Research Article

Unified Lifelong Technical Learning Integration with Structured Framework for The Technical Education System to Foster Expertise Using Academic Bank of Credit

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ARTICLE INFO	ABSTRACT
	In the dynamic landscape of India's technical sector, the concept of Lifelong Technical Learning (LTL) assumes paramount importance. With technology evolving at a rapid pace, it's crucial for technocrats to continually update their skills and knowledge to maintain competence. LTL, inspired by established educational practices, encompasses various activities such as live events, publications, and online programs aimed at enhancing proficiency. By implementing a robust registration and licensure renewal system, accountability and competence maintenance can be ensured using Academic Bank of Credit (ABC) portal. This proactive approach not only benefits individual technocrats but also fosters societal and scientific progress by catalyzing innovation and advancement. Embracing LTL facilitates adaptation to emerging technologies and fosters a culture of continual improvement, ultimately contributing to the overall development of the nation's technical ecosystem. Suggestive system with one case study and probable advantages and challenges are presented. **Keywords:** Lifelong Technical Learning (LTL), Technocrats, Academic Bank of Credit (ABC), Validity of Credit.

1. INTRODUCTION

Lifelong Technical Learning (LTL), akin to Continuing Medical Education (CME), is imperative for technocrats to remain abreast of advancements in their fields. Despite the influx of millions of engineers into the workforce and the presence of billions in various sectors, their expertise often remains confined to specific domains. **[1]** This myopic focus neglects peripheral areas, fostering reliance and inefficient resource allocation in workplaces. Mandating LTL can alleviate these challenges by ensuring continuous knowledge updates among technical professionals. Enforcing LTL could diminish dependence, resulting in cost efficiencies and potentially amplifying overall productivity. By broadening technocrats' skillsets and knowledge bases, LTL like CME **[2]** not only facilitates professional development but also augments organizational efficiency and global competitiveness.

LTL offers a standardized platform where regulations are established, mandating all technocrats to undergo periodic LTL sessions. Upon completion of the prescribed educational hours, technocrats have their registrations renewed every three to five years. The proposed Lifelong Technical Learning (LTL) initiative aims to support technical professionals in maintaining competence and staying updated with advancements in their fields. These activities encompass a variety of formats including live events, publications, online programs, and multimedia resources, with content curated and delivered by expert faculty from industry, academia, or research institutes. Similar to academic journals, measures are in place to address potential conflicts of interest among faculty members. While critics may raise concerns about biased sponsorship favoring certain products,

the benefits of LTL outweigh such criticisms. Technocrats across engineering fields stand to gain significantly from LTL, benefiting not only individuals but also organizations, institutions, society, and the nation as a whole. However, critics may also be there, as the critic in medical field is that the drug and device manufacturers often use their financial sponsorship to bias CME's towards marketing their own products. But the benefits are on higher side as compared to the critics and not only the individuals but also the organization, institutes, the society and the nation as a whole is going to get benefitted out of activities like LTL.

The proposed Lifelong Technical Learning (LTL) initiative targeting technocrats is an ambitious undertaking that requires careful planning and execution. The implementation of this project will be phased, beginning with the inclusion of recently graduated technocrats and eventually expanding to encompass all levels of expertise. Given the scale of work involved, a robust strategy for on-the-ground implementation must be devised. At the outset, the LTL project will commence at a national level, necessitating the establishment of a centrally operating commission. To lay the groundwork for this mission, several prerequisites must be addressed. Firstly, national and state-level bodies need to be formulated to facilitate coordination and governance. Additionally, existing technical personnel must be registered and provided with licenses, renewable periodically as per regulations set by the governing commission. Another critical prerequisite involves the registration of freshly graduated technocrats, who enter the workforce in significant numbers annually. Their inclusion is pivotal for the comprehensive implementation and nationwide dissemination of the LTL initiative. Once the renewal period for licenses is established, and registration processes are delineated, the development of a rating system and course curriculum becomes imperative. This rating system will determine the criteria for technocrats to accumulate points necessary for license renewal, fostering a culture of continuous learning. Furthermore, active promotion among various organizations, universities, institutes, and industries is essential to encourage the hosting of LTL programs and workshops. Institutes play a crucial role as facilitators, allowing fresh technocrats to apply for licenses through their respective educational institutions, thus distributing the registration workload. Lastly, the issuance of certificates and license renewals to applicants completes the prerequisites. Licensees will accrue points through participation in LTL activities, which will be instrumental in their license renewal applications. The employability status of engineers in India is already stated by many. **[3]**

In summary, the successful implementation of the LTL initiative for technocrats hinges on meticulous planning, adherence to prerequisites, and active engagement across various stakeholders. This comprehensive approach ensures the cultivation of a dynamic learning environment conducive to professional growth and development. It seems like you've outlined a comprehensive plan for the implementation of a Lifelong Technical Learning (LTL) program focused on technocrats. Let's break down the stages and prerequisites for implementation:

Stages of Implementation:
1. Establishment of National Operating Commission: Create a commission responsible for overseeing the implementation and regulation of the LTL program on a national level.

2. Formation of National and State-Level Bodies: Establish bodies at both national and state levels to assist in the coordination and execution of the program.

3. Registration of Technical Manpower: Register newly graduated technocrats, who enter the workforce annually, into the program. Register existing technical manpower, providing them with licenses for a stipulated period. Renew licenses periodically as defined by the regulatory commission.

4. Development of Rating System and Course Contents: Design a rating system to . evaluate technocrats' participation and performance in LTL activities. Develop comprehensive course contents to facilitate continuous learning.

5. Promotion and Engagement with Organizations: Encourage organizations, universities, institutes, and industries to conduct LTL programs, workshops, and courses. Institutes can facilitate registration for their students, sharing the burden of registration.

6. Awarding Credits and deciding expiry year: Issue certificates and renew licenses based on technocrats' participation and fulfillment of requirements.
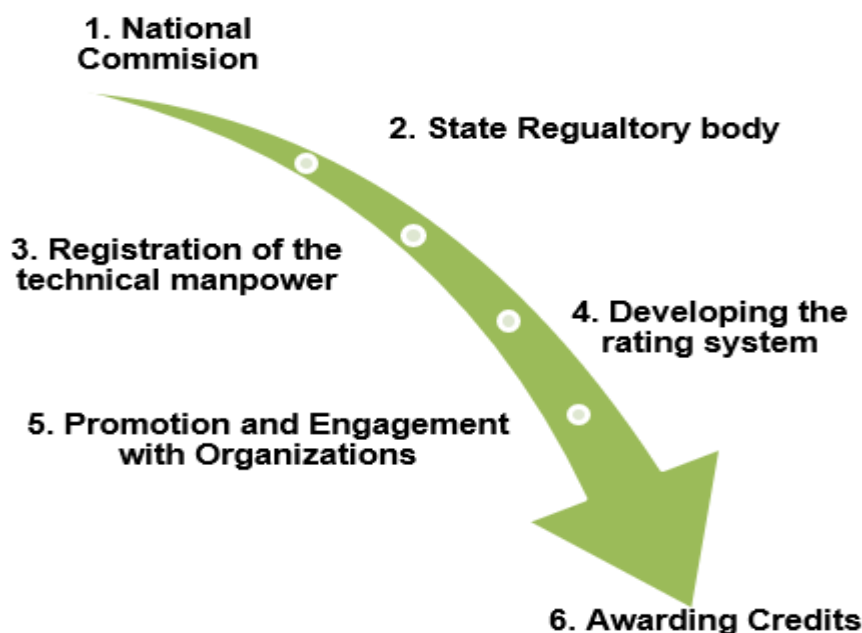
Figure 1 : TLT Implementation steps

2. Academic Bank of Credit (ABC) with Reference to NEP in India

The Academic Bank of Credit (ABC) in India represents a pioneering concept aimed at revolutionizing the educational landscape. It serves as a centralized repository for storing academic credits earned by students through various courses, allowing for seamless transferability and accumulation of credits across institutions and disciplines. This innovative system facilitates flexibility in education, enabling learners to chart their academic journey according to their interests, career goals, and individual pace. By consolidating academic achievements within a single platform, the ABC simplifies administrative processes and promotes efficiency in credit recognition and transfer, ultimately enhancing the accessibility and affordability of higher education. **[4]** Furthermore, it encourages Lifelong Technical Learning (LTL) by providing opportunities for individuals to accumulate credits over time, thereby facilitating continuous skill development and career advancement also stated in NEP2020 vision document of Government of India in directly or indirect way. **[5]**

Moreover, the ABC fosters inclusivity by accommodating non-traditional learners, such as working professionals and adult learners, who may require flexible learning pathways to pursue further education. Through its comprehensive framework, the ABC contributes to the democratization of education, promoting equal access to quality learning opportunities for all segments of society. As India continues to prioritize educational reforms and innovation, the Academic Bank of Credit stands as a beacon of progress, heralding a future where education is truly accessible, adaptable, and empowering for all.

3. LTL REQUIREMENTS

It seems like you're proposing a hierarchical structure for the implementation of LTL (Lifelong Learning) in India, involving both national and state regulatory bodies. Here's a breakdown of the proposed structure:
1. National Commission for LTL: This body would be formed with the help of the existing National Council for Technical Education. It would oversee the implementation of LTL at a national level.
2. State Directorates of Technical Education (DTE): Each state would have its own DTE, which would operate under the umbrella of the national commission. These directorates are well-connected with institutes in their respective states, making them ideal for facilitating the implementation of LTL on a local level.
3. Institutes: Institutes operating in each region would be involved in the implementation process. They would assist in the registration of fresh technocrats and the issuance of licenses.
4. CII (Confederation of Indian Industries): At the industrial level, CII would play a significant role. It would encompass all industries under LTL, with the possibility of adding state branches of CII to broaden the scope of LTL.

Here's how the hierarchy would flow:
- The National Commission for LTL would set overarching policies and guidelines.
- State DTEs would implement these policies at a regional level, working closely with institutes.
- Institutes would directly engage with technocrats for registration and licensing.
- CII would oversee the implementation of LTL within industries.

This proposed structure leverages existing infrastructure and expertise in technical education, application, and business to establish a comprehensive framework for LTL implementation in India. Only approval committee on ABC is added to confirm slandered certification or maintain quality level of degree / certificate / course, etc.

1. National Body of LTL

2. Approval cumittee on ABC

3. Technical Education state officials

4. Institutes and Industries
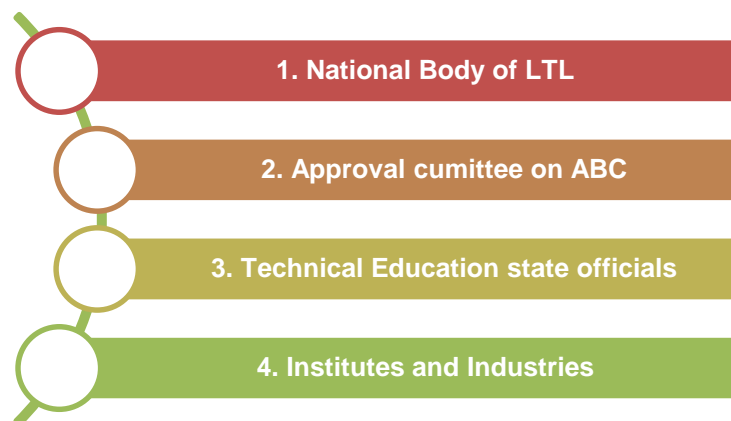
Figure 2 Hierarchy of implementing bodies

The initial step in the regulatory process involves the issuance of a unique registration number to each technocrat through the regional boards. This registration number, serving dually as a license number, encapsulates essential details such as the year of passing and the date of registration. This foundational identifier ensures a streamlined tracking system for technocrats within the professional landscape. Additionally, technocrats are mandated to engage in continuous professional development every three or five years, wherein they must accumulate a set number of rated points. These points are earned through participation in approved Lifelong Technical Learning activities, which encompass workshops, seminars, online courses, and other relevant forms of skill enhancement. The culmination of these efforts results in the attainment of a Lifelong Technical Learning Certificate, signifying the technocrat's commitment to ongoing learning and proficiency maintenance. The monitoring of these activities and the management of accumulated credits are facilitated through the ABC portal, a dedicated digital platform designed to oversee the professional advancement of technocrats. Complementing this framework is a meticulously crafted rating system, which serves as a qualitative assessment mechanism for evaluating the efficacy and relevance of the undertaken Lifelong Technical Learning measures. Through this comprehensive approach, the regulatory bodies aim to uphold the standards of excellence within the technocrat community while fostering a culture of lifelong learning and professional growth.

1. The first and the basic requirement through the regional boards are to provide a unique registration number to each technocrat. The registration number should include the year of passing, the date of registration.
2. The registration number will serve as the license number for the technocrat.
3. Every three or five years span the technocrat is supposed to collect some rated points.
4. A Lifelong Technical Learning Certificate is issued if within a period of 3 or 5 years prior to application the technocrat has completed lifelong technical learning measures the sum total of which reaches to specified credits
5. These will be monitored by ABC portal. The sample rating system to be implemented is discussed with the following text to understand the proposition clearly.

4. Rating System

The LTL is implemented using grades achievements by technocrats. There are various methods a technocrat can achieve credits, and many more can be added as and when required, which will be oral of Central body at national level. Tracks for that could be Like
Part A – Actual school learning
1.   By joining PG Degree / Ph D degree
2.   By joining Certification Courses / PG Diploma
3.   By joining additional single courses (online / offline)
Part B – By Research or such work
1.   By getting research grant
2.   By getting research paper
3.   By getting patent awarding
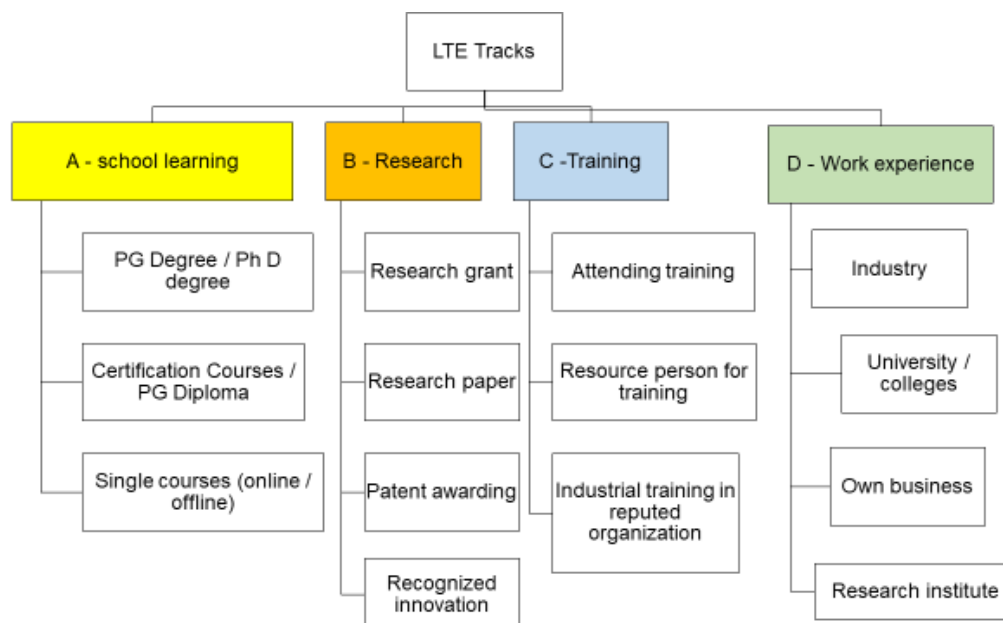4.   Recognized innovation

Part C – Training
1.   By attending training
2.   By joining as resource person for training
3.   By joining industrial training in reputed organization
Part D – Work experience
1.   At Industry
2.   At university / colleges
3.   At own business
4.   At research institute
The various categories are summarized in Fig.

Figure 3: LTE suggestive tracks

Lifelong Technical Learning Measures discussed above table only become the basis for awarding continual education certificate on furnishing the subsequent proofs.

Recognition of Measures: Recognition presumes that the Lifelong Technical Learning contents are communicated for keeping with the objectives of code of professional conduct and Lifelong Technical Learning regulations. How Credits are to awarded, as the suggestion given below in Fig. 4.

Figure 4 : Suggestive Credit awarding pattern

The sample case study is shown as below: Fig. 5

A person passed engineering examination in year 2015. After registering at ABC portal, he started his own business and is working for last 9 yrs. Meanwhile he completed his master's degree. He gets a research grant of 5 Lakh Rs from Govt. He also applied for a patent and it is awarded to him. He conducted a training at other organization for 3 days. It indicates he will be having validity till 2031.

The formula used will be:

Graduation year = Pass out year of graduation

Basic Validity = Validity of degree for basic stated years (5 Yrs.)

Total Credits earned = Sum of all category credits on ABC portal till date

Total years earned = Total credits / 10

Total validity up to = Graduation year + basic years + Earned years

Category	Credit	Value
PG Degree / Ph D degree	40 CR / Yr	80
Certification Courses / PG Diploma	40 CR / Yr	0
Single courses (online / offline)	40 CR / Yr	0
Research grant	1 CR / Lakh	5
Research paper	10 CR / Paper	0
Patent awarding	10 CR / Patent	10
Recognized innovation	10 CR / Innovation	0
Attending training	2 CR / 5 Days	0
Resource person for training	3 CR / Day	9
Industrial training in reputed organization	2 CR / 5 days	0
Industry	1 CR / Year	0
University / colleges	1 CR / Year	0
Own business	1 CR / Year	9
Research institute	2 CR / Year	0

Graduation Year	Basic validity years	Total CR	Dividing Factor 10 :	Validity = Basic years + Earned years	Validity till
2015	5	113	113/10 = 11	= 5+11 =16	2031

Figure 5 : A case study sample

5. Other parameters of LTL system

It's excellent that there's recognition of the importance of lifelong technical learning (LTL) and the various avenues through which it can be pursued. Here's a breakdown of the points you've mentioned:

1. Organizations Involved in LTL Activities:

 - Professional associations: These often provide seminars, workshops, and conferences focused on technical learning and development within specific fields.

 - Technical education agencies: Government bodies or organizations dedicated to technical education often offer courses, certifications, and training programs.

 - Industries: Many industries invest in ongoing training for their employees to keep their skills updated and relevant.

 - Educational institutions, including universities: Universities and colleges offer continuing education programs, workshops, and courses tailored to professionals looking to advance their technical skills.

 - Private Institutions: Companies specializing in training and development also offer courses and programs in various technical fields.

All activities are monitored carefully and pre-approved only.

2. Classification of LTL Activities:

 - Formal Learning Activities: These are structured programs like workshops, courses, and seminars provided by organizations.

- Process Improvement LTL (PI-LTL): This could involve activities aimed at improving learning processes within organizations to make them more effective and efficient.

- Informal Learning Activities: These include self-directed learning through internet research, participation in journal clubs, and other self-improvement initiatives.

3. National Program for Professional Certification:

- National Commission for Certification of LTL Professionals: This body would oversee the certification process for professionals involved in LTL planning.
- Certified LTL Professional (CLTLP) certificate: This certification would indicate that an individual has met certain standards of expertise in LTL planning and implementation.
 - Registry of Certified Professionals: Maintaining a registry helps to ensure that certified professionals are recognized and can be easily identified by employers and stakeholders.

Overall, having structured pathways for ongoing technical learning, along with professional certification, can greatly benefit individuals and industries alike by ensuring that skills remain up-to-date and relevant in rapidly evolving fields.

6. PROBABLE ACHIEVEMENTS OF LTL

These points outline the significant benefits that a well-implemented Lifelong Technical Learning (LTL) program could bring to technocrats and the technical field as a whole:
1. Parallels with Established Fields: By recognizing the importance of ongoing learning akin to fields like medicine and chartered accountancy, the technical field can ensure its professionals stay current and competent.
2. Keeping Pace with Technology: Given the rapid pace of technological advancement, an LTL program becomes essential for technocrats to stay abreast of new developments and innovations.
3. Technical Enrichment: Continuous learning opportunities allow technocrats to deepen their technical knowledge and skills, enhancing their expertise over time.
4. Cross-Functional Competence: Exposure to different aspects of technology, such as design and production, can broaden the perspective of technocrats and make them more versatile professionals.
5. Collaborative Problem Solving: Collaboration between researchers and industry professionals through LTL activities can lead to the development of solutions for real-world problems, contributing to national development.
6. Boost for Research: LTL programs encourage research activities and facilitate knowledge sharing, leading to advancements in technology and innovation.
7. Preventing Stagnation: Mandatory participation in LTL activities ensures technocrats remain active and engaged in their profession, preventing stagnation and encouraging continuous improvement.
8. Increased Participation: Making LTL participation mandatory can increase the number of beneficiaries and amplify the positive impact of such programs.
9. Enhanced Quality: Regulations promoting LTL can raise the overall quality of education and technological practices within the field, benefiting both professionals and society.
10. Cultivating Professionalism: Integrating learning as a fundamental aspect of professionalism instills a culture of continuous improvement with ethics [6] and lifelong learning among technocrats.
In summary, structured autonomy [7] with instituting a robust LTL program within the technical field can lead to a myriad of benefits, ranging from personal and professional development to societal progress and innovation.

7. PROBABLE CRITICS

It's understandable that the implementation of LTL regulations may face some resistance from certain industries. Here are some reasons why industries might initially resist such regulations:
1. Perceived Lack of Substance: Initially, some industries may view LTL regulations as unnecessary or lacking in tangible benefits, especially if they don't see immediate returns on their investment.
2. Resource Allocation: Industries may be reluctant to allocate both time and financial resources towards LTL activities, especially if they perceive them as additional burdens on their already stretched budgets and schedules.
3. Compliance Requirements: Technocrats within industries may feel pressured by mandatory regulations to comply with LTL requirements in order to maintain their licensure, which could be seen as an added administrative burden.
4. Commercial Interests: There might be concerns that industries involved in LTL activities could potentially use these platforms to promote their own products and services, which may raise questions about the neutrality and integrity of the learning environment.
5. Manpower Constraints: Industries may be hesitant to spare manpower for LTL activities, especially if it affects their operational efficiency or productivity. Mandatory regulations could help address this reluctance by ensuring participation across the board.
6. Careful balanced credit award system for quality work to be planned, otherwise road shops may be opened for awarding credits, and it might be uncontrolled matter in future.
Despite these potential challenges, there are several ways to address industry resistance and encourage participation in LTL initiatives:

- Education and Awareness: Providing clear information about the benefits of LTL and how it can positively impact industry productivity, innovation, and competitiveness may help alleviate concerns about its value.
- Incentives: Offering incentives such as tax breaks, grants, or other forms of support for industries that actively participate in LTL activities could encourage greater engagement.
- Collaborative Approach: Engaging industries in the development and implementation of LTL programs can help ensure that the initiatives are relevant, practical, and aligned with industry needs and priorities.
- Flexibility: Providing flexible options for participation in LTL activities, such as online courses or on-the-job training programs, can help accommodate industries' scheduling and resource constraints.
- Regulatory Support: Enforcing mandatory regulations for LTL participation, while initially met with resistance, can ultimately help establish a culture of continuous learning within industries and drive long-term benefits for both professionals and organizations.

By addressing these concerns and implementing strategies to foster industry participation, LTL initiatives can become more widely accepted and embraced as essential components of professional development within the technical field.

8. CONCLUSION

The proposed system of technical education draws inspiration from the existing Continuing Medical Education (CME) model, aiming to enrich technocrats with knowledge. The establishment of regulations would compel technocrats to regularly update their knowledge within their respective fields, thereby fostering a culture of continuous learning and research. This initiative is expected to serve as a catalyst for technological advancements. As a national mission, the implementation of Lifelong Technical Learning (LTL) requires collaboration between the central government and state directorates. ABC portal launched by government of India can be utilised effectively as base with digital India mission. Lots of challenges are also seen; few are stated with one sample case study to understand system better. Extensive planning and consideration are essential prior to implementation. Support from industry, research institutes, and government entities is crucial for the successful execution of this mission. Similar model can be implemented and thought of for other than technical education also.

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