students together are participating and winning recognitions, prizes and special jury awards at reputed regional, state and national level competitions like hackathons, National Robocon, ISROs Lander Mission Design contests, Mapathons, Google summer of code, etc.
- v. Faculty and student groups together are working on mini, minor, major project and/or product developments and started earning consultancies, and savings for the institute automation through these developments.
- vi. These documented innovation and creativity on developing projects has generated the research proposal documents to be submitted and presented at various research agencies.
- vii. Regular writing, submitting and getting grants for minor research proposals at University of Mumbai has boosted the confidence levels of institute faculty

- viii. At the next higher stage, till date 4 successful major project development consultancies, 2 major training on emerging areas consultancies, 3 major financial support for organization ICAST and 3 major grants for organization of FDPS/STTPs have been received till date by various faculty.
- ix. Faculty are contributing in few collaborative major research development projects under Somaiya Vidyavihar University and Michigan State University (SVU–MSU) global alliance, Databytes Systems and Services Pvt Ltd, Indian Meteorological department (IMD), Tata Power, ISRO etc.
- x. Startups and entrepreneurial culture is growing with few successful individual startups and under the guidance of Riidl.
- xi. Institute is continuously supporting faculty and students through all means required to grow and establish RD&C culture.

Strategic Growth Plan Goal 8 (SGPG 8).

Establishing International Center for Exchange of Knowledge and Information

For exchange of knowledge and information at international level, a Center will be established organising faculty and student exchange programs through summits, conferences, short term programs, credit courses etc and expanding the horizons in other areas of societal needs.

The targeted time duration for the same shall be 5th year onwards the SGP.

I. Current Scenario

The increased collaboration with organizations, institutions and industry for research, development and consultancies (RD&C) shall create a platform for international interactions through continuous efforts as elaborated in points 1 to 7.

- i. Increased RD&C culture shall be created with the improved support systems of external experts regularly visiting, motivating, guiding and interacting institute faculty and students.
- ii. Faculty and student groups together working on mini, minor, major project and/or product developments and consultancies and publishing their research contributions have already provided the awareness and exposure for them at national and international level.

The knowledge and information exchange center shall boost the morals for representing KJSIEITs RD&C caliber across the globe.

II. Plan of Action:

- i. Establishing international center for exchange of knowledge & information will take a step ahead in creating and providing an enhanced exposure in Project-based Learning by,
 - Strengthening the technical proficiency,
 - Communication and leadership skills,
 - Working in collaborative and interdisciplinary environment,
 - Sources for earnings and revenue generation through learning and research development in the areas of emerging technologies

- Shall also imbibe a sense of responsibility in students and faculty of the institute – ultimately fulfilling the vision of the institute.
- ii. The international center for exchange of knowledge & information will act as a global platform for
- Writing major Collaborative research proposals
 - Submitting these proposals to national and international research granting agencies and reputed research publication houses,
 - Developing and deploying sustainable solutions for public and private organizations in the domain of AI, Data Science, IoT, Cyber security etc.
 - Removing the barriers to open collaboration across the boundaries
 - Providing exposure to KJSIEITs students and faculty to represent RD&C world at international level.

Thus a world-leading research ecosystem can be created that leverages the varied strengths of individuals generating consultancies and becoming source for earning for the self and institute development as is the agenda of Ministry of Education for higher and Technical institutes under various initiatives.

Result

With the comprehensively identifies and defined strategic growth plan goals, continuous working on it, with regular monitoring and evaluation against the target settings, i.e. the constant and sustainable growth of the institute has resulted into the use of extensive powers of

emerging areas of technologies towards betterment of humankind. By working on the comprehensive suggestions and involvement of all the stakeholders of institute for realizing strategic growth plan goals has resulted into the progressive and sustainable growth of the institute, from all the aspects such as active industry involvement into industry ready hands on curriculum designing and persistent up gradation very year; orientation and field visits to industries; business case studies; industry projects for implementation in terms of mini, minor and major funded/non-funded project developments and paid internships; industry expert online and offline guest lectures; interactions and mentorship by industry managers; sharing experiences of successful entrepreneurs, free lancers and business consultancy services gave tremendous industrial exposure to institute students.

The technological skill development through skill based, activity based, technology based and exposure based learning has resulted into the pre-requisite to employability and improvements in student performance in communication, placement interviews, problem solving through design thinking, business-event correspondence, team building, team leading, professional and societal work ethics etc.

Conclusion

Strategic growth plan for KJSIT, has presented a road map of an engineering institute in the era of Emerging areas of science and technologies looking at continuous and sustainable development of the institute over certain time duration by utilizing its present strengths and skillsets. This article presented the blueprint towards achieving the vision and mission of the higher and technical engineering

educational institute of India by measuring the performance indicators of academics, pedagogies, administration, financial self-sustenance, skill based, activity based, project based and experiential learning through research and extension activities, making use of state of the art technologies and emerging areas for the overall growth of the institute, students and employees in the ever growing competitive automated world. The paper has concluded that the extensive use of emerging areas of powerful technological expansions by the institute through curriculum, research and extensive activities has resulted into earning while learning through consultancy assignments to students, financial self-sustenance to faculty and the institute and contributions of academic institution for developing India's long term sustainable growth.

The proved practices of KJSIT engineering academic institute working on nationwide initiatives in healthcare, education, agriculture, societal and need based automated project development solutions under the targeted sustainable growth of the institute which is excelling all together, transforming educational institute into a constant learning organization and has created a remark in the education sector which can adopted as a guiding framework by other developing engineering institutes in India.

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