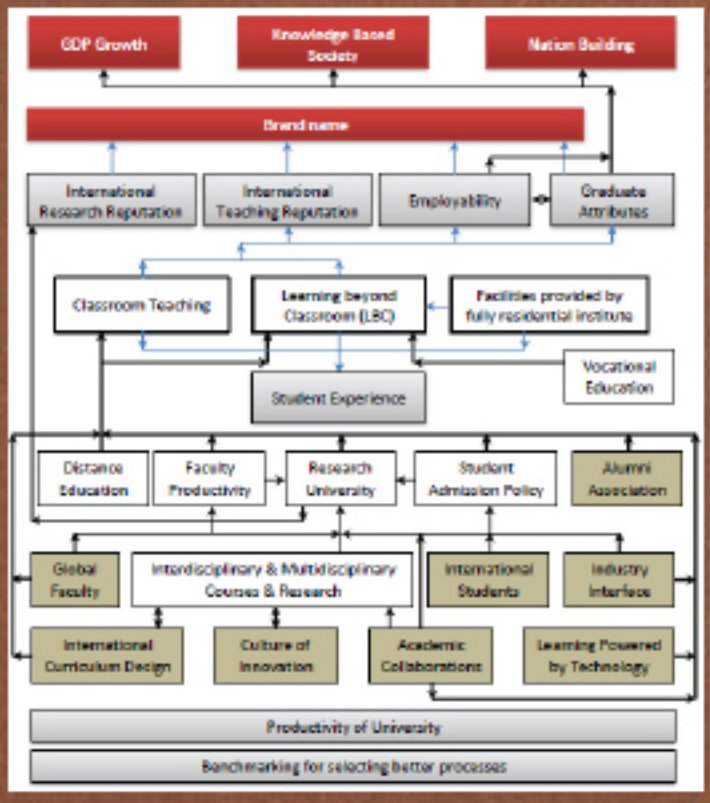
Fifth Title in the Series of Books on
World Class Universities or Institutes

Washington Accord & Multi-Objective Integrated Model for Developing WCU

World Class University

Focus on Globalization, Good Governance, Finance, GDP, Knowledge Based Society, Nation Building, Brand Name, Benchmarking, Productivity, Graduate Attributes and Employability etc.

Compiled By
Dr. Rajiv V. Dharaskar

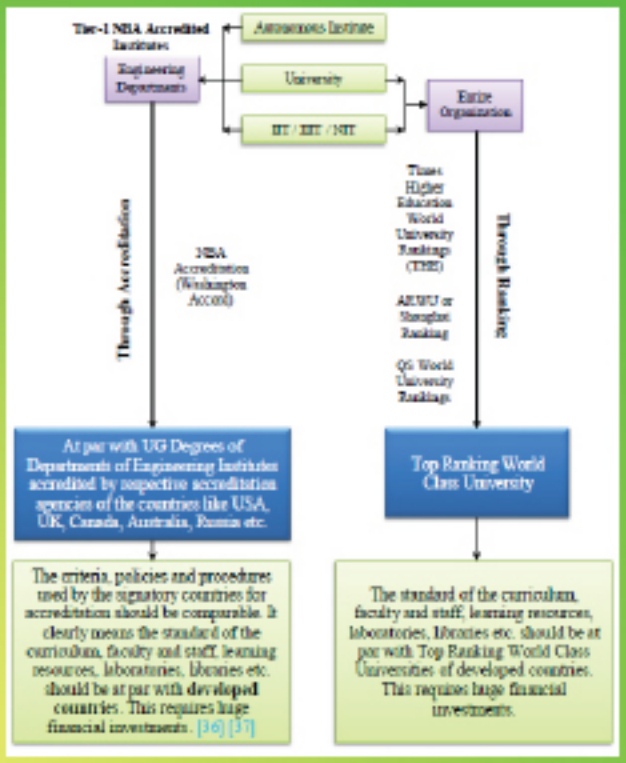


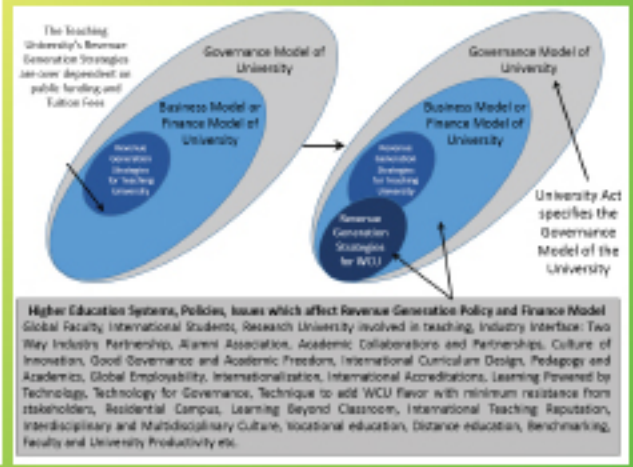
SPD

This book deals with Washington Accord along with
Multi-Objective and Multi-Parameter Based Integrated Model for Developing WCU which combines hundreds of Factors with Complex Inter Relationships among them

This book deals with Integrated Approach for developing WCU and Tier-1 Institutes under Washington Accord to achieve multiple objectives like:

- Globalization and Internationalization
- International Standards
- Financial Challenges
- Extended Governing Model and Finance Model
- Change Management processes
- Development of Multidisciplinary and Interdisciplinary culture
- Tightly coupled Distance Education with Academic programs
- Tightly coupled Vocational Education with Academics
- Enhancing the Brand Name of the Institute or University
- Teaching Reputation
- Research Reputation
- Enhancing Graduate Attributes
- Developing Global Employability at par with Developed countries
- 24x7 Teaching-Learning Activities through Learning beyond Classroom (LBC)
- Enhancing Faculty Productivity
- Enhancing Productivity of University or Institute
- Selection of best processes for optimizing financial investment through Benchmarking
- Selection of best legal framework and location
- Strengthening the National Economy and GDP through Knowledge Based Economy
- Relation of Global Economy and World Order with WCU
- Crucial and balanced admission policies and many more





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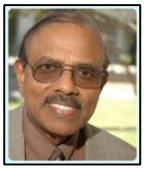
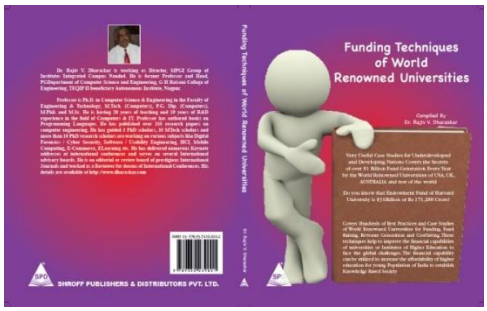
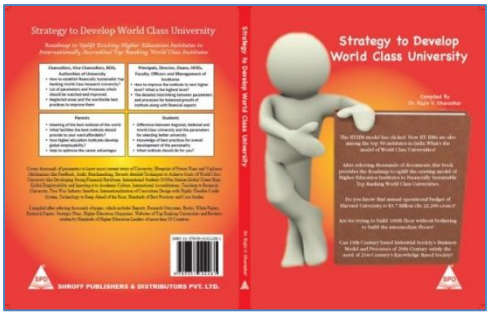
Dedicated To

Dignitaries who are taking keen interest in developing World Class Education and Universities in India	
Hon. Pranab Mukherjee President of India	
Hon. Narendra Modi Prime Minister of India	
Mr. Ashok Thakur Secretary, Department of Higher Education, India	
Dr. Dinesh K. Paliwal Former National Board of Accreditation (NBA) member secretary, India	
Dr. Raman Menon Unnikrishnan Dean of Engineering and Computer Science at California State University, Fullerton, USA	
The credit for making India a member of Washington Accord goes to many individuals who worked behind the scenes for years. Among them are Raman Menon Unnikrishnan of California State University, Fullerton, who pleaded India's case along with former National Board of Accreditation (NBA) member secretary Dinesh K Paliwal and education secretary Ashok Thakur. (Times of India)	

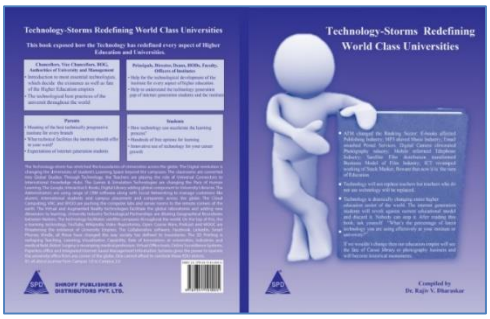
Published Books



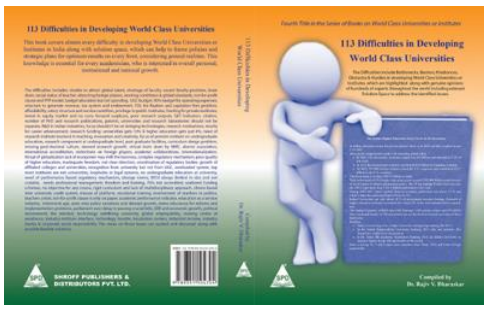
Funding Techniques of World Renowned Universities (204 pages, 251 References)



Strategy to Develop World Class University (500 pages, 444 References)



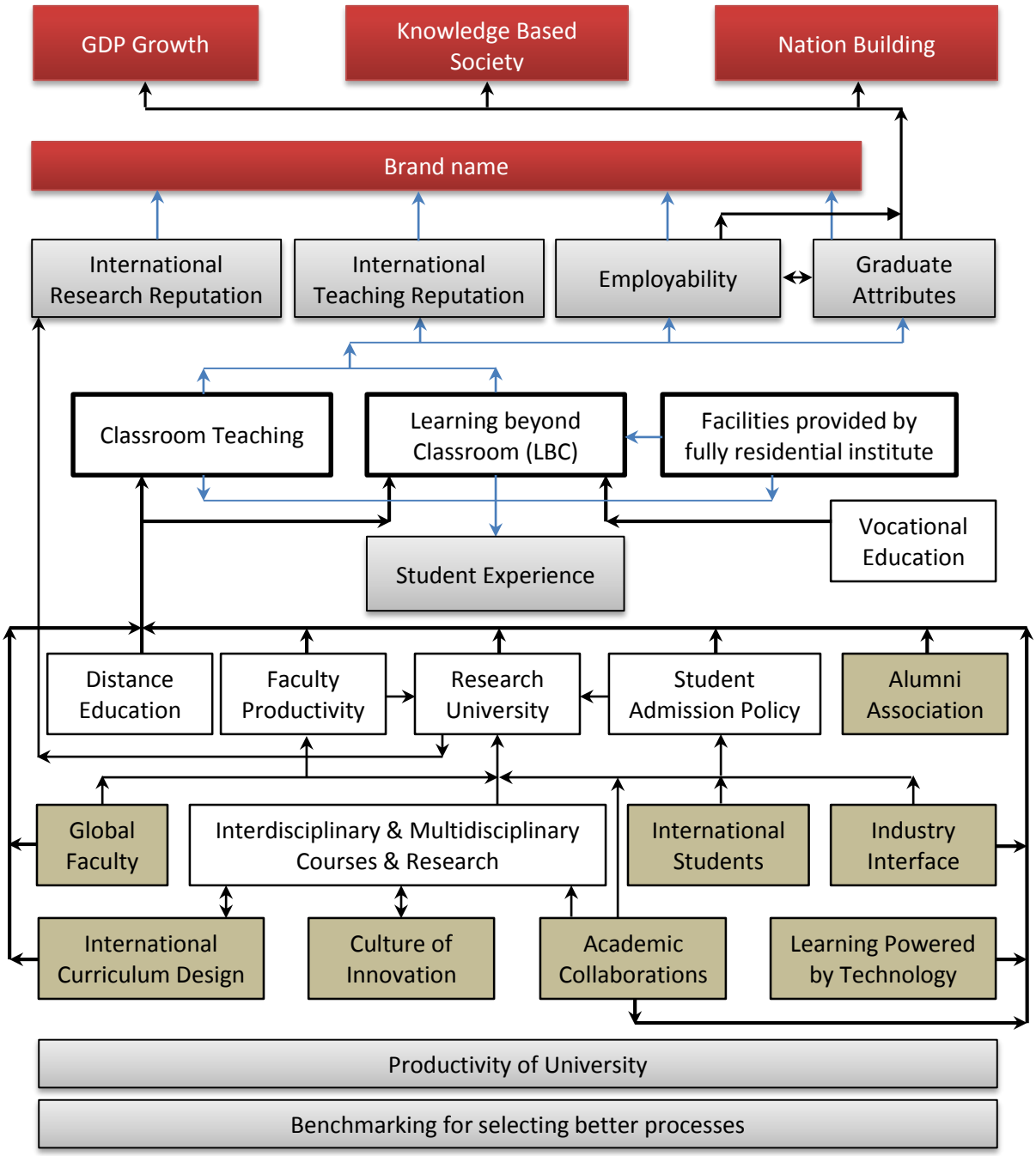
Technology-Storms Redefining World Class Universities (412 pages, 523 References)



113 Difficulties in Developing World Class Universities (319 pages, 345 References)
This book is available for FREE download at http://dharaskar.com/world-class-university-book-4.html

Preface

This book deals with Washington Accord along with Multi-Objective and Multi-Parameter Based Integrated Model for Developing World Class University (WCU), which combines hundreds of Factors with Complex Inter Relationships among them. I have tried to reveal this complex nature with the help of following diagram.



The topics covered in this book are very diverse in nature and one may apparently feel that they are not at all related to WCU or Tier-1 institutes under Washington Accord. I feel that, few concepts are easy to understand but difficult to digest. In initial stages, few reviewers of this book could not be convinced about my thought process behind this work. As per views and comments received, I had patiently rewritten these controversial chapters many times and finally could convince them through logical presentation. In this exercise, I had restructured the entire sequence of the book number of times. It was a herculean task and required lot of patience. This tedious job demanded full attention and thus without bothering the financial losses, I took a long sabbatical leave for completing this series of 5 books on WCU.

The globalization and Internationalization brings global competition and in turn introduction of the International Standards in every field. The academics is not an exception. I have highlighted this issue in the first Chapter. In the Chapter 16, I have continued the same topic and correlated the Global Economy and World Order with financial investment of WCU.

The Accreditation is better than Ranking Mechanism, which provides the international equivalence in more realistic way. Thus for India, the Washington Accord is very vital and crucial tool for enhancing the standards of technical higher education sector and in turn for the development of Knowledge Based Economy as well as for economic growth of the nation.

The membership of Washington Accord is an international recognition of the quality of undergraduate engineering education offered by the member country and is an avenue to bring it into the **world class category**. It ensures a **minimum global quality** for Tier-1 engineering institutions in India and thus require **huge financial investments like World Class University** (WCU). I have discussed this issue in the 2nd Chapter of this book.

To arrange this huge finance, new revenue generation policies are required, which will introduce many new higher education systems and will also affect the Finance Model of the University. The University Governance Model consist of Finance administration, Office administration and Academic administration. Change in Finance Model affects the Finance administration and eventually affects the office administration as well as academic administration. That is, to accommodate the new revenue generation policies there is a need to extend the University Governance Model. All these aspects have been covered in 3rd Chapter.

The human being always resists changes. Many changes are needed to attain world class education standards. If we try to change the existing system then the resistance from stakeholder is inevitable. I would like to propose a new technique with the help of Center of Excellence, which can introduce the World Class Research University Component without any opposition and without major modification in existing structure. The University Ranking Mechanism expects changes at entire University level whereas the Washington Accord expects changes at Department level. In both the cases there is a possibility of resistance of stakeholder. The proposed new technique neither directly affects working pattern of entire University nor it affects Departments. It brings changes through Center of Excellence. These issues have been discussed in the 4th Chapter of this book.

To enhance student's employability, to produce graduate attributes at par with the developed countries, to improve international teaching and research reputation there is a need to address many

issues and crucial policies. Many of them have been already covered in my previous four books. To avoid redundancy, in this book, I have not repeated the topics already covered in my previous four books. The **Chapter 5 to 16** covers only new topics and are applicable for developing WCU as well as Tier-1 NBA accredited institutes.

Following issues and policies are discussed in details in my book "Strategy to Develop World Class University"

1. Global Faculty (Chapter 8, pages 186-203)
2. International Students (Chapter 7, pages 138-185)
3. Research University involved in teaching (Chapter 11, pages 265-291)
4. Industry Interface: Two Way Industry Partnership (Chapter 10, pages 250-264)
5. Alumni Association (Chapter 13, pages 312-354)
6. Academic Collaborations and Partnerships (Chapter 15, pages 364-376)
7. Culture of Innovation (Chapter 19, pages 407-426)
8. Good Governance and Academic Freedom (Chapter 18, pages 399-306)
9. International Curriculum Design, Pedagogy and Academics (Chapter 12, pages 392-311)
10. Global Employability (Chapter 9, pages 204-249)
11. Internationalization (Chapter 17, pages 390-398)
12. International Accreditations (Chapter 16, pages 377-389)

The following issues are covered in details in my book "Technology-Storms Redefining World Class Universities"

13. Learning Powered by Technology (Chapter 1-9, pages 1-198)
14. Technology for Governance (Chapter 10-15, pages 199-332)

All the necessary topics related to new revenue generation techniques and Financial Model are covered in my book "Funding Techniques of World Renowned Universities"

The obstacles and hurdles for developing WCU are covered in my book "113 Difficulties in Developing World Class Universities"

In the **Chapter 5 to 16** of this book, I have discussed the new issues and topics, which are not covered in my previous books. These issues and crucial policies are:

15. Technique to add WCU flavor with minimum resistance from stakeholders
16. Residential Campus
17. Learning Beyond Classroom
18. International Teaching Reputation
19. Interdisciplinary and Multidisciplinary Culture
20. Vocational Education
21. Distance Education
22. Benchmarking
23. Faculty and University Productivity
24. Student Admission Policy
25. State Government Laws and Location
26. GDP, Employment and Employability
27. Globalization and Financial Aspects of WCU

I have compiled this information in the form of book for national interest. How to improve the university or higher education institute is always a major challenge faced by all the academicians. For helping them to find this information at one place, I have put these efforts and published series of five books. The credit of each point mentioned here goes to respective authors mentioned in the references. I am amazed to see their enormous contribution in the field of higher education. I could refer only few articles written by them and could include very few points in this book. For detailed information regarding any issue, please refer their original articles and if needed search their other articles on the Internet. This is not just 300 pages compiled work but pointers to articles of thousands of pages, contributed by authors, who have spent their lives for the cause of education of mankind. I am thankful to them.

I had introduced hundreds of problems, suggestions, remedies and best practices through my series of 5 books on World Class Universities, with more than **1700** pages and **1800** references. I have referred thousands of documents from around 30 countries and gone through beyond **3 Lakh pages**. With GOD's grace, I could reach to more than 5 Lakh academicians across the world and could ignite the minds of young faculty, researchers and students across the nation. In this pretty long journey, I was not alone. Thousands of academicians were constantly encouraging me to compete this gigantic task. I am thankful to them. The valuable comments of high profile readers are available at http://dharaskar.com/world-class-university-book-4.html

Many World Top 200 Ranking World Class Universities (2013-14 Times Higher Education) like California Institute of Technology (CalTech) (Rank 1), Massachusetts Institute of Technology (MIT) (Rank 5), Georgia Institute of Technology (Georgia Tech) (Rank 28), Korea Advanced Institute of Science and Technology (KAIST) (Rank 56), KTH Royal Institute of Technology (Rank 117), Tokyo Institute of Technology (Rank 125), Karlsruhe Institute of Technology (Rank 154) and Rensselaer Polytechnic Institute (Rank 181) are Universities but used the word Institute for University. Thus, throughout the series of these four books, I have followed the same convention and **used these words "University" and "Institute" interchangeably** at many places.

I have taken maximum care to give the authentic information but in case at some place, if you find some discrepancies then forgive me and help me to correct it in the next edition of this book. I am sure; the readers will like and welcome my sincere efforts to enhance the standards of higher education system. I hope this book will act as catalyst and will help in improving the overall higher education system, which can compete with the Universities in the developed countries.

Dr. Rajiv V. Dharaskar

About Author

He is Director, MPGI Group of Institutes Integrated Campus Nanded. He is former Professor and Head, PG Department of Computer Science and Engineering, G H Raisoni College of Engineering, TEQIP II beneficiary Autonomous Institute, Nagpur. He had started his career at MIET, Gondia (1984-2008).

He is Ph.D. in Computer Science & Engineering in the Faculty of Engineering & Technology, MTech (Computers), P.G. Dip. (Computers), M.Phil. and M.Sc. He is having 30 years of teaching and 22 years of R&D experience in the field of Computers & IT.

He is an author of the books

- "The Hidden Treasure of C" from BPB Publications
- "Funding Techniques of World Renowned Universities" from Shroff Publication
- "Strategy to Develop the World Class Universities", Shroff Publication
- "Technology-Storms Redefining World Class Universities", Shroff Publication
- "113 Difficulties in Developing World Class Universities", Shroff Publication

He has more than 260 research papers to his credit. He has guided 4 PhD scholars, 35 MTech scholars and more than 10 PhD research scholars are working on various subjects like Digital Forensics / Cyber Security, Software / Usability Engineering, HCI, Mobile Computing, E-Commerce, E-Learning etc. He has delivered numerous Keynote addresses at international conferences and serves on several International advisory boards. He is on editorial or review board of prestigious International Journals and worked as a Reviewer for dozens of International Conferences and journals. His details are available at http://www.dharaskar.com

Acknowledgement

I am thankful to hundreds of great authors for their wonderful articles and reports on higher education system in India and Abroad, which I have referred to compile this book of national interest. I am thankful to

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Brief Contents

Detailed Contents

Chapter 1: Internationalization, Globalization and International Standards

Globalization affects everything viz. Production, Processes, Technology, Goods, Commodities, Fund, Capital, Investment, Information etc. The worldwide tough competition force these resources to adopt the ***global standards****. It is applicable to Human Capital too. The Indian HE Sector has over neglected this issue.*

In practice, there is a growing market for internationalization and expansion in the segments of undergraduate and research ... The introduction of education as one of the service industries to be deregulated through the World Trade Organization's ***General Agreement of Trade in Services (GATS)*** *dramatizes the first trend. The other trend is related to a broader effort to develop international,* ***comparative standards*** *and information in many areas, from statistical data to accounting procedures, being stimulated by international organizations and multilateral agencies, such as OECD and the United Nations. [1]*

Internationalization and globalization lead to an erosion of the national regulatory and policy frameworks in which universities are embedded. [2]

1.1. Era of Globalization and Internationalization

Globalization, considered by many to be the inevitable wave of the future, **frequently confused with internationalization**, is in fact **something totally different**.

- Internationalization refers to the increasing importance of international trade, international relations, treaties, alliances, etc. Inter-national, of course, means between or among nations. The basic unit remains the nation, even as relations among nations become increasingly necessary and important.
- Globalization refers to global economic integration of many formerly national economies into one global economy, mainly by free trade and free capital mobility, but also by easy or uncontrolled migration. It is the effective erasure of national boundaries for economic purposes. International trade (governed by comparative advantage) becomes interregional trade (governed by absolute advantage). What was many becomes one. [3]

Globalization is an automatic and natural process, which can't be stopped. Whereas Internationalization can be controlled or restricted through laws of the region. The Globalization can replace the old regulatory mechanism by new world order or International regulatory mechanism.

Our world has become so quickly global and is not slowing down. The impact of globalization is invading each part of our daily lives in the home, workplace and society as a whole. Today is the era of globalization and internationalization. Changes at one corner of the world affect another corner. The Internet and Communication technologies played a major role in globalization. The competition has become global. Every industrialist is designing the product for international market and not for regional market. We may drive to work in a car designed in Italy, manufactured in Japan, assembled in India, electronics gadget from Korea, shipped by a Russian company, burns Middle Eastern oil and becoming one of the major cause for global warming. Let's see few examples.

- Stock Market shows the reflections of to global happenings, which includes political up and downs, wars, Economic fluctuations and natural calamities etc.
- Global Economy
- Variation of prices of electronics goods across the world
- Launch of new industrial product across the world for example Mobile, TV
- International Currency Exchange Rates
- Gold price
- Rate of Petroleum products fluctuate according to international conditions
- Automobile industry: design, manufacturing of part, assembling at different countries
- Film Industry: Releasing the film at a time across the world
- International Medical Tourism and International Sports
- Outsourcing of services: For example, the Apple has shipped the manufacturing of the iPhone and the iPad to China
- Fashion design and Food habits
- Chain of Retail Mega mart like Walmart, which is an American multinational retail corporation that runs chains of large discount department stores and warehouse stores across the world. It has over 11,000 stores in 27 countries. The company is the world's largest public corporation,

according to the Fortune Global 500 list in 2014, the biggest private employer in the world with over 2.2 million employees. For the fiscal year ended January 2014, Walmart increased net sales by 1.4% to $473 billion. [4] [5]

1.2. Impact of Globalization: Old Kingdoms Can Disappear

In 1982, Maruti Udyog Ltd. (MUL) came up as a government initiative in collaboration with Suzuki of Japan to establish volume production of contemporary models. It's a starting point of Globalization of Automobile Industry in India. Prior to this only two companies dominated the Indian Automobile market namely Fiat and Ambassador. After the lifting of licensing in 1993, 17 new ventures have come up of which 16 are from manufacturing sector of cars. The Indian Auto Industry and the Auto component industry is suddenly exposed to the vast international market as an opportunity and to Global competition in large scale. The industry has worldwide business opportunity and the threats from Mega suppliers who are more equipped to compete. After 20 years the scenario of Indian Automobile industry has dramatically changed. Many world class automobile brands (Ford, Hyundai, Renault, Mitsubishi, BMW, Daimler, Caparo, Mini, Datsun, General Motors, Volkswagen, Skoda, Mercedes Benz, Land Rover, Jaguar Cars, Honda, Toyota and Chevrolet) are dominating Indian market and old kingdoms of Fiat and Ambassador had disappeared. This industry currently accounts for nearly 4% of the GNP and 17% of the indirect tax revenue. The Indian Automobile Industry has been one of the major contributors for Indian economy due to its revenue generation and employment potential. [6]

1.3. Effect of Globalization on Academics

The academics is not the exception. Throughout the world the Globalization has changed almost every aspect of Academics.

Director of TCS' Global Consulting Practice (GCP), Mr. Venguswamy Ramaswamy said that "**The campus would see the same fate that branches and ATMs saw in banking**". [338]

"The third and most significant megatrend is **globalization**. The startling revolution in transportation and communication technology has brought the world closer together than ever before. The effects of this revolution have been felt not only in the economic and political spheres but also in **academia**". [7]

The Globalization has affected the Learning Habits of students. I have covered this topic in Chapter 1 to 9 of my book "Technology-Storms Redefining World Class Universities".

In the presentation at UNESCO Expert Meeting, Dirk Van Damme discussed the impact of globalization on higher education (see following figure). [8]

Fig. 1.1: Dirk Van Damme presentation at UNESCO Expert Meeting [8]

Fig. 1.2: How Globalization affect universities? [9]

The emergence of a **global economy** due to increased trade, investment and mobility of people and, more recently, work across borders has forced nation states to adapt their systems of higher education to the changed global realities. Rather than continuing with their inward looking policies, several countries are reshaping their systems of higher education for making them globally competitive. Pragmatism, rather than ideology, is driving this change.

- The United States of America (USA) has major plans for investment in higher education.
- The United Kingdom (UK) has injected new dynamism in the higher education sector through competition and incentives.

- China has undertaken a package of comprehensive reforms in higher education for over the past two decades. The government in China has declared education, science and technology to be the strategic driving forces of sustainable economic growth. [10]

The Globalization has changed the entire university system. It has changed the learning habits of students of knowledge based economy of 21st century. The detailed discussion is available in my book "Technology-Storms Redefining World Class Universities".

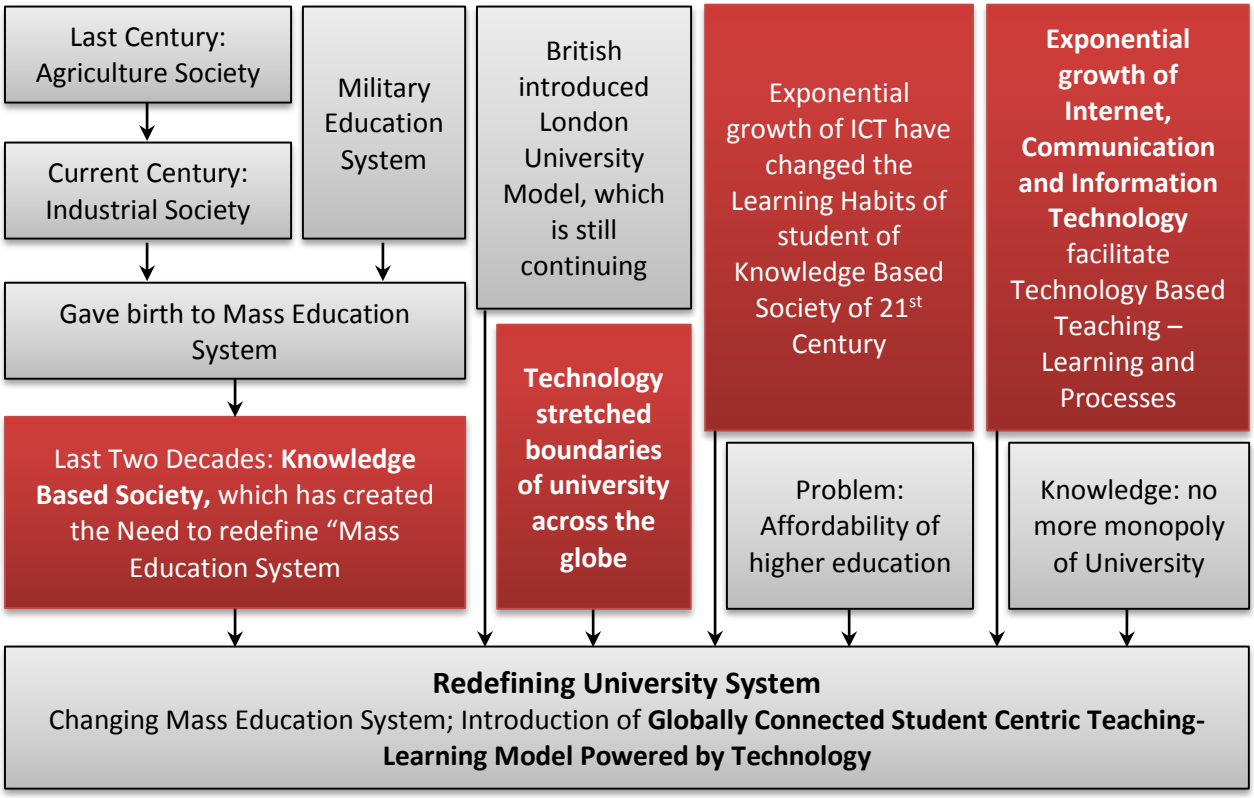


Fig. 1.3: Globalization is redefining the University System

Fig. 1.4: Transition of Society

Ernst & Young's report stated that "The higher education sector is undergoing a fundamental transformation in terms of its role in society, mode of operation, and economic structure and value. To explore these themes and future directions, we have conducted an industry-wide study of the main forces impacting the **higher education industry globally and locally**, and the opportunities, challenges and implications for Australian universities. [336]

Ilkka Tuomi, Riel Miller have discussed the concept of **redefining the education model** nicely in their research paper "Learning and Education after the Industrial Age". They stated that "**Each historical era creates a system of education that addresses its needs**. In the 19th century, the educational revolution was driven by a radical shift from family-centric production to manufacturing and industrial organization, and the associated rapid urbanization and social mobility in industrializing countries. In this process, the home, the workplace, community life, and the church lost many of their earlier functions in the educational system. The school became a central institution in education, to the extent that we now often think that education equals schooling. **At present, the knowledge society transformation is again changing the system of education.** To understand these changes and their implications, we have to understand the fundamental needs that education addresses in society". [337]

Report to the European Commission on "Improving the quality of teaching and learning in Europe's higher education institutions" (June 2013) stated that "One major change in recent decades is the **massive internationalization and even globalization of science, economics and politics**. This development is likely to continue, accelerate and expand into ever more sectors of our public and private life – predominantly in the labor market – driven not only by the exponential growth of world trade, global capital investment and human mobility, but even more so by new media. **This development will not only impact on the content of traditional subjects ('the international dimension') but also change the ways of delivery and reception**. Any serious discussion about teaching and learning within the perspective of lengthening lifespans – most of Europe's students today will live to see the year 2080 – has to deal with the impact of globalization on education, including higher education". In short, global competitiveness and global cooperativeness are core aims for teaching and learning which aim to equip students for peaceful and healthy lives in the 21st century. For our higher education institutions, that means that 'Internationalization' – which has long been seen as a 'luxury add-on' – must move into the very centre of the university or college strategy and development. At the same time, the definition of 'internationalization' which has often been limited to the recruitment of international students, must be extended into a new holistic approach, where its impact on the overall quality of programmes and graduates is reflected in the globally interconnected and intercultural learning outcomes. In practice, this means student and staff mobility (incoming and outgoing), the international dimension of curricula, the internationalization of the campus, a positive and efficient approach to foreign language learning, transnational delivery of courses and degrees (offshore branches, distance education, MOOCs), international networks, alliances and partnerships and so forth. This should be put together to form an explicit 'Internationalization Strategy' of universities and colleges, which in turn, must be an integral part of the overall mission and strategy of the individual higher education institution. [351]

Higher education institutions should develop and implement holistic internationalization strategies as an integral part of their overall mission and functions. Increased mobility of student and staff, international dimension of curricula, international experience of faculty, with a sufficient command of English and a second foreign language and intercultural competences, transnational delivery of courses and degrees, and international alliances should become indispensable components of higher education in Europe and beyond. [351]

1.4. ISB Hyderabad: Classic Example of Impact of Globalization on Indian Academics

The **ISB Hyderabad** is the **best example for Globalization effect on academics**. ISB Hyderabad is the World Top Ranking B-School and could establish its brand without bothering Indian regulatory mechanism. It's all because of Globalization, Internationalization of Institute (Tie ups with global brands like Kellogg School of Management, The Wharton School and London Business School), followed the International Standards and International Accreditation. For more details please refer the Chapter 12 of my book "113 Difficulties in Developing World Class Universities".

1.5. Global Economy: Jobs Can Go Anywhere

US President Barack Obama has said while stressing on education reforms to prepare Americans for a **global economy** where "**jobs can go anywhere**." He said that "We live in a 21st century global economy. And **in a global economy, jobs can go anywhere**. Companies, they are looking for the best-educated people, wherever they live, and they will reward them with good jobs and good pay…..**Now you have got billions of people from Beijing to Bangalore to Moscow, all of whom are competing with you directly**. And they are -- those countries are working every day to out-educate and out-compete us……We need to bring down the cost of college and give more young people the chance to go to college…..In previous generations, America's standing, economically was so much higher than everybody else's that we did not have a lot of competition." [11]

Lakshmi Narayanan, Vice Chairman of Cognizant, stated that "The Indian labor market is in the midst of an era of rapid expansion. Recent studies—by the International Labor Organization (ILO), Lieberman Research Worldwide (LRW), and McKinsey Global Institute—have characterized India as one of the world's "young" developing economies that are expected to **lead global labor force growth through 2030**, with a nearly **60 percent share**. India alone will account for a **net addition of 174 million workers** to the global labor force between 2010 and 2030, compared to 132 million between 1990 and 2010." [12]

1.6. Internationalization: Missing Link of Indian HE Sector

Unfortunately the Indian Higher Education sector couldn't focus on Globalization and International Standards, except very few. They have capability but neither government nor private sector is seriously involved in this direction. They are primarily involved and focusing only the local or regional market. To remain in global competition the scenario must change. Indian Higher Education could not properly focus on

- International Students
- International Faculty
- Internationalization of Curriculum Design

- Global Employability
- MOU with Global Industry and Academics
- International Alumni Activities
- International Accreditation and Ranking
- International Higher Education Standards
- Global Funding Resources
- Use of Technology etc.

No doubt that, few of the higher education institutes have shown interest in global academic tie ups recently but it is limited in nature.

The main fear is "Internationalization and globalization lead to an erosion of the national regulatory and policy frameworks in which universities are embedded". [2] [8]

I have discussed these topics in details in my book "Strategy to Develop World Class University".

1.7. International Standards: Dominated Every Field

The process of globalization and international competition gave birth to international standards. If you like to enter in the international market then local standards are not useful. You will have to follow global rules. Just see the world with open eyes, you will find the international standards are dominating every field. For example,

- ISO Standards: ISO has developed over 19,500 International Standards and all are included in the ISO Standards catalogue.
    - Generalities, Terminology, Standardization, Documentation
    - Services, Company Organization, Management And Quality, Administration, Transport. Sociology
    - Mathematics. Natural Sciences
    - Health Care Technology
    - Environment. Health Protection, Safety
    - Metrology and Measurement, Physical Phenomena
    - Testing
    - Mechanical Systems and Components for General Use
    - Fluid systems and Components for General Use
    - Measurement of Fluid Flow
    - Manufacturing Engineering
    - Energy and Heat Transfer Engineering
    - Electrical Engineering
    - Electronics
    - Telecommunications. Audio and Video Engineering
    - Information technology, Office Machines
    - Image Technology
    - Precision Mechanics, Jewelry
    - Road Vehicles Engineering

  - Railway Engineering
  - Shipbuilding and Marine Structures
  - Aircraft and Space Vehicle Engineering
  - Materials Handling Equipment
  - Packaging and Distribution Of Goods
  - Textile and Leather Technology
  - Clothing Industry
  - Agriculture
  - Food Technology
  - Chemical Technology
  - Mining and Minerals
  - Petroleum and Related Technologies
  - Metallurgy
  - Wood Technology
  - Glass and Ceramics Industries
  - Rubber and Plastic Industries
  - Paper Technology
  - Paint and color industries
  - Construction Materials and Building
  - Civil Engineering
  - Military Engineering
  - Domestic and Commercial Equipment, Entertainment, Sports [13] [14]
- IEEE standards: The Institute of Electrical and Electronics Engineers Standards Association (IEEE-SA) is an organization within IEEE that develops global standards in a broad range of industries, including:
  - Aerospace Electronics
  - Antennas
  - Biomedical
  - Communications
  - Computer Technology
  - Consumer Electronics
  - Electromagnetic Compatibility
  - Green & Clean Technology
  - Healthcare
  - Information Assurance
  - Information Technology
  - Instrumentation & Measurement
  - IT Industry Applications
  - Nanotechnology
  - National Electrical Safety Code
  - Nuclear Power
  - Power & Energy
  - Power Electronics
  - Propagation Batteries
  - Smart Grid Software
  - Systems Engineering Transportation

  - Telecommunication
  - Transportation
  - Wired & Wireless [15] [16]
- CMM Level 1 to 5: Capability Maturity Model (CMM) was developed by the SEI at Carnegie Mellon University in Pittsburgh. CMM can be used to assess an organization against a scale of five process maturity levels. Each level ranks the organization according to its standardization of processes in the subject area being assessed. The subject areas can be as diverse as
  - Software Engineering
  - Systems Engineering
  - Project Management
  - Risk Management
  - System Acquisition
  - Information Technology (IT) Services
  - Personnel Management. [17]
- ASTM: International, formerly known as the American Society for Testing and Materials (ASTM), is a globally recognized leader in the development and delivery of international voluntary consensus standards. Today, some 12,000 ASTM standards are used around the world to improve product quality, enhance safety, facilitate market access and trade, and build consumer confidence. ASTM's leadership in international standards development is driven by the contributions of its members: more than 30,000 of the world's top technical experts and business professionals representing 150 countries.
  - Iron and Steel Products
  - Nonferrous Metal Products
  - Metals Test Methods and Analytical Procedures
  - Construction
  - Petroleum Products, Lubricants, and Fossil Fuels
  - Paints, Related Coatings, and Aromatics
  - Textiles
  - Plastics
  - Rubber
  - Electrical Insulation and Electronics
  - Water and Environmental Technology
  - Nuclear, Solar, and Geothermal Energy
  - Medical Devices and Services
  - General Methods and Instrumentation
  - General Products, Chemical Specialties, and End Use Products
  - Driving Quality and Safety in the Automotive Industry
  - Technical Resources for Oil Spill Response
  - Consumer Product Standards
  - Energy Standards
  - Environmental Safety Standards
  - Alternative Energy Standards
  - Standards for Medical and Surgical Materials and Devices
  - Safe and Sustainable Highways with ASTM Standards
  - Water [18] [19]

- International Federation of Accounts (IFAC): The final set of clarified standards comprise 36 International Standards on Auditing (ISAs) and International Standard on Quality Control (ISQC) [20]
- W3C — World Wide Web Consortium
- WMO — World Meteorological Organization
- OHICC — Organization of Hotel Industry Classification & Certification [21]

The list is unending and beyond the scope of this book. The international standards are strict and rigid in nature and can't be diluted for political or personal interests.

1.8. Indian Higher Education: Be Ready for International Standards, Can't Escape

The Indian Higher Education Sector can't escape from Globalization and International Standards. The first major shock came from the "**World University Ranking**", which has disappointed the entire Indian Higher education sector.

The **Washington Accord** is our initiative, which will evaluate our technical higher education system with global standards. Hereafter we need to be prepared for such shockwaves. The Sydney Accord and the Dublin Accord can be in a waiting list.

The **Foreign University Bill** is on 100 days agenda of MHRD. It will be the third shock. It will be a Tsunami for Indian Higher Education sector.

Out of 3952 Indian B-Schools, already following 20 B-schools are internationally accredited. [22]

SN	Business School
AMBA (Association of MBAs)	
1.	Management Development Institute (MDI), Gurgaon
2.	IIM Kozhikode
3.	IIM Lucknow
4.	SP Jain Mumbai
5.	International Management Institute (IMI) Delhi
EQUIS (European Quality Improvement System)	
6.	IIM Ahmedabad
7.	IIM Bangalore
IACBE (International Assembly for Collegiate Business Education)	
8.	Alliance University, Bangalore
9.	Acharya Institute of Management and Sciences,
10.	Ramaiah Institute of Management Studies, Bangalore
ACBSP	
11.	PSG Institute of Management (PSGIM), Coimbatore
12.	Institute of Computers and Business Management - School of Business Excellence (ICBM-SBE), Hyderabad
13.	Amity University Noida
14.	Apeejay School of Management
15.	Jansons School of Business, Coimbatore, Tamil Nadu

16.	Ramaiah Institute of Management Studies, Bangalore, Karnataka
17.	Regional College of Management Autonomous, Bhubaneswar, Orissa
18.	School of Communication and Management Studies (SCMS), Cochin, Kerala
AACSB (Association to Advance Collegiate Schools of Business)	
19.	Indian School of Business (ISB), Hyderabad
20.	T A Pai Management Institute, Manipal (TAPMI) Karnataka

Table 1.1: List of Internationally accredited Indian Business Schools [23] [24] [25] [26] [271] [28] [29] [30] [31]

At present only two Indian University are ABET (USA) Accredited, namely VIT University and SRM University. [32] [33] [34] [35]

Every year, the new international standard will invade the higher education sector. No one can stop it. We should be prepared to remain in the international competition.

Any industry, which is selling the products in international market, will have to follow the international standards to remain in global competition. The passed out student is the product of Higher Education Industry and millions of Indian students are trying for global employment or opting for International Higher Education. Thus to remain in global competition, the Indian HE sector will have to prepare for the Higher Education International Standards, which are not flexible and can't be diluted for the interest of any section of society.

Chapter 2: Washington Accord, NBA Accreditation, World University Rankings & Huge Financial Investments

Every sector in Indian economy is dominated by International Standards, except Higher Education. The Washington Accord and World University Ranking may change the scenario but the Higher Education as per International Standards need huge financial investments.

In a country where anything foreign is highly valued, it looks like the NBA has used WA as ***a tool for overhauling the engineering education system****. This is perfectly fine as long as NBA achieves its goal of improving technical education in the country… While India's entry into WA is appreciated, it should not end up becoming a* ***marketing tool****. [36]*

Nearly more than 50 percent of the Indian institutions would not be able to meet the Washington Accord standards. [37]

2.1. Tier-1 Institutes and WCU: Need Huge Financial Investment

As per information on NBA website "The membership of Washington Accord is an international recognition of the quality of undergraduate engineering education offered by the member country and is an avenue to bring it into the world class category". [38]

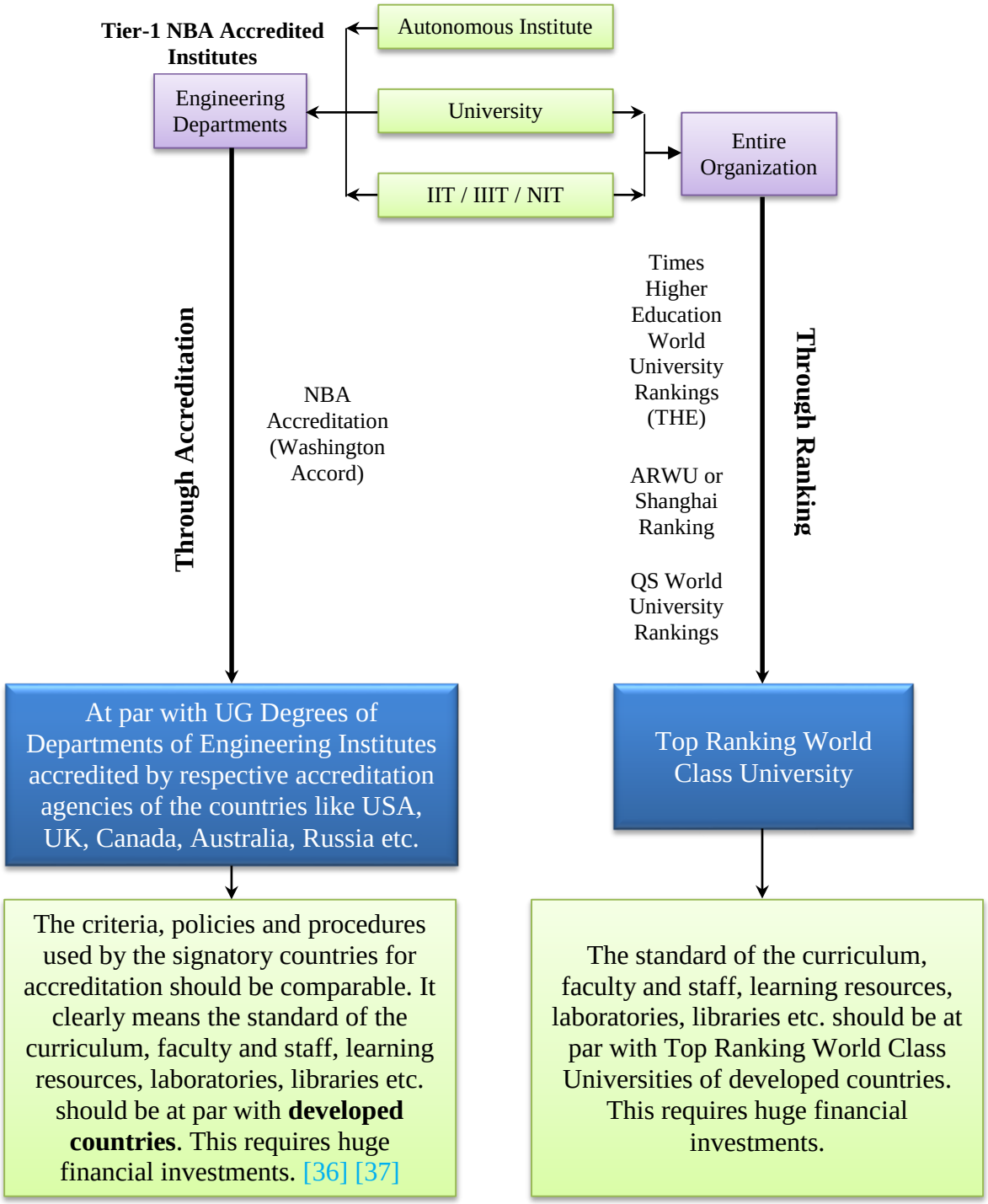


Fig. 2.1: WCU and Tier-1 Institutes: Need Huge financial investments

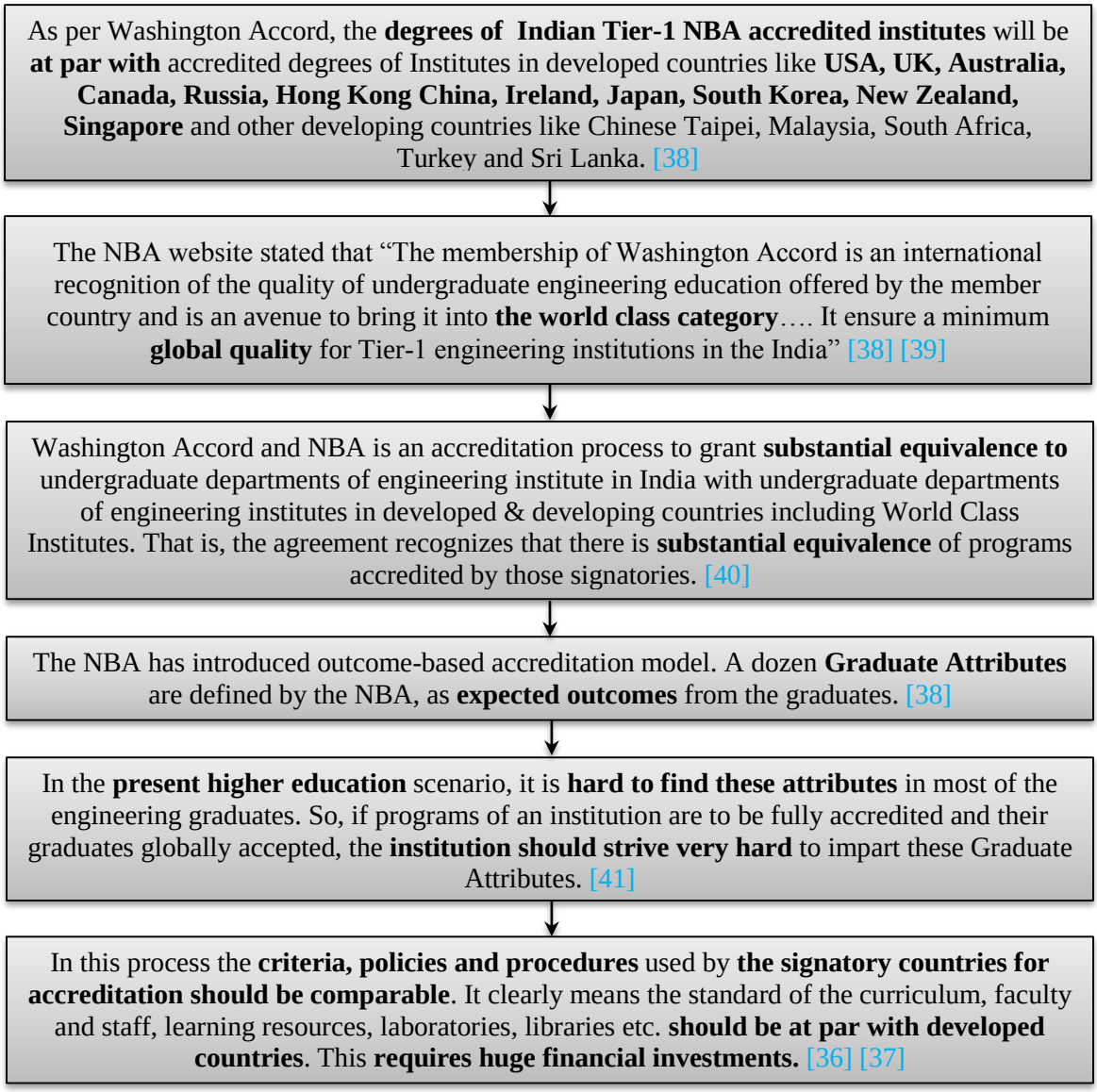


Fig. 2.2: "NBA accredited Tier-1 institutes" and "Top Ranking World Class Universities" need huge Financial Investments.

Let's see the Washington Accord and new NBA accreditation model in details.

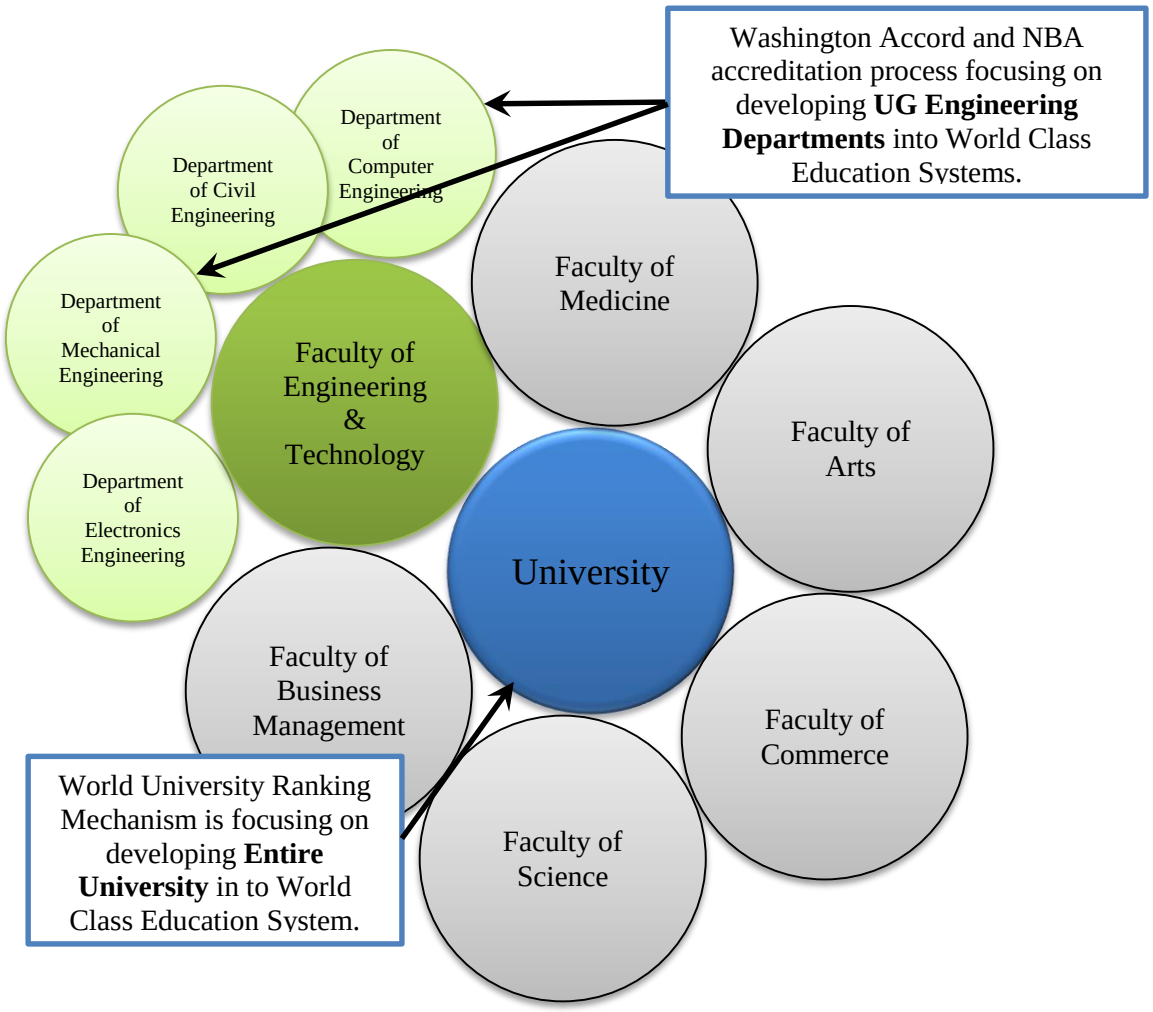


Fig. 2.3: Accreditation Process under Washington Accord focuses on UG Engineering Departments whereas University Ranking Mechanism focuses on Entire University

2.2. Washington Accord: Only Tier-1 Institutes Will be Benefited

After years of efforts and several failures, India finally became the 17th member of the exclusive Washington Accord. It will help create equivalence of engineering degree programmes and allow Indians to practice engineering in other member countries. This decision was taken at the meeting of the International Engineering Alliance in Wellington, New Zealand on June 13 2014. This is applicable with immediate effect. [42]

Washington Accord Status Table

Country	Institution	Year of joining
Australia	Engineers Australia	1989
Canada	Engineers Canada	1989
Chinese Taipei	Institute of Engineering Education	2007
Hong Kong China	Hong Kong Institution of Engineers	1995
Ireland	Engineers Ireland	1989
Japan	Japan Accreditation Board for Engineering Education	2005
Malaysia	Board of Engineers Malaysia	2009
Korea	Accreditation Board for Engineering Education of Korea	2007
New Zealand	Institution of Professional Engineers NZ	1989
Russia	Russian Association for Engineering Education	2012
Singapore	Institution of Engineers Singapore	2006
South Africa	Engineering Council of South Africa	1999
Turkey	MUDEK	2011
United Kingdom	Engineering Council UK	1989
United States	Accreditation Board for Engineering and Technology	1989
India	National Board of Accreditation (Applies only to programmes accredited by NBA offered by education providers accepted by NBA as Tier 1 institutions.)	2014
Sri Lanka	Institution of Engineers Sri Lanka (2014)	2014
	Provisional Members *	
Bangladesh	Board of Accreditation for Engineering and Technical Education	
China	China Association for Science and Technology	
Peru	ICACIT	2014
Pakistan	Pakistan Engineering Council	
Phillipines	Philippine Technological Council	

compiled by SEAA www.seaastandards.org from Washington Accord data 2009 www.washingtonaccord.org

Table 2.1: Washington Accord Status Table [43]

Washington Accord will, however, not be valid for IT engineers. India will have to sign the Seoul Accord to create similar equivalence of programmes. Becoming part of Washington Accord also does not necessarily mean that all engineering degrees by all Indian colleges will get equivalence with those of other member countries. NBA has shortlisted **220-odd engineering colleges** as Tier-I institutes whose undergraduate engineering programme is in tune with what is required under the Accord. [42]

But even **Tier-I institutes** which include IITs/NITs/BITS Pilani besides many autonomous and deemed universities will now have to apply afresh to NBA and only after extensive verification of their programmes will they be declared fit to be part of Washington Accord institutions. A massive redesigning of course will take place with emphasis on outcomes and letting students explore and innovate. [42]

For the crowded list of **Tier-II institutions**, NBA has given a roadmap so that they are well prepared to become members of Washington Accord. NBA has asked universities to allow affiliated engineering colleges to design at least 50% of the course. For instance, Washington Accord lays emphasis on teaching social sciences along with engineering. [42]

NBA follows nine parameters in its accreditation process, which includes programme outcome, curriculum, students' performance and faculty contribution. **Non-autonomous institutions, which fall under Tier-2 category, are also allowed to apply for Tier-1 accreditation**. [44]

The Washington Accord, originally signed among **six countries** in 1989, is an International Agreement among bodies responsible for accrediting undergraduate engineering degree programs. It recognizes the substantial **equivalency of programs** accredited by those bodies and recommends that graduates of programs accredited by any of the signatory bodies be recognized by the other bodies as having met the academic requirements for entry to the practice of engineering in the area of their jurisdiction. The membership of Washington Accord is an **international recognition** of the quality of undergraduate engineering education offered by the member country and **is an avenue to bring it into the world class category**. It encourages and facilitates the mobility of engineering graduates and professionals at international level.

- National Board of Accreditation, **India has become the permanent signatory member of the Washington Accord on 13th June 2014**.
- The **NBA accredited programmes offered by the Tier-1 Institutions** are eligible for the recognition of the programmes by other signatories of the Washington Accord.
- Recognition of graduates of programmes accredited by any signatory by registering or licensing bodies in other signatory jurisdictions is subject to the following restriction. The graduate must have completed the programme:
    - After the date of acquiring the signatory status, i.e., 13th June 2014
    - During the period of validity of the accreditation (which may have commenced prior to the date of admission)
    - Recognition of graduates before the date of admission is not required under the Accord. Other signatories may, at their sole discretion, recognize graduates of accredited programmes from before the admission date [38]

Tier I programs are housed in **institutions with autonomy** to review the content of curriculum and make changes as a result of recommendations from accreditation visits. These institutions have the **fiscal and academic independence** to engage in nimble continuous improvement actions in the local settings **without waiting for the approval of outside bodies unlike the affiliated institutions**. [38]

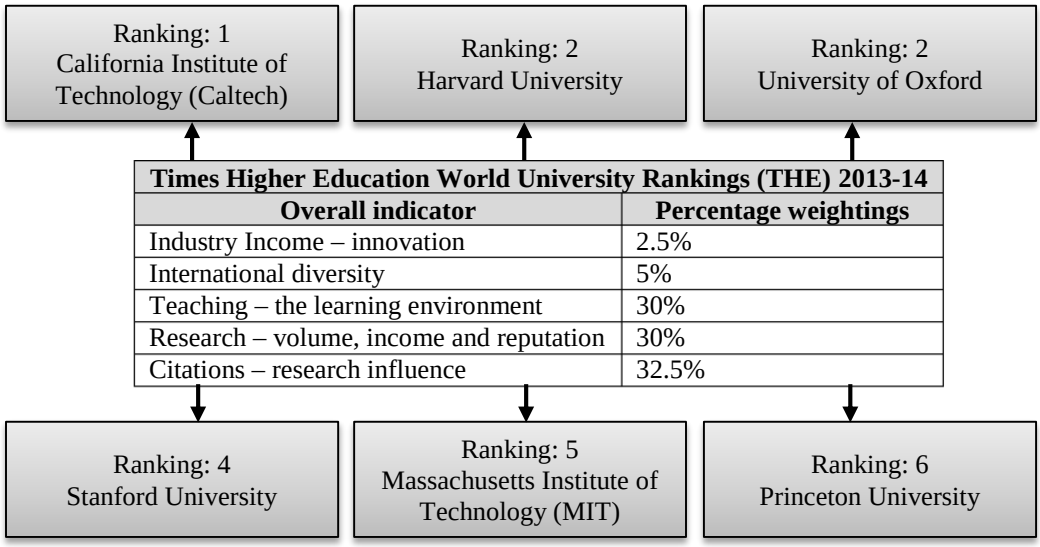
"For India, the Washington Accord came in to effect from June 14 after the country was given full signatory status. There will be no retrospective recognition of degrees by the member countries," a senior NBA official told Deccan Herald. [45]

"There are 3,500 institutions offering engineering programmes in the country. But all of them are not eligible to seek accreditation under tier-I category because they are not autonomous institutions," the NBA official said. [45]

Apart from recognition for Indian engineering degrees, this membership of the international accreditation agreement will also ensure a minimum global quality for all engineering institutions in the nation. We hope that this will open vast and new opportunities for the India's abundant talent pool. [39]

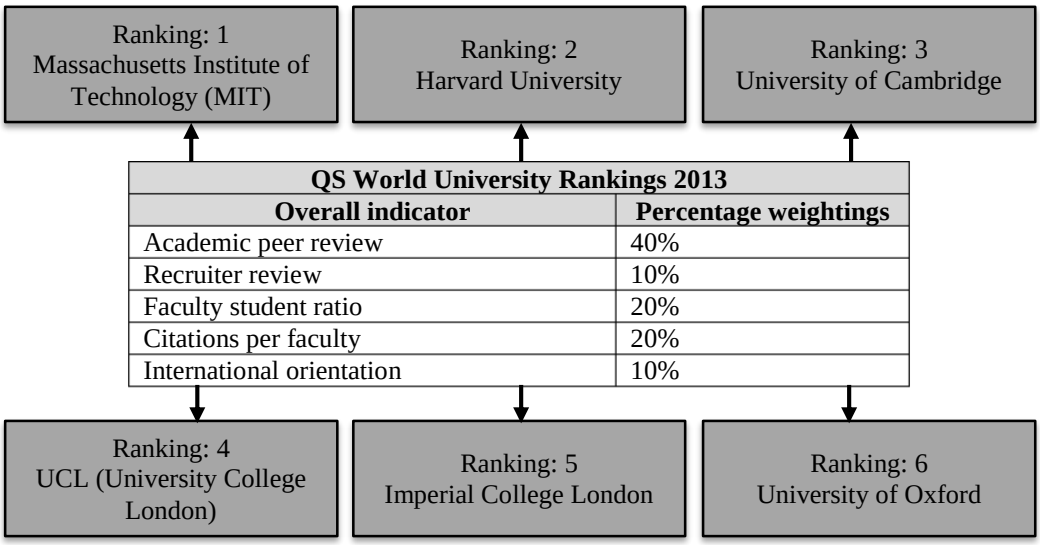
2.3. Comparison of Ranking and Accreditation

Accreditation and ranking are different forms of quality assurance mechanisms that are expected to enable a higher education system to maintain its quality. Ranking, done by independent agencies, particularly helps in realizing the **position of an institution according to its performance in comparison to others**, whereas accreditation **assigns a particular grade to an institution if it qualifies for it**. [46]



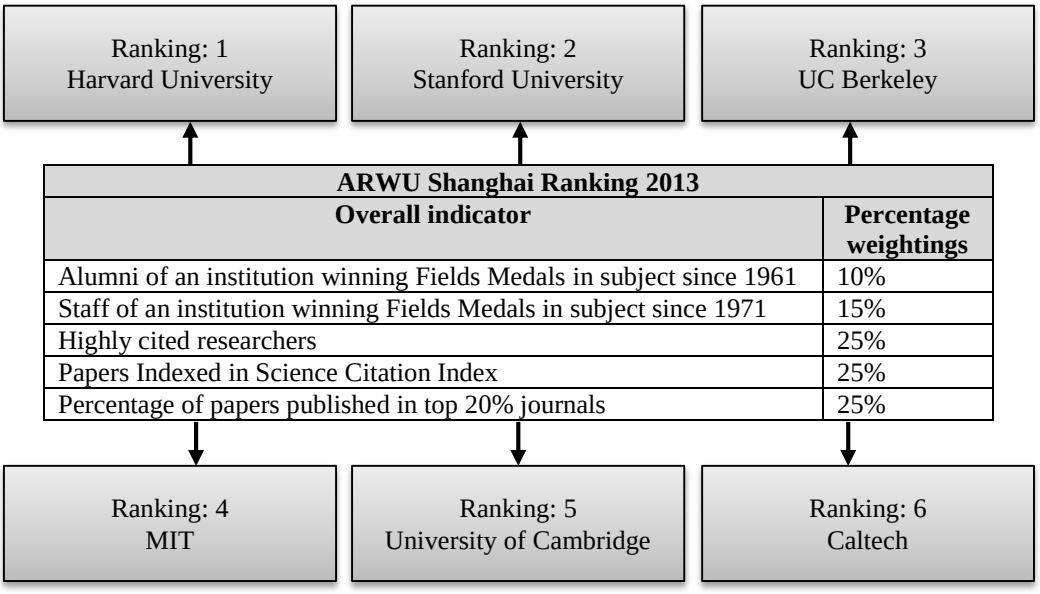
Times Higher Education World University Rankings (THE) 2013-14	
Overall indicator	**Percentage weightings**
Industry Income – innovation	2.5%
International diversity	5%
Teaching – the learning environment	30%
Research – volume, income and reputation	30%
Citations – research influence	32.5%

Times Higher Education World University Rankings (THE) 2013-14 [47] [48]



QS World University Rankings 2013	
Overall indicator	**Percentage weightings**
Academic peer review	40%
Recruiter review	10%
Faculty student ratio	20%
Citations per faculty	20%
International orientation	10%

QS World University Ranking 2013 [49]



ARWU Shanghai Ranking 2013 [50]

Fig. 2.4: Ranking (**by Comparison**): On the basis of **fixed criteria** of the respective Ranking Agencies (Times HE, QS, ARWU) the Universities across the World are measured and ranked.

Accreditation and ranking help the institution in keeping focus on achieving high academic standards and continuous quality development, and are also instrumental in building reputation. Accreditations & rankings are important ways for us to benchmark our performance and ensure that we keep up high quality and stay focused on acquiring new goals. Rankings and accreditation are two different forms of quality assurance or measurement. **In terms of measures of quality, Accreditation is much more important than Rankings**. [51] [52] [53]

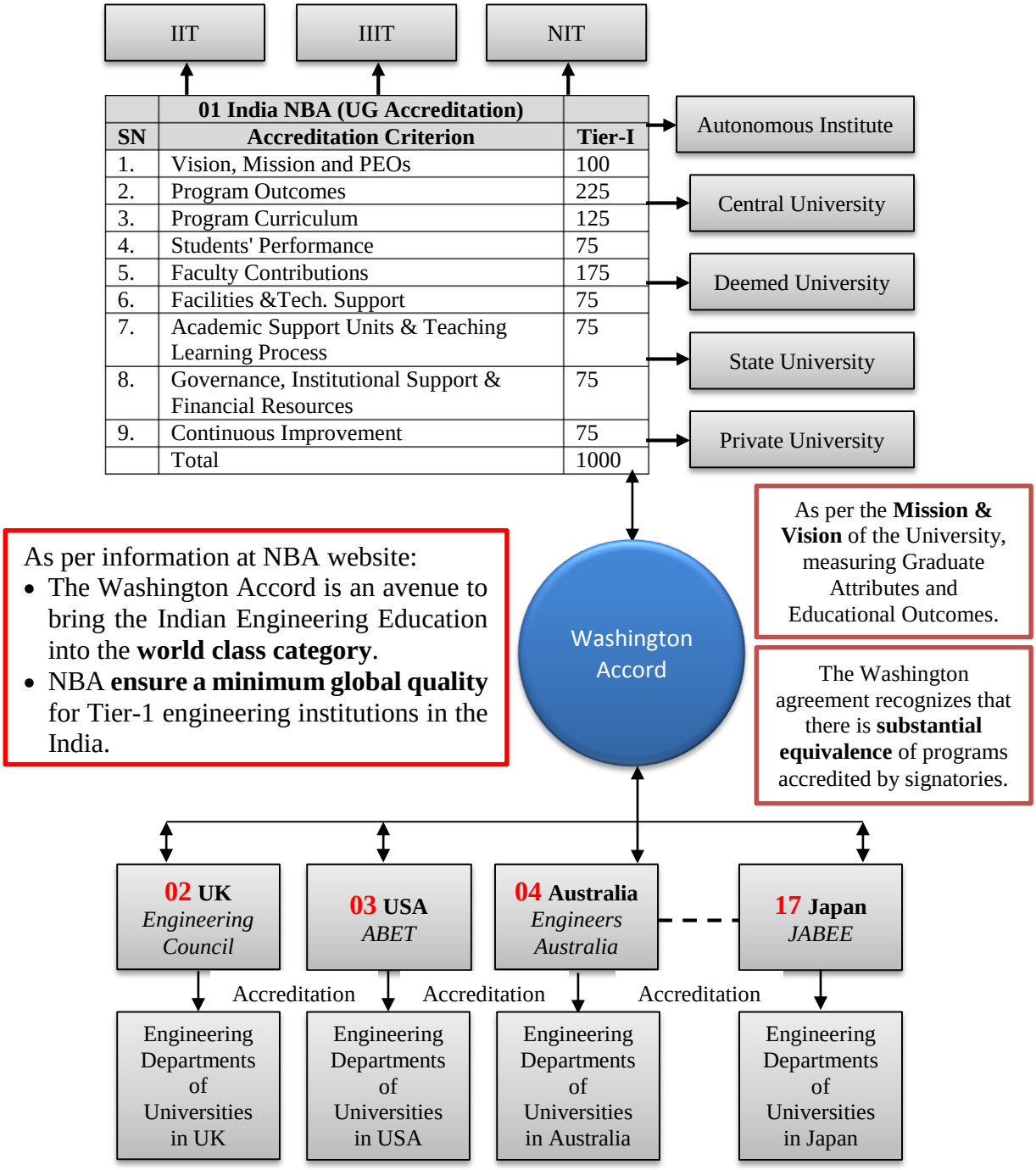


Fig. 2.5: Accreditation (Rate institutes independent of others): On the basis of **Well-defined, Logical and Specific international standards**, the Universities / Institute quality assessment are done, under the supervision of National Accreditation Agencies of the respective countries.

2.3.1. Ranking

- Rankings are a comparison of institutes that is organized by some external agency.

- Rankings will only tell you which institute, an external agency thinks, is number 1, number 2, number 3, etc.
- Ranking also provides information about the performance of HEIs within a competitive set up. [51] [53]

Another important objective that the global ranking mechanism ends up achieving is fostering competition among the universities across the nations for attracting the best minds, thereby ensuring quality. Students being rational consumers will choose the best possible institutions for themselves given their budget constraint, and only the best universities will draw good students. Not-so-good universities will try their level-best to achieve the 'best' stamp, and those who ultimately fail to perform well will automatically go out of business. Thus, in a competitive environment every university will try to improve their quality for their own benefit, which ultimately leads to an enhancement of the overall higher education sector. [46]

2.3.2. Accreditation

- Accreditation is a process of quality assessment that is conducted by peers under the supervision of professional associations.
- Accreditation will tell you that an institute meets specific international standards.
- Accreditation provides an independent validation. To ensure that course content, facilities and teaching quality meet certain standards, a team of assessors visits each school and decides whether the school should be accredited. The associations endorse various elements of an institution that enhance or guarantee that it delivers a quality program that serves the needs of the market.
- What accreditation does is to assure the clients that quality of education being imparted by an institution conforms to the well-defined standards set by the regulatory authority.
- It is a collegial process based on self-evaluation and peer-assessment for improvement of academic quality and public accountability. Accreditation assures that higher education institutions and their units, schools, or programs meet appropriate standards of quality and integrity. [51] [53]

2.3.3. Comparison

- Ranking differs from accreditation in that the institution is measured against the other participant schools based on a set of criteria.
- The main difference is that rankings rank a Higher Education Institution (HEI) **with respect to others** but accreditation agencies rate HEIs **independent of others**. [51] [53]

2.4. Washington Accord: Need to Match World Class Standards for Substantial Equivalence of Programs

ABET, incorporated as the Accreditation Board for Engineering and Technology, Inc., is a non-governmental organization of USA that accredits post-secondary education programs in "applied science, computing, engineering, and engineering technology. ABET accredits 3,367 programs in applied science, computing, engineering, and engineering technology at **684 institutions** in **24 nations**. As per Washington Accord the US accreditation organization ABET is at par with Indian NBA. At present only two Indian University or Institutes are ABET Accredited, namely VIT University became the first university in India to undergo the ABET accreditation process successfully. Recently, five B. Tech programmes of the SRM University had been accredited by ABET. [32] [33] [34] [35]

The following table shows **Top 16 US Universities of QS World Ranking 2013**, whose Chemical, Civil and Mechanical Engineering programs are ABET accredited. This data is authentic and collected from the website of Council for Higher Education Accreditation, USA (CHEA). [47] [48]

SN	University	QS World ranking 2013	ABET Accredited Chemical Engineering	ABET Accredited Civil Engineering	ABET Accredited Mechanical Engineering
1.	Massachusetts Institute of Technology (MIT)	1	Y	Y	Y
2.	Harvard University	2			
3.	Stanford University	7	Y	Y	Y
4.	Yale University	8	Y		Y
5.	California Institute of Technology (Caltech)	10	Y		Y
6.	Princeton University	10	Y	Y	Y
7.	University of Pennsylvania	13			Y
8.	Columbia University	14	Y	Y	Y
9.	Cornell University	15	Y	Y	Y
10.	Johns Hopkins University	16	Y	Y	Y
11.	University of Michigan	22	Y	Y	Y
12.	Duke University	23		Y	Y
13.	University of California, Berkeley	25	Y	Y	Y
14.	Northwestern University	29	Y	Y	Y
15.	University of California, Los Angeles (UCLA)	40	Y	Y	Y
16.	Brown University	47	Y	Y	Y

Table 2.2: Top US universities in the QS World University Rankings 2013, whose Chemical, Civil and Mechanical Engineering programs are ABET accredited [47] [48]

LIST OF INSTITUTIONS WHOSE PROGRAMMES ARE NBA ACCREDITATED UNDER TIER-I (Institution Wise)			
Sl.No.	Name of the Institution	Program	Accredited
1	B.M.S. College of Engg., Bangalore, Karnataka	Instrumentation Technology	2014 - 2015
2	B.M.S. College of Engg., Bangalore, Karnataka	Mechanical Engineering	2014 - 2018
3	Narsee Monjee Institute of Management Studies, Maharashtra	Electronics and Telecommunication Engineering	2014 - 2015
4	Narsee Monjee Institute of Management Studies, Maharashtra	Computer Engineering	2014 - 2015
5	National Institute of Technology, Silchar, Assam	Civil Engineering	2014 - 2015
6	National Institute of Technology, Silchar, Assam	Electrical Engineering	2014 - 2015
7	National Institute of Technology,Silchar, Assam	Electronics and Communication Engineering	2014 - 2018
8	National Institute of Technology, Silchar, Assam	Mechanical Engineering	2014 - 2015
9	National Institute of Technology, Rourkela, Orissa	Civil Engineering	2014 - 2018
10	National Institute of Technology, Rourkela, Orissa	Computer Science and Engineering	2014 - 2015
11	National Institute of Technology, Rourkela, Orissa	Electrical Engineering	2014 - 2018
12	National Institute of Technology, Rourkela, Orissa	Electronics and Communication Engineering	2014 - 2018
13	National Institute of Technology, Rourkela, Orissa	Electronics and Instrumentation Engineering	2014 - 2018
14	National Institute of Technology, Tiruchirappalli, Tamil Nadu	Electronics and Communication Engineering	2014 - 2015
15	National Institute of Technology, Tiruchirappalli, Tamil Nadu	Production Engineering	2014 - 2015

Table. 2.3: List of Indian Institutions, who's Programmes are NBA Accredited under Tier-I (As per data collected from NBA website on dated 19 July 2014 [38]

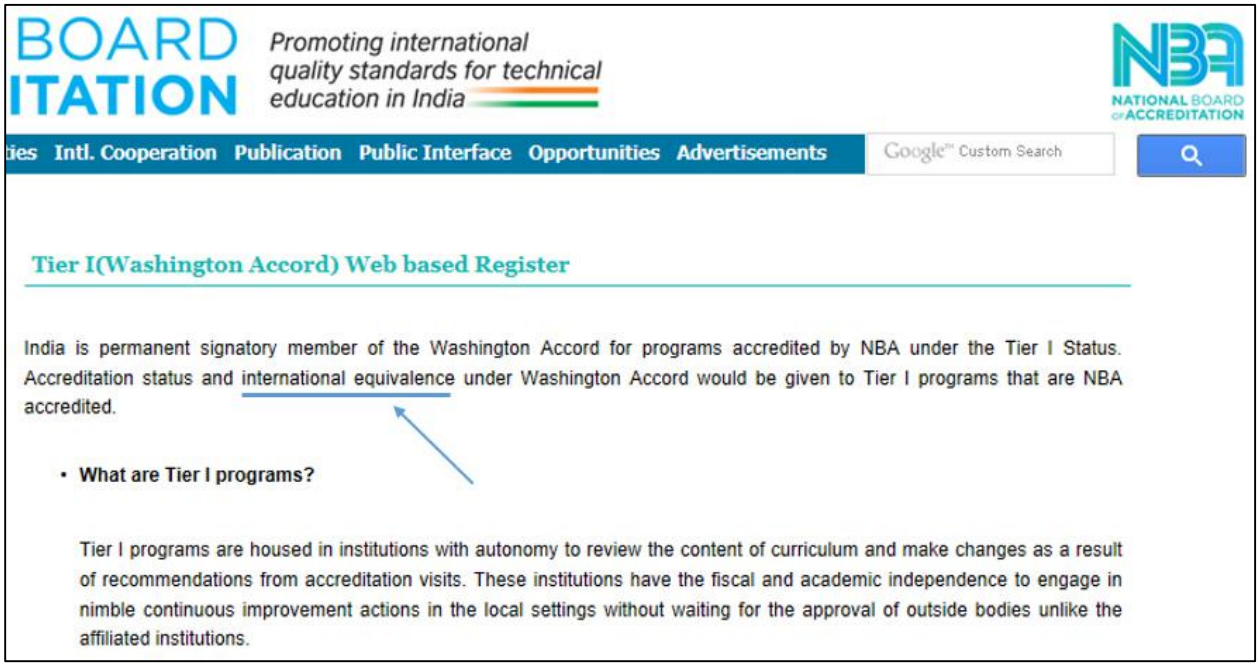


Fig. 2.6: International Equivalence under Washington Accord (from NBA website) [38]

The Washington Accord is an international accreditation agreement for professional engineering academic degrees, between the bodies responsible for accreditation in its signatory countries. The agreement recognizes that there is **substantial equivalence of programs accredited by those signatories**. [40]

Comparability of accreditation systems and mutual recognition of graduates is based on the principle of substantial equivalence. **Substantial equivalence relates to the output of degree programmes rather than their detailed internal structures**. [38] [54]

As per NBA and Washington Accord (**Figure 2.6**), the "UG degrees of Engineering Departments of Tier-1 NBA accredited institutes" listed in **Table 2.3** and "UG degrees of Engineering Departments of above top ranking ABET accredited US Universities" listed in **Table 2.2** are **substantial equivalent**. That is,

- Degree of Mechanical Engineering from NIT Silchar, BMS College of Engineering Bangalore and 15 Top Ranking World Class US Universities are **substantial equivalent** (See Table 2.4)
- Degree of Civil Engineering from NIT Silchar, NIT Rourkela and 12 Top Ranking World Class US Universities are **substantial equivalent** (See Table 2.5)

Out of 17 signatory countries of Washington Accord, most of the Accreditation Agencies has maintained the quality of the accreditation processes and not allowed to use this Accord as a Marketing Tool. In Indian scenario, it's a major challenge and responsibility of concerned authorities. They must take care that this power should not be misused.

SN	Top US universities in the QS World University Rankings 2013, whose Mechanical Engineering programs are ABET accredited	List of Institutions Whose Mechanical Engineering Programmes are NBA Accredited Under Tier-I
1.	Massachusetts Institute of Technology (MIT)	B.M.S. College of Engineering, Bangalore, Karnataka
2.	Stanford University	National Institute of Technology, Silchar, Assam
3.	Yale University	
4.	California Institute of Technology (Caltech)	
5.	Princeton University	
6.	University of Pennsylvania	
7.	Columbia University	
8.	Cornell University	
9.	Johns Hopkins University	
10.	University of Michigan	
11.	Duke University	
12.	University of California, Berkeley	
13.	Northwestern University	
14.	University of California, Los Angeles (UCLA)	
15.	Brown University	

Table 2.4: Degree of **Mechanical Engineering** of top 15 World Class Universities of US, NIT Silchar and B.M.S. College of Engineering, Bangalore are equivalent.

SN	Top US universities in the QS World University Rankings 2013, whose Civil Engineering programs are ABET accredited	List of Institutions Whose Civil Engineering Programmes are NBA Accredited Under Tier-I
1.	Massachusetts Institute of Technology (MIT)	National Institute of Technology, Rourkela, Orissa
2.	Stanford University	National Institute of Technology, Silchar, Assam
3.	Princeton University	
4.	Columbia University	
5.	Cornell University	

6.	Johns Hopkins University	
7.	University of Michigan	
8.	Duke University	
9.	University of California, Berkeley	
10.	Northwestern University	
11.	University of California, Los Angeles (UCLA)	
12.	Brown University	

Table 2.5: Degree of **Civil Engineering** of top 12 World Class Universities of US and two NITs are equivalent

The NBA Website clearly stated this "**international equivalence**". This website also mentioned that "The membership of Washington Accord is an international recognition of the quality of undergraduate engineering education offered by the member country and is **an avenue to bring it into the world class category**." (See following figure) [38]

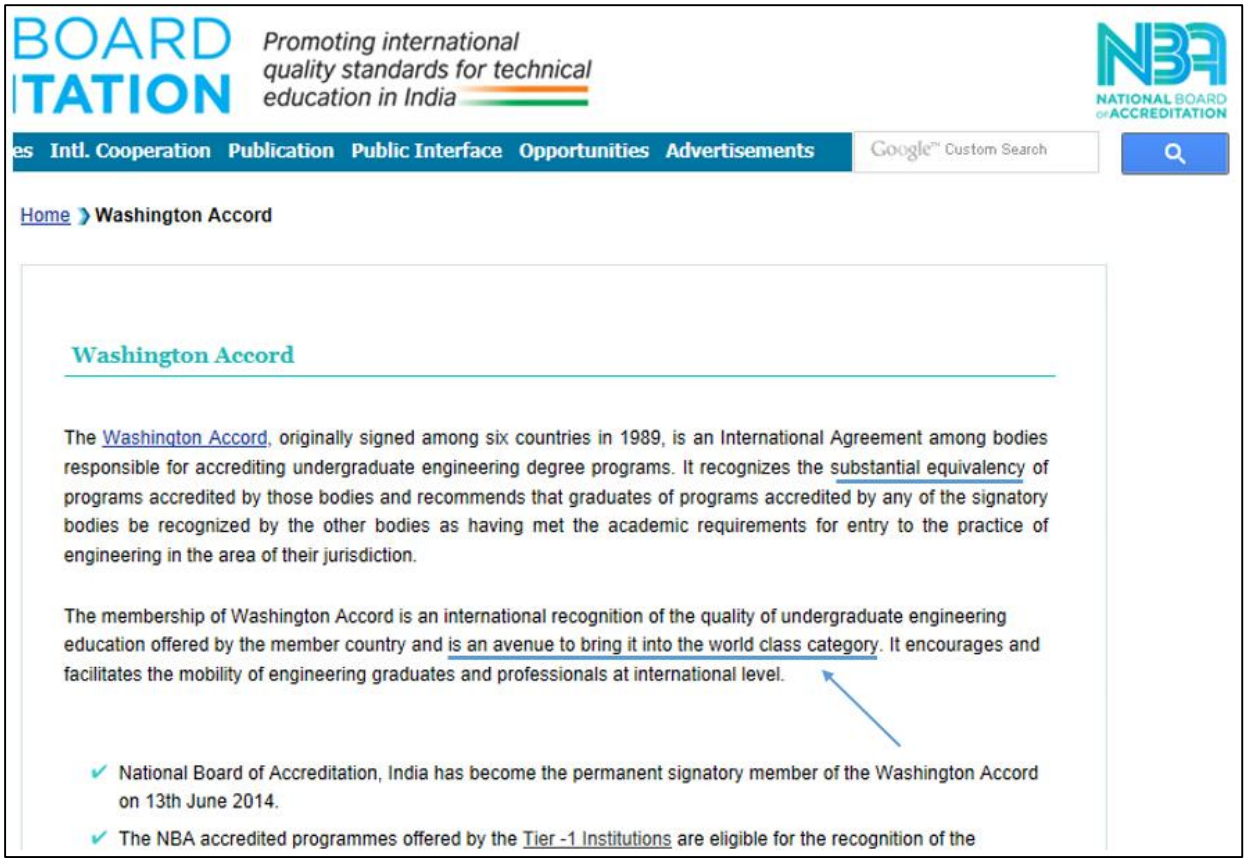


Fig. 2.7: The Membership of Washington Accord is an avenue to bring UG Engineering Education into the **world class category** (from NBA website) [38]

About Washington Accord, Major G. Lakshmanarao stated that "The criteria, policies and procedures used by the signatory countries for accreditation should be **comparable**. ***It clearly means the standard of the curriculum, faculty and staff, learning resources,***

laboratories, libraries etc. should be at par with developed countries. This requires huge financial investments. [37]

2.5. NBA Accreditation: Outcome Based Education

The National Board of Accreditation (NBA) has introduced **outcome-based accreditation model** under which technical institutions will have to prove the outcome of the programme for it to be given the NBA's approval. The Outcome Based Education ensures that learners would achieve predefined outcomes for programme in which they are enrolled. [55] [56]

A dozen **Graduate Attributes** are defined by the NBA, as **expected outcomes** from the graduates turned out by the program, namely: [41]

1. Engineering Knowledge (Application of Maths, Science and Engineering Fundamentals to Complex Engineering Problems)
2. Problem Analysis
3. Design and Development
4. Investigation of Complex Problems
5. Modern Tool Usage
6. Engineer and Society
7. Environment and Sustainability
8. Ethics
9. Individual and Team Work.
10. Communication
11. Lifelong Learning
12. Project Management and Finance [41]

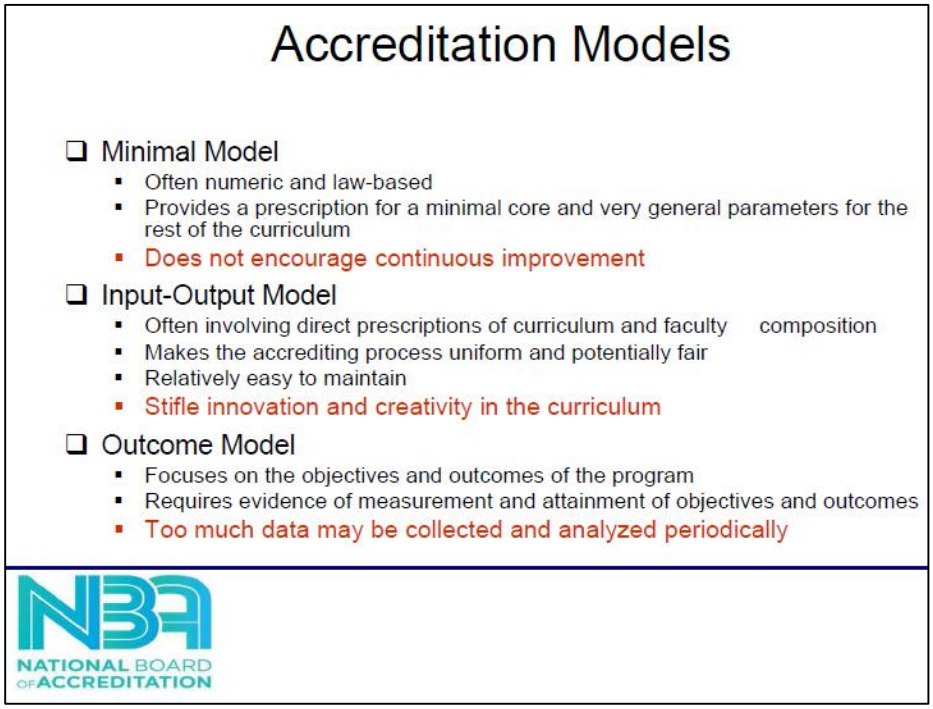
These Graduate Attributes are in line with ABET (Accreditation Board for Engineering and Technology, USA). The Graduate Attributes are referred to as **Program Outcomes** by Washington Accord.

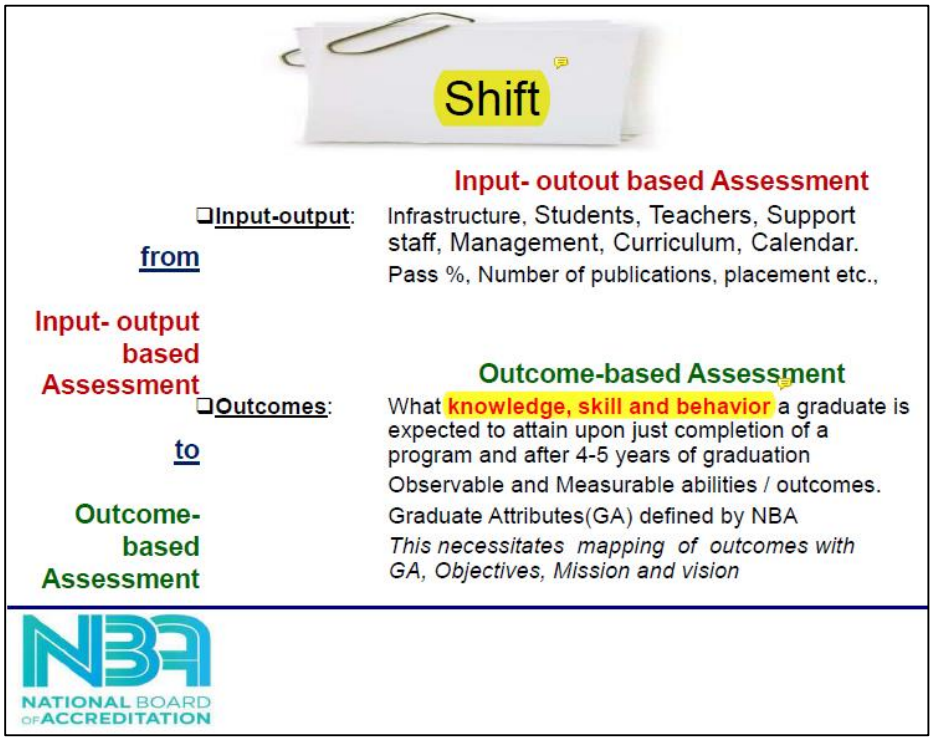
In the present higher education scenario, it is hard to find these attributes in most of the engineering graduates. So, if programs of an institution are to be fully accredited and their graduates globally accepted, the institution should strive very hard to impart these Graduate Attributes. A rigorous training is required, beginning from the very first year; periodical training for faculty also is needed in subjects and in skills. [41]

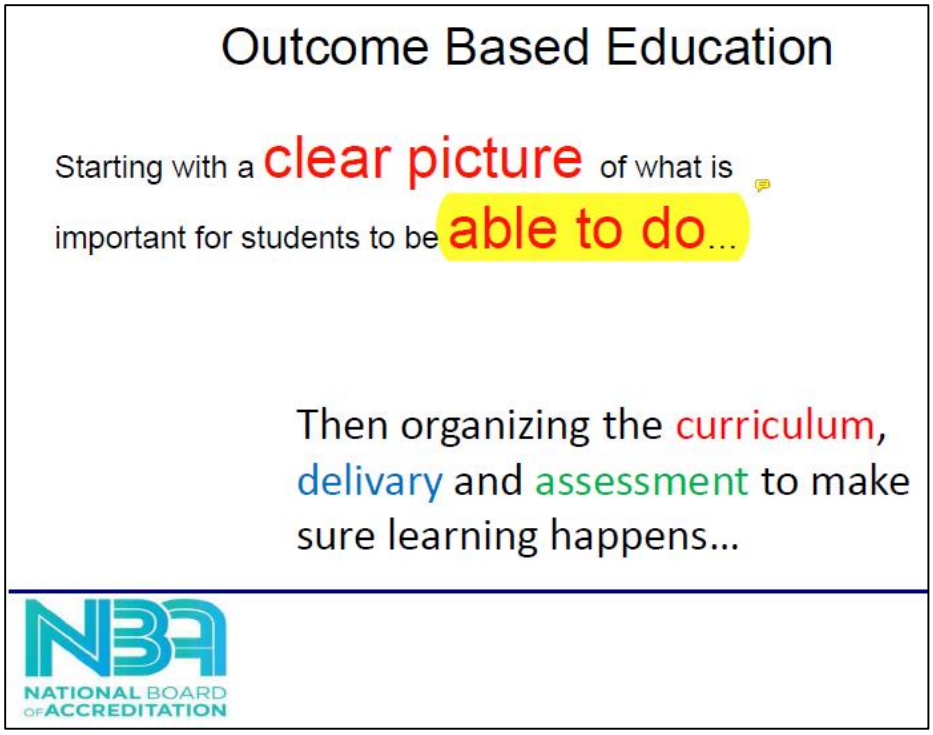
The evaluation process of NBA is very tough. The Program Outcomes are verified through variety of innovative ways like

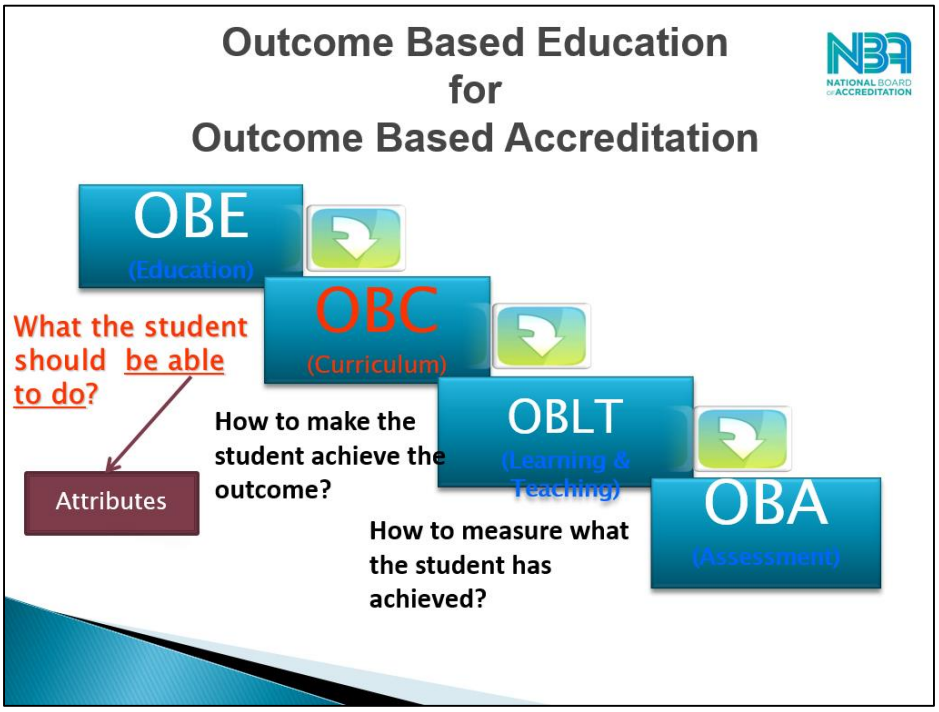
- Evaluation of outcomes by students' attainment
- Evaluation of outcomes due to faculty contributions and Achievements
- Evaluation of outcomes from placement
- Evaluation of achievements as disseminated in media/public forum
- Documented process and evaluation by Industries
- Documented process and assessment from Alumni

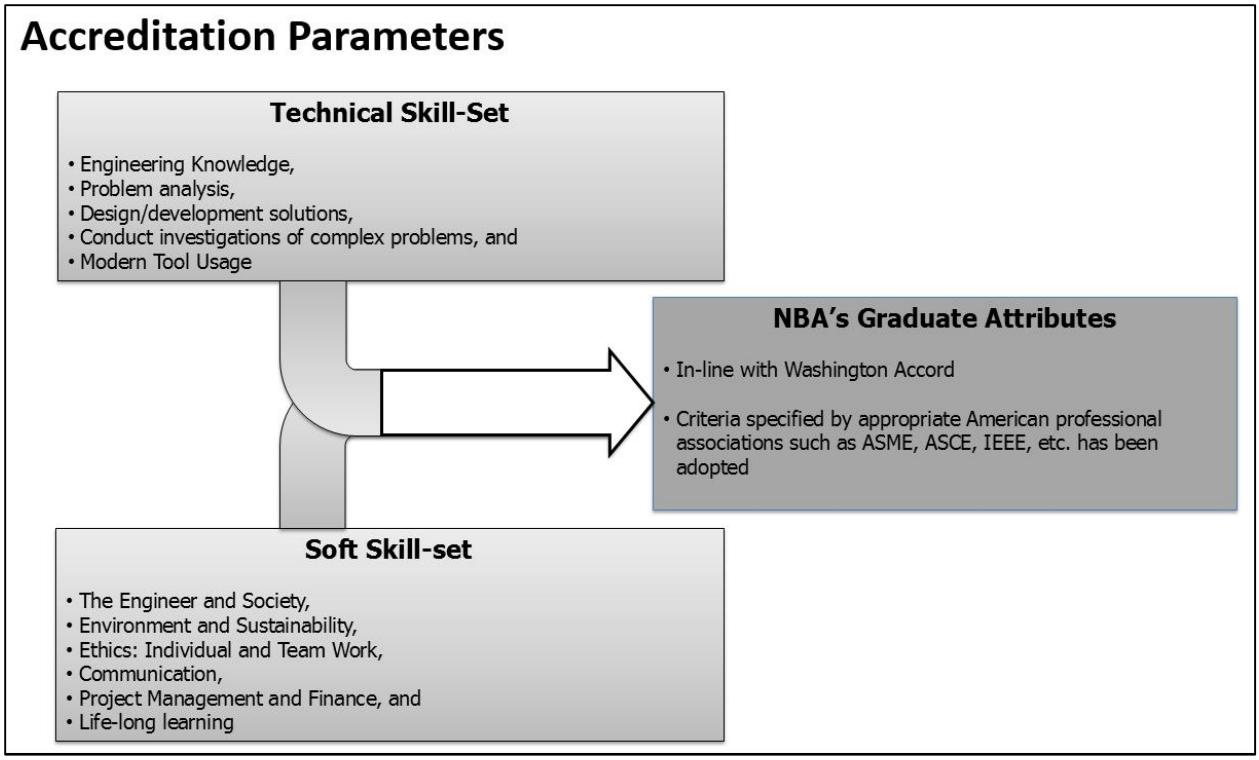
- Documented process and assessment from Professional Bodies
- Effectiveness and Efficiency of the Mechanism/Procedure for Continuous Review and Outcome Measurements

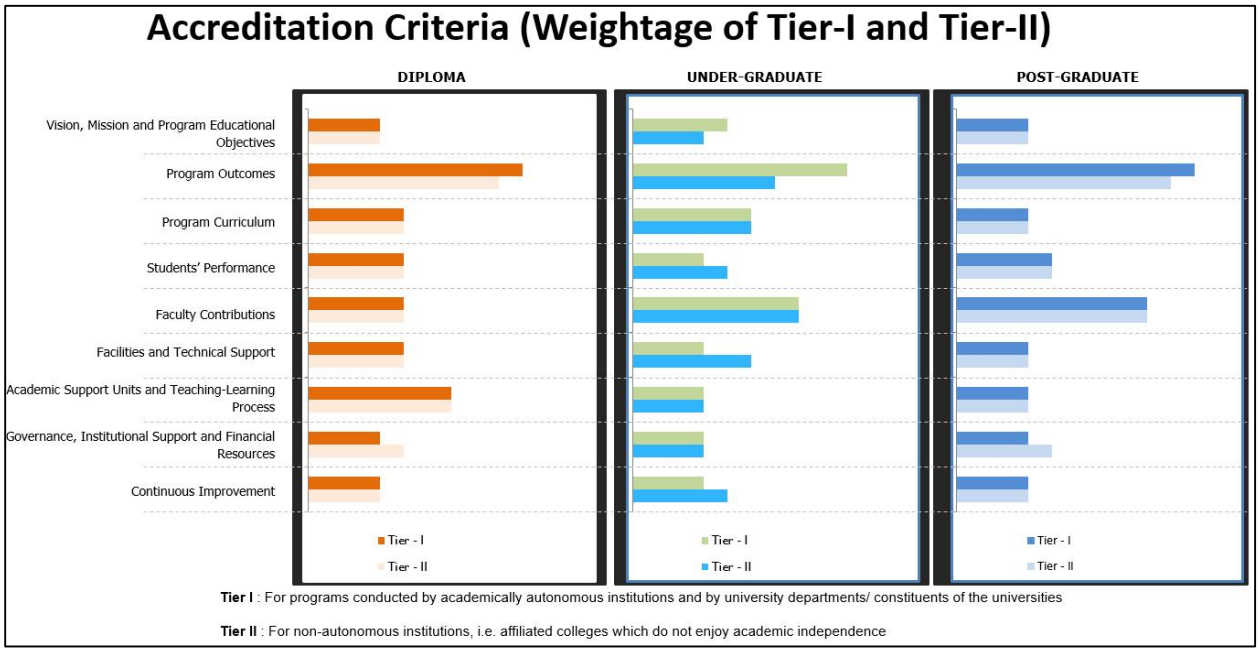


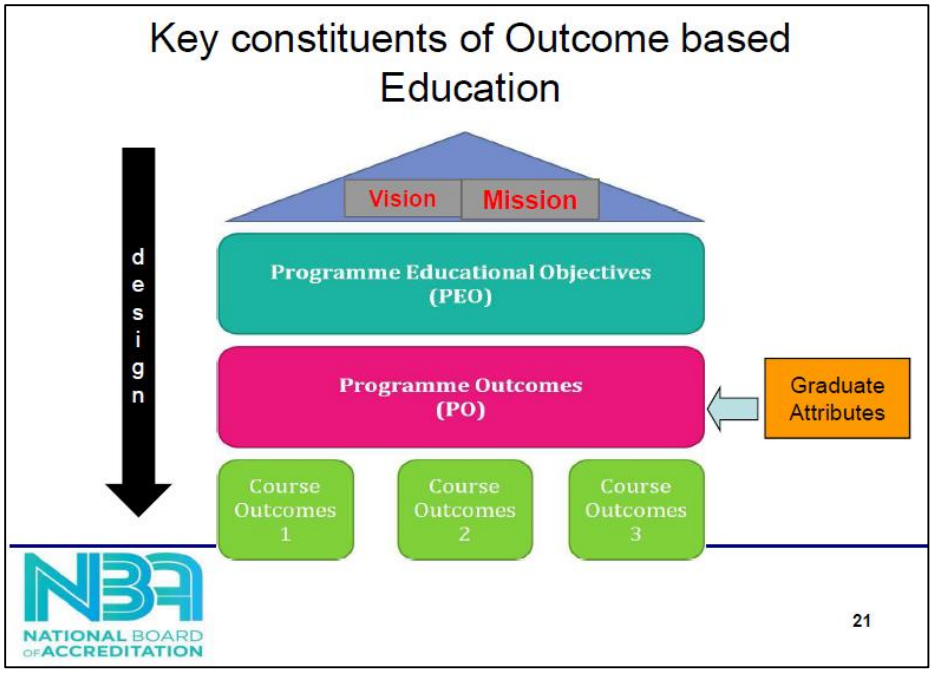


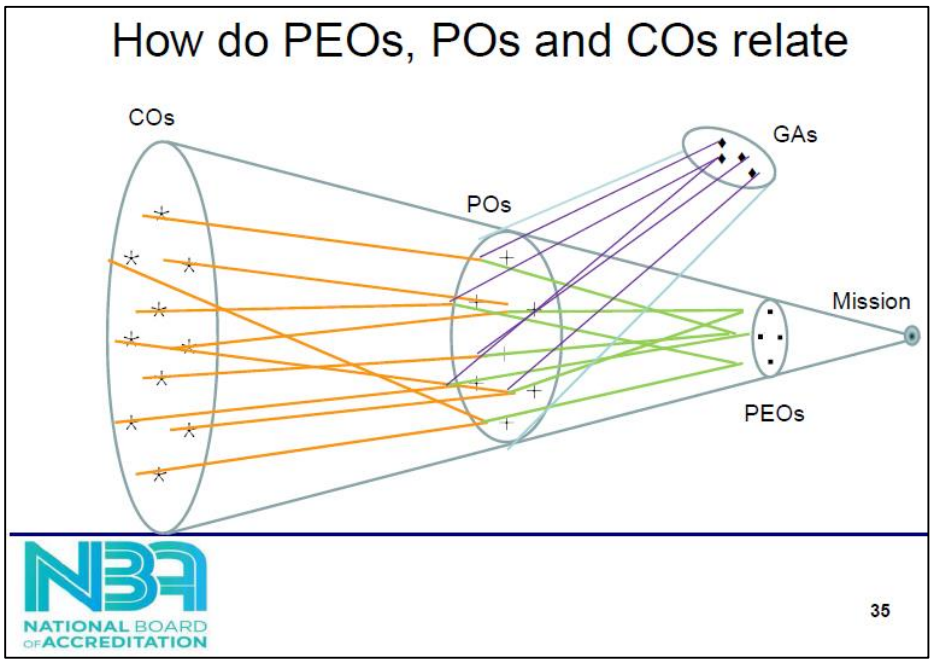

Outcome Based Education
Starting with a clear picture of what is important for students to be able to do...
Then organizing the curriculum, delivary and assessment to make sure learning happens...
NATIONAL BOARD OF ACCREDITATION


Outcome Based Education
for
Outcome Based Accreditation
OBE
(Education)
OBC
(Curriculum)
OBLT
(Learning & Teaching)
OBA
(Assessment)
What the student should be able to do?
Attributes
How to make the student achieve the outcome?
How to measure what the student has achieved?


Accreditation Parameters
Technical Skill-Set
• Engineering Knowledge,
• Problem analysis,
• Design/development solutions,
• Conduct investigations of complex problems, and
• Modern Tool Usage
NBA's Graduate Attributes
• In-line with Washington Accord
• Criteria specified by appropriate American professional associations such as ASME, ASCE, IEEE, etc. has been adopted
Soft Skill-set
• The Engineer and Society,
• Environment and Sustainability,
• Ethics: Individual and Team Work,
• Communication,
• Project Management and Finance, and
• Life-long learning


Accreditation Criteria (Weightage of Tier-I and Tier-II)
DIPLOMA
UNDER-GRADUATE
POST-GRADUATE
Vision, Mission and Program Educational Objectives
Program Outcomes
Program Curriculum
Students' Performance
Faculty Contributions
Facilities and Technical Support
Academic Support Units and Teaching-Learning Process
Governance, Institutional Support and Financial Resources
Continuous Improvement
Tier - I
Tier - II
Tier I : For programs conducted by academically autonomous institutions and by university departments/ constituents of the universities
Tier II : For non-autonomous institutions, i.e. affiliated colleges which do not enjoy academic independence


Key constituents of Outcome based Education
design
Vision
Mission
Programme Educational Objectives (PEO)
Programme Outcomes (PO)
Graduate Attributes
Course Outcomes 1
Course Outcomes 2
Course Outcomes 3
NATIONAL BOARD OF ACCREDITATION
21


How do PEOs, POs and COs relate
COs
GAs
POs
Mission
PEOs
NATIONAL BOARD OF ACCREDITATION
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Summary of assessment methods/tools

	Assessment Tool	Assessment frequency	Assessed by	Reviewed by
PEOs	Employer survey Alumni survey Any other	Every year Once or twice a	Institute Department	Institute/Department Institute
POs	Assignments Examinations End-of-course survey Rubrics specific to PO/POs Employer survey Faculty survey Any other	two months Semester end Every six months Every year Every six months	Faculty Faculty Faculty Institute Department	Faculty Faculty/Department Faculty/Department Department
COs	Assignments Examinations Projects Group tasks	two months Semester end Every six	Faculty Faculty Faculty	Faculty Faculty/Department Faculty/Department

NATIONAL BOARD OF ACCREDITATION

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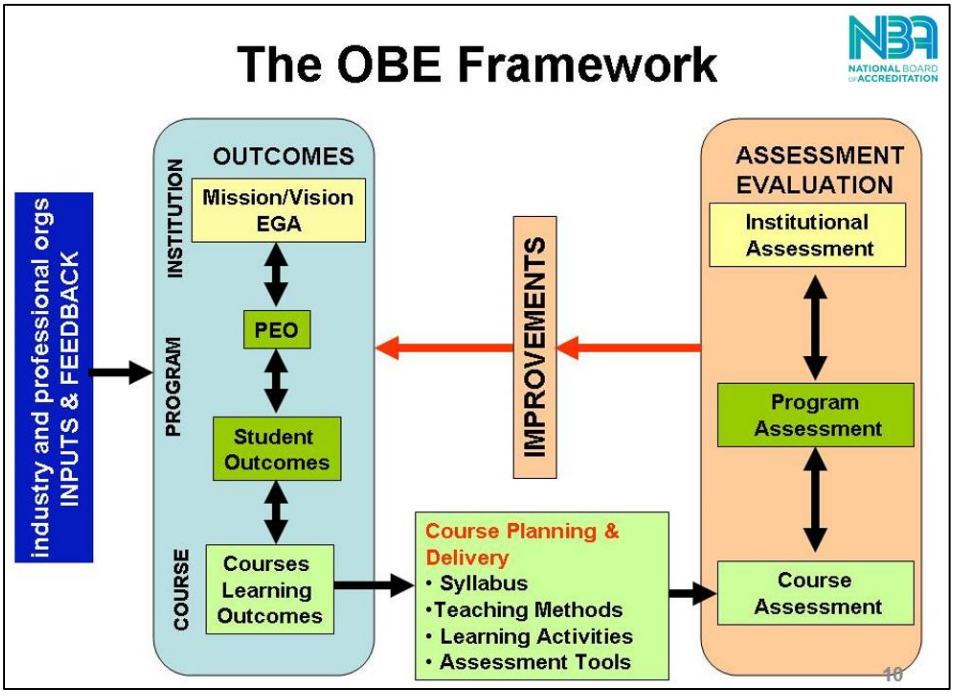

When to Assess

Program Educational Objectives(PEOs)

Few years after Graduation – 4 to 5 years

Program Outcomes (POs)

Upon graduation

Course Outcomes (COs)

Upon course completion

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How to Access

Mapping of Course Educational Objectives with Program Educational Objective

Type	Units	Course Number & Title	Program Outcomes a	b	c	d	e	f	g	h	i	j	k	l	m	n
LEC	4	CHEM20A Chemical Structure	■													
LEC	4	CHEM20B Chemical Energetics and Change	■													
LAB	3	CHEM20L General Chemistry Laboratory	■													
LEC	4	CHEM30A Chemical Dynamics and Reactivity	■													
LAB	4	CHEM30AL General Chemistry Laboratory II	■	■					■		■					
LEC	4	EE1 Electrical Engineering Physics I	■								■					
LEC	4	EE2 Physics for Electrical Engineers	■	■							■			■	■	■
OTH	2	EE3 Introduction to Electrical Engineering								■	■	■				
LEC	4	EE10 Circuit Analysis I	■		■						■		■		■	■
LEC	4	EEM16 Logic Design of Digital Systems	■	■	■						■				■	
OTH	1	EE19 Fiat Lux Freshman Seminar								■		■				
OTH	2	EE99 Student Research Program									■					
LEC	4	EE100 Electrical and Electronic Circuits	■				■				■		■		■	■
LEC	4	EE101 Engineering Electromagnetics	■		■	■					■		■		■	■
LEC	4	EE102 Systems and Signals	■	■	■				■		■				■	
LEC	4	EE103 Applied Numerical Computing	■	■	■		■		■		■		■		■	■

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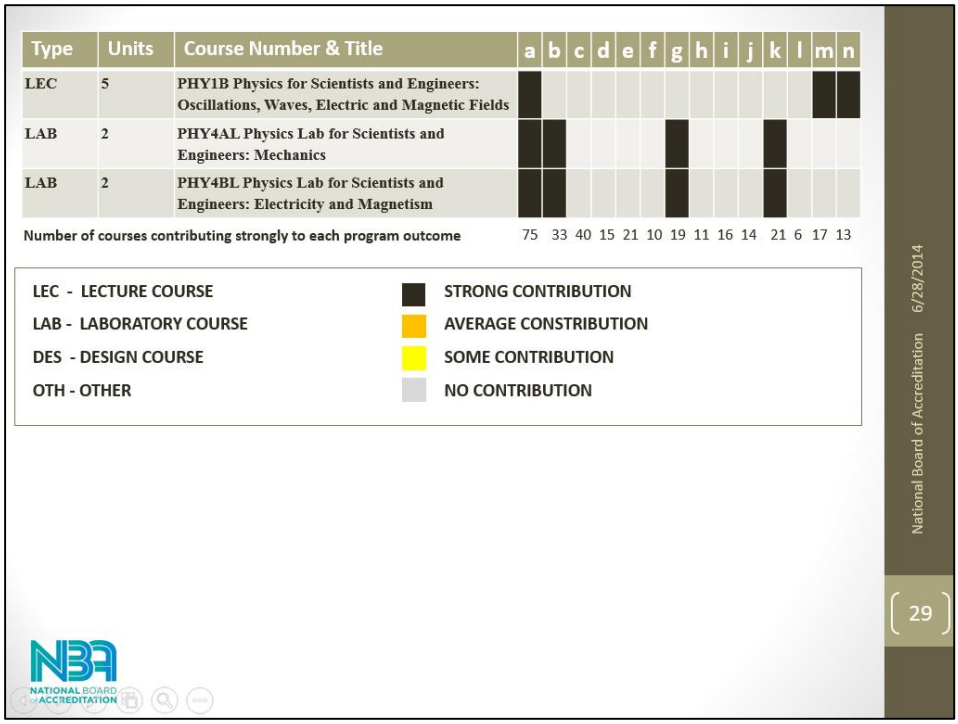


Fig. 2.8: NBA: The Outcome based Accreditation [57] [58] [59]

Students enrolling during a term of accreditation and continuing studies through to graduation without a substantial break will be deemed to have graduated from an accredited program. [60]

2.6. Benefits of Washington Accord

The Washington Accord will boost the engineering education system and there are enormous benefits like:

2.6.1. Credit Transfer and Mobility

According to NBA officials, a major significance of the new recognition will be the "**credit transfer and mobility**." Like in the U.S., if one does two years at one institution, two other semesters somewhere else and graduates from a different university or college, all of those credits will be accepted by all member countries of the Washington Accord. [61]

2.6.2. Global Recognition & Credibility

An engineering degree from Indian colleges is globally recognized. The "B.Tech degree holders going to Washington Accord member countries will not be **questioned about the credibility** of their degrees (any more)," said D.K. Palliwal, former NBA member secretary. [62]

2.6.3. Global Employment

The WA also increases an Indian engineering student's chances of finding a **job abroad**. India is producing 1.5 million engineering graduates and our country doesn't have jobs for all the engineering graduates. In a statement issued by the ministry, HRD Minister Smriti Irani states, "The signatory status will substantially **increase global employment opportunities** for technical and engineering graduates". Traditional engineering programmes such as civil and electrical engineering or architecture in institutions that have NBA accreditations will now be exempted from the mandatory entrance test before taking up jobs or university course in the 16 other member countries. The door was today opened for lakhs of budding Indian engineers to be able to work or pursue higher studies in countries such as America and Britain without having to undergo **fresh assessment**. [63]

The Indian market doesn't have jobs for all these engineers. Besides, IT and manufacturing, there is nothing much in other sectors we train our engineers in (like chemical, metallurgy). This leads to engineers who study chemical engineering, metallurgy, textile engineering ending up in the IT sector. It is a loss for the company as well as the engineer. The company has to train them again and risk having them turning out to be not a good software engineer. The engineer's 4-year training is wasted and he/she might not excel in the other sector. [64]

2.6.4. Attract International Students, Reduce Brain Drain & Improves Student Enrollment

Palliwal spelt out another advantage: "Now, many **foreign students will come to India** to study engineering because the degrees would be recognized in the developed countries. India will become an **education hub** for engineering for the world. " [62]

Rekha Sethi, director general of All India Management Association and Member of NBA said "Permanent membership of the accord is a recognition of India as an education destination. Study in India will now be an acceptable norm worldwide and Indian certification will not be looked down upon by developed countries". [65]

Since the overall living expenses and tuition fee etc. cost is quite less in India, therefore foreign students may want to seek admission in Indian Tier-1 institutes.

Industry chamber has recently reported that 450,000 Indian students spend over USD 13 billion each year in acquiring higher education overseas. These students can get that same international accredited degree in India, which can help to reduce the brain drain. [66]

This accreditation improves student enrollment both in terms of quality and quantity. The Tier-1 institutes will be center of attraction for local students.

2.6.5. Collaborations

- Encouraging co-operation in the fields of research and training in areas of mutual interest. [67]

- It would promote **co-operation and collaboration in the processes of regulation** and maintenance of standards in technical academic programmes as well as in training and research areas. [67]
- It would provide a forum to continue the dialogue to pursue other issues connected with the development of technical education. [67]
- It would give regular communication and sharing of information concerning their accreditation criteria, systems, procedures, manuals, publications and list of the accredited programmes. [67]
- NBA feels that impact of globalization in the present global scenario has necessitated trans-migration of technologies, technicians and professionals to various countries at a much rapid pace than ever before. The difficulties faced by the technical professionals include non-recognition of degrees/diplomas, quality of education & training and absence of facilitating mechanisms for easy mobility of technical professionals. The membership of the Washington accord would facilitate
    - Easy exchange of ideas
    - Mobility of students and professionals at international levels
    - Platform to share innovations
    - Possibilities for collaboration in joint research
    - Information sharing and dissemination with an overall objective of enhancing reputation and standards of technical education amongst signatories. [67]

2.6.6. Ensure Quality in the Technical Education

It will **ensure quality in the technical education** system in general by establishing or strengthening an objective and transparent system of accreditation. [67]

2.6.7. Common Standards

- It would facilitate **common standards of education** [67]
- Substantial **parity and consistency in the processes and procedures** of accreditation could be obtained amongst the signatories in satisfying the academic requirements for the practice of engineering at the professional level. [67]
- The criteria, policies and procedures used by the signatories in accrediting engineering academic programs are **comparable**. [67]

2.6.8. Strengthening Indian Institutes to Accept the Foreign University Challenges

The foreign university bill is on 100 days agenda of MHRD. If this is bill is passed by government then “to meet the HE standard of foreign universities” will be a big challenge for Indian varsities. The Washington Accord and New NBA can strengthen Indian Higher Education sector to face these challenges. [68]

2.6.9. Funding

Helps the Institution in securing necessary funds from government, industry and from other sources.

2.7. Challenges: Outcome Based Curriculum, Huge Finance, Faculty

It is in this context, we have to ponder over many challenges or issues arising. We have to focus our attention towards steps needed by us for preparing for this Accord so that we could be treated at par in international community.

2.7.1. Curriculum

The institutes, which are authorized to design their own curriculum, are included in Tier-1 institutes. The following institutions are eligible to apply for Accreditation under Tier-I system:

- Institutions of National importance: Indian Institutes of Technology (IITs), Indian Institute of Science (IISc), Indian Institute of Information Technology Design and Manufacturing (IIITDM), Indian Institutes of Science Education and Research (IISERs), Indian Institutes of Information Technology (IIITs)
- National Institutes of Technology (NITs)
- Central Universities
- State Universities(Imparting programs in their campus itself)
- Private Universities
- Deemed-to-be Universities
- Autonomous Institutions [38]

The curriculum design and its implementation is the major challenge for becoming Tier-1 institutes. The curriculum has to be made competency or outcome based.

2.7.2. Need Huge Finance and Affordability

“The high weightage parameters required for WA accreditation include faculty contributions, programme outcomes, facilities and technical support. This would mean **huge effort and cost** to be incurred by the colleges for modifying existing courses, training/replacing academic staff, improving infrastructure and cost of accreditation process. It is likely that **the cost will simply be passed on to the students**. This is justifiable, provided there is a marked improvement in the quality/employability of the engineers”. [36]

The government subsidized education can keep the fee structure of public institute quite low and affordable but it’s a most difficult task for private players.

The second issue involved in this process is the criteria, policies and procedures used by the signatory countries for accreditation should be comparable. It clearly means the standard of the

curriculum, faculty and staff, learning resources, laboratories, libraries etc. **should be at par with developed countries**. This requires **huge financial investments.** This is a major challenge for Indian Universities and Institutes because of old governance model, which neglect resource generation through sources other than Tuition Fees and Government funds. [37]

In the General Manual of Accreditation stated that "It is precisely with this objective that the Ministry of Human Resource Development of the Government of India has envisaged "National Board of Accreditation" to provide a scientific and systematic base of evaluation for various institutions and Courses in a holistic manner, covering every aspect of world class quality education on a specific measurable scale. This can act as a guideline for the students, their parents and the corporate to choose the right kind of Institution. To motivate the Institutions to opt for this evaluation, the **government has been giving many benefits to the accredited institutions, like permission to charge higher fees to maintain high standards of education**, support for expansion, research activities etc." [66]

2.7.3. Faculty Productivity and Shortage of Highly Qualified and Trained Faculty

- The exponential growth of Higher Education institutes in India has created problem of faculty shortage. In addition to this, the regulatory constraints added fuel to it. The detailed discussion on this issue is available in Section 2.3, 6.38 of my book "113 Difficulties in Developing World Class Universities".
- Another key issue is the workload pattern of the faculty as adopted in the advanced countries. This involves increase in number of faculty in quality and quantity.
- In spite of offering best possible salaries it is very difficult to find suitable candidates in government colleges and universities. This problem is more precarious in self-financed colleges. Finding candidates holding PG Degree in engineering is difficult and finding suitable Ph.D. holders is definitely a more difficult task. **So well thought out action plan to create physical and human resources is required to satisfy the demands of Washington Accord**. The performance and professional development activities of the faculty are a grey area which requires an impetus from both college managements and regulatory bodies. [37]
- In India, the lack of Residential Campuses and less priority for developing campus culture reduced the faculty productivity. There is an urgent need of developing fully residential campus with "24x7 learning culture" to enhance the productivity of the institutes.

2.7.4. Very Few Are Accredited

The catch is that among India's nearly **3,500** engineering colleges, **just about 200 now have NBA accreditation**. These are mostly state government colleges with a few leading private tech schools. Even the National Institutes of Technology — central government-run engineering institutes that are a rung below the IITs — lack the NBA stamp. [62]

The status of accreditation of Indian Universities by National Assessment and Accreditation Council (NAAC) is also similar.

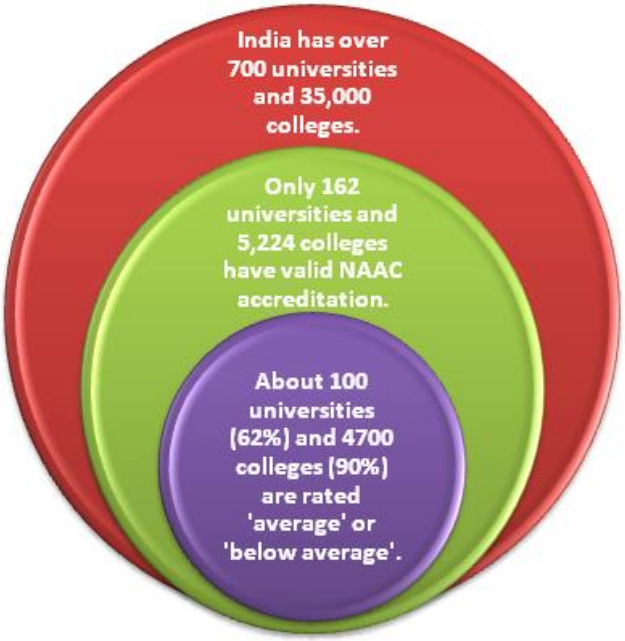


Fig. 2.9: Status of accreditation of Indian Universities by NAAC [69]

The detailed discussion on this issue is available in Section 6.21 of my book "113 Difficulties in Developing World Class Universities".

2.7.5. Accreditation becomes Very Difficult: Money Can Buy Inputs but not Academic Processes and Outputs

Rajeev Kumar, an IIT Kharagpur professor who headed the committee that revised the accreditation guidelines, explained the difference. "Earlier, the NBA focused on factors like infrastructure, funds, the teacher-student ratio, number of labs and the campus area. Under the revised guidelines, the NBA examines the research output, patent generation, publications etc." With today's development, tech colleges will be under pressure to gain the status to attract the best students. But any overnight change is unlikely because it's become **tougher to get NBA accreditation** because of a shift of focus away from infrastructure **"inputs", which money can possibly buy, to academic "outputs" that it can't.** [62]

In addition to premier institutes of India, the Private Universities and Autonomous Institutes have fair chances of getting the NBA accreditation. The new NBA accreditation is very difficult for affiliated colleges and upcoming colleges.

2.7.6. Should Not End Up Becoming a Marketing Tool

In a country where anything foreign is highly valued, it looks like the NBA has used WA as a tool for overhauling the engineering education system. This is perfectly fine as long as NBA achieves its goal of improving technical education in the country… While India's entry into WA is appreciated, **it should not end up becoming a marketing tool**. [36]

2.8. Technical Higher Education Scenario of Next Decade

Due to Washington Accord, within few years, the Indian Technical Higher Education institutes will be divided in to two major groups,

- Tier-1 NBA Accredited Institutes: Authorized Internationally Recognized Degree Granting Institute
- Tier-2: Non-International Degree Granting Institutes

All the Tier-1 NBA Accredited institutes could become the Premier Technical Institutes of India. There is a possibility of cutthroat competition for becoming Tier-1 NBA Accredited institutes of India.

2.9. Washington Accord: Step towards WCU

As per information at NBA website:

- The Washington Accord is an avenue to bring the Indian Tier-1 Engineering Education into the **world class category**.
- NBA **ensure a minimum global quality** for Tier-1 engineering institutions in the India. [38]

To achieve this goals,

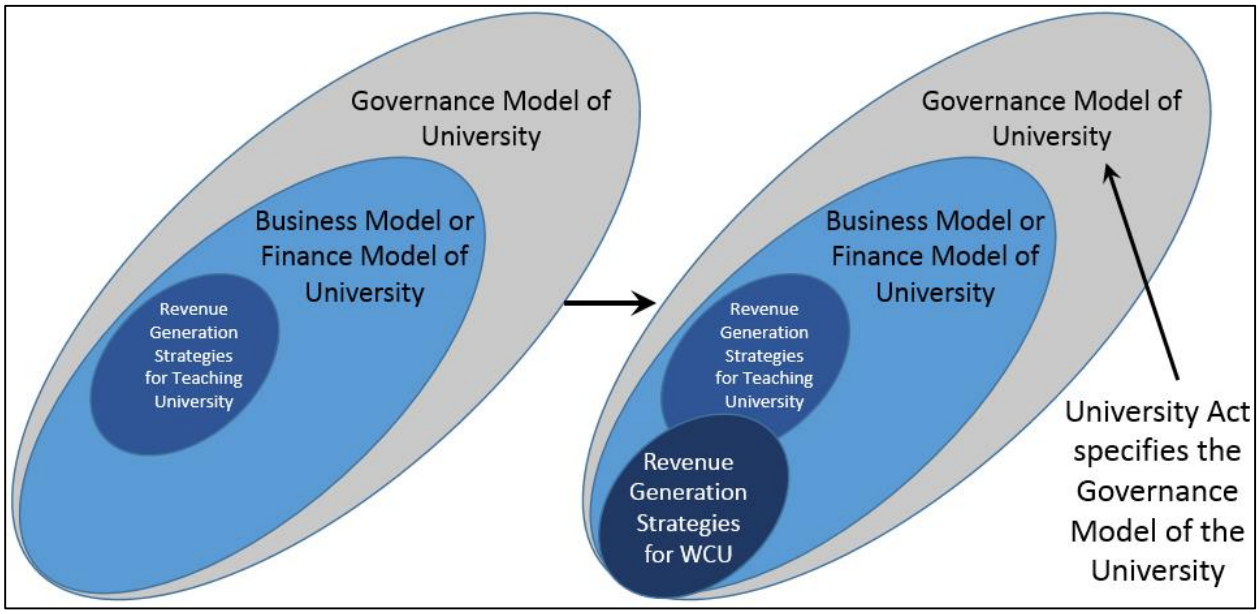
- The standard of the curriculum, faculty and staff, learning resources, laboratories, libraries etc. should be at par with developed countries, which need huge financial investments
- In addition to this, drastic changes are required in governing structure, revenue generation processes and academic culture of these institutes of higher education.
- There is a need to redesign many policies and need to change mindset of all the stakeholders of these institutes.

Thus the developing strategies for Tier-1 Engineering Institutes and WCU are almost same. No doubt that, the WCU needs more financial investment as compare to Tier-1 institutes.

In the rest of the book I would like to discuss the issues related to developing World Class Education system (Tier-1 as well as WCU). The World Class Education System requires abundant resources and in turn huge financial investments. Thus, I would like to discuss the issues related to **financial policy** of the Indian Universities in the next chapter.

Chapter 3: Need of Abundant Resources: Revenue Generation Must Be Part of University Policies, Finance & Governance Model

*To become **Tier-1** institutes or **WCU**, in both cases, require **abundant resources**, which needs huge finance. To generate huge finance requires* new Revenue Generation Policies and Financial Model. This Financial model must be mapped to Governance Model *of the University. The University Act provide the Governance Model of the University. The current Center or State University Acts can easily accommodate these changes, without much modifications.*



Proposed Extended Governance and Finance Model of the University

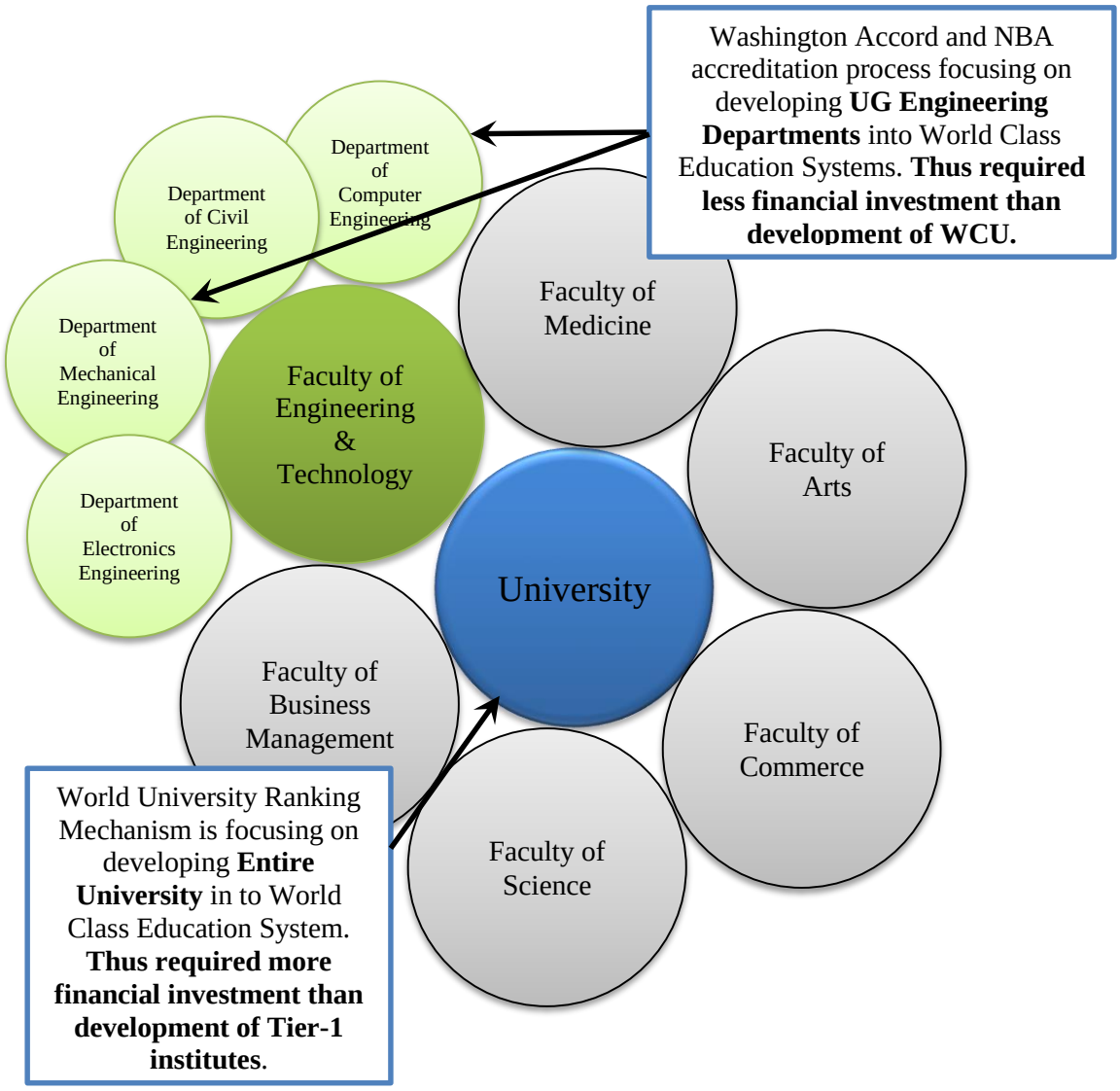


Fig. 3.1: Accreditation Process under Washington Accord focuses on UG Engineering Departments (less investment) whereas University Ranking Mechanism focuses on Entire University (more investment)

3.1. Revenue Generation: Part of University Governance Model

In most of the Universities of the world the revenue generation activities are part of the university finance and governance model. Let's see the screenshots of the websites of few world renowned Universities regarding their revenue generation initiatives and activities.

Fig. 3.2: Revenue Generation: University of Houston, USA [70]

Fig. 3.3: Revenue Generation: SAN JOSE State University, USA [71]

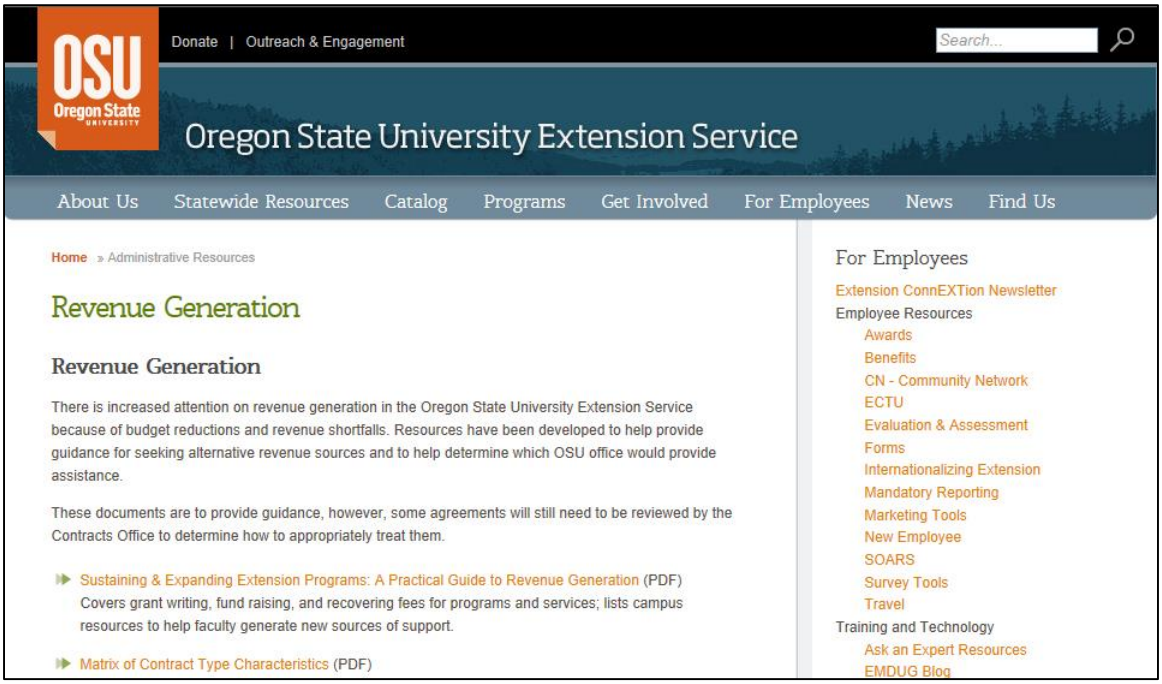


Fig. 3.4: Revenue Generation: Oregon State University, USA [72]

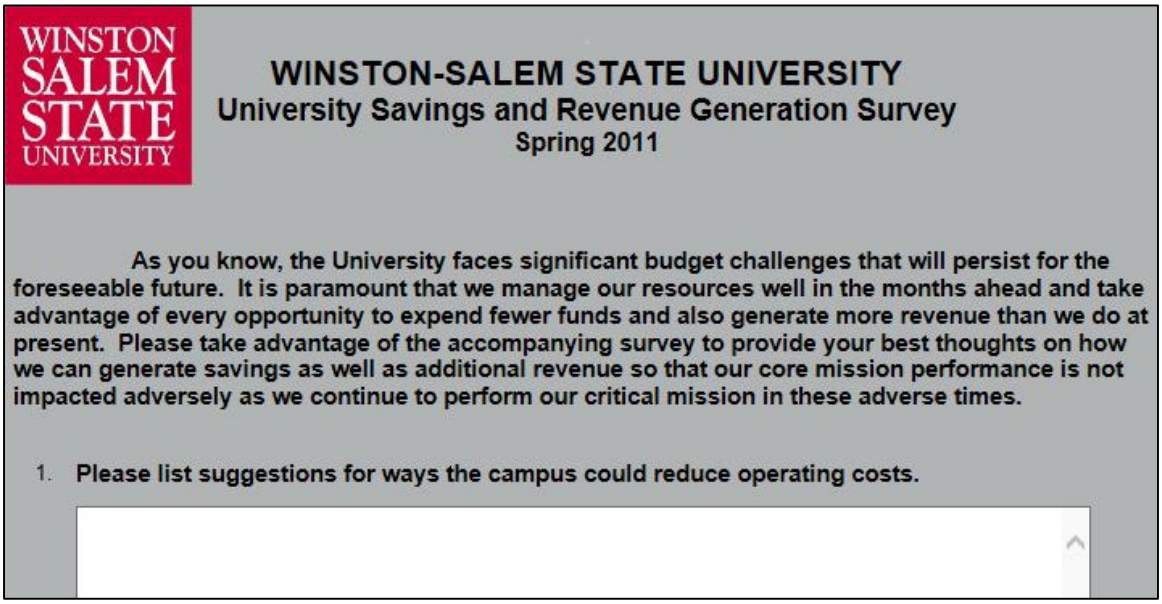


Fig. 3.5: Revenue Generation: Winston-Salem State University, USA [73]

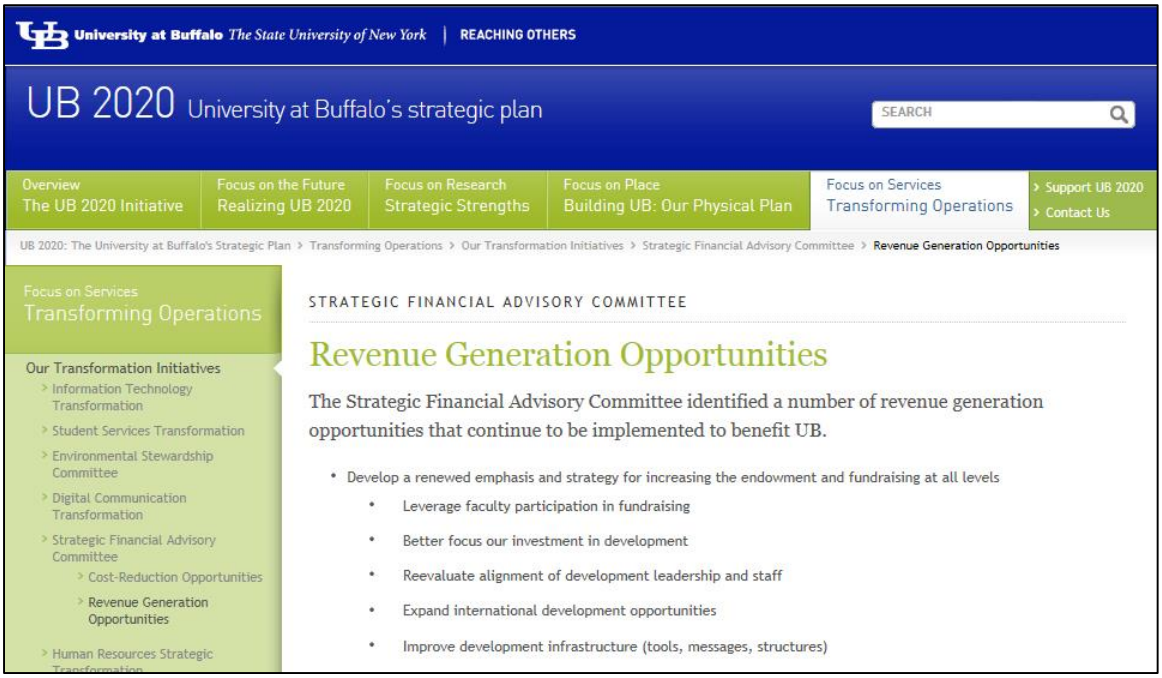


Fig. 3.6: Revenue Generation: University at Buffalo, USA [74]

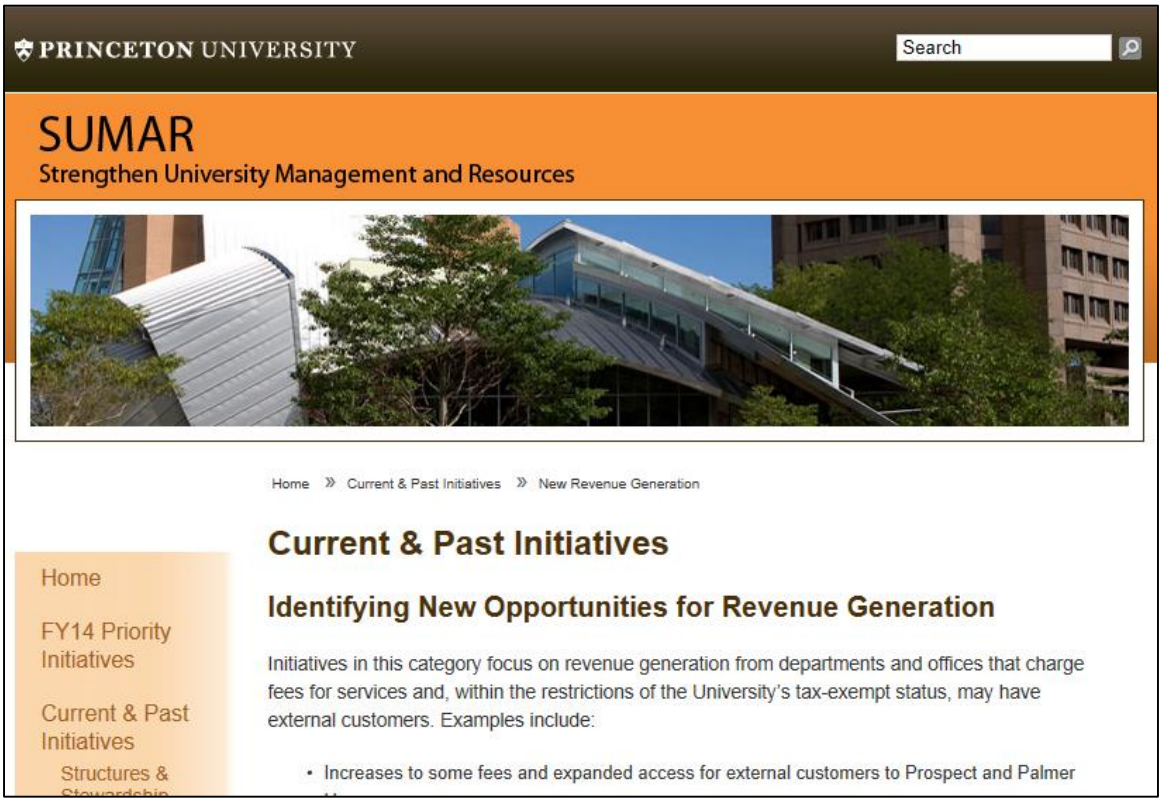


Fig. 3.7: Revenue Generation: Princeton University, USA [75]

Fig. 3.8: Revenue Generation: University of California UC Berkeley, USA [76]

Fig. 3.9: Revenue Generation: University of Alabama, USA [77]

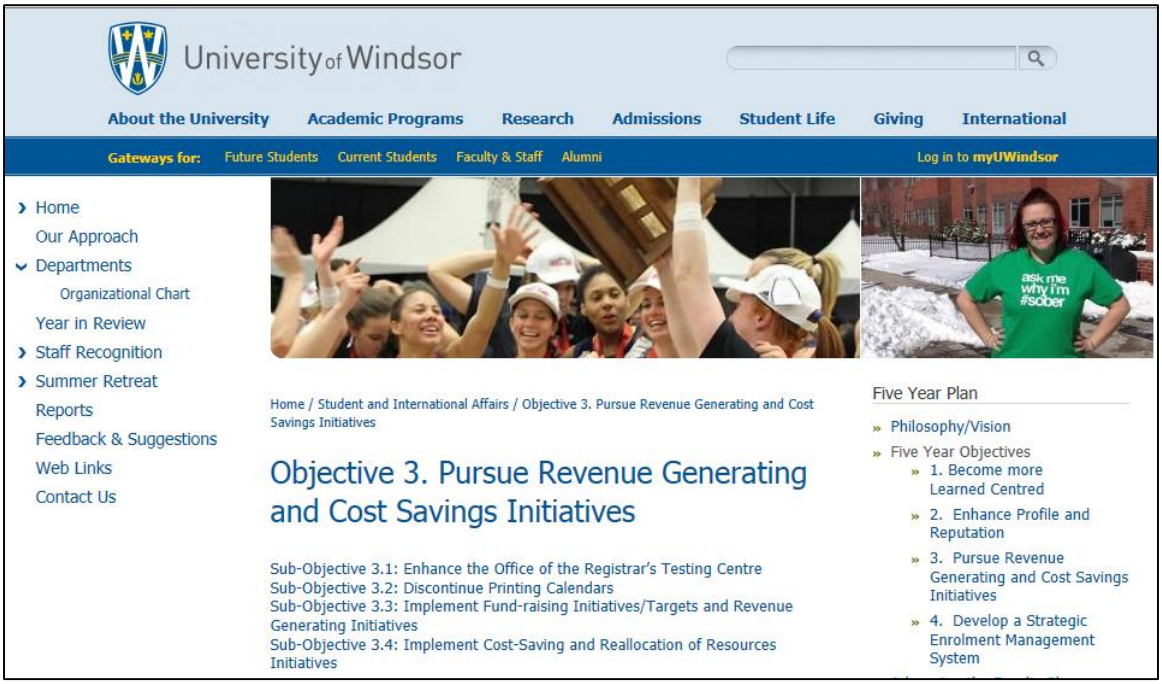


Fig. 3.10: Revenue Generation: University of Windsor, Canada [78]

3.2. WCU: Huge Financial Requirements

Many Indian Universities in Public or Private sector are Teaching-Universities. While trying to convert the Teaching-University in to Research-University they try to stretch the financial model of teaching-university, which generally doesn't work. Entirely new financial model is required for Interdisciplinary Research-University.

The Teaching Universities normally have following funding sources, which are inadequate to develop the "Interdisciplinary Research University".

Teaching University	Government Grants
	Tuition Fees
	Hostel Fees
	Examination Fees
	Building Development Fess

Table 3.1: Funding sources of Teaching University

The trends of financial models of Indian Universities are changing drastically. Professor Bijendra Nath Jain, VC BITS Pilani said "the institute is also increasingly focusing on growing sponsored research-led projects. If we were securing Rs 5 crore for R&D funding two years ago, we are attempting to secure about Rs 15 crore today. I expect this to grow to about **Rs 100-140 crore a year by 2020**. The most important way for us to secure funds is **through competitive research funding and sponsored research projects**". [79]

3.2.1. Establishing Cost of WCU

The WCU needs huge capital investment, which can't be provided by government of any country or any private player. I would like to quote few reference.

- At the beginning of the 20th century, the University of Chicago became a world-class institution in two decades and slightly more than $50 million--donated at the time by Rockefeller himself. The price has ballooned, not only because of inflation but because academic institutions have become immensely more complex and expensive. The competition has also become much fiercer. Now, it might take more than $500 million (Rs. 3000 Crore) along with clever leadership and much good luck - Philip G. Altbach (March 2004) [80]
- A world-class research university that can play in the best international leagues is an expensive undertaking — to establish and then to sustain. As an example, one large research-intensive new Chinese university cost around $700 million (Rs. 4200 Crore) to build and has a total annual budget of close to $400 million (Rs. 2400 Crore)- Philip G. Altbach & N. Jayaram (23 Oct 2008) [81]
- …..And decent infrastructure remains a major concern – there is just too little money being put in for building educational infrastructure, as we still seem to believe that higher education needs just modest funding – an investment of Rs 200-500 crores for setting a university is viewed as extremely "generous", when this amount is typically used to construct a high quality building for one department (the CS building of UIUC, Georgia Tech, MIT, Stanford – which have come up in the last 10 years, have cost in the vicinity of $100 million (Rs. 600 Crore))- Pankaj Jalote, Director, IIIT-Delhi (9 May 2012) [82]

Thus, in 2004 the approximate Establishment Cost was around Rs. 3000 Crore. In 2008, it was around Rs. 4200 Crore. **Thus in 2014, the establishment cost of WCU in India will be around Rs. 8000 to Rs. 10,000 Crore.**

3.2.2. Operational Cost of WCU

- In 2005, the average per year per student expenditure of WCU was
    - USA: 90 Lakh
    - UK: 23 Lakh [83]

  Thus in 2014, the average per year per student expenditure of WCU at India could be around Rs. 30 Lakh. Due to the Purchase Parity Index the operational cost decrease in India. But the salaries of international faculty and Internationalization of activities increase the budget. Thus in India in 2014, the yearly Operational Cost of WCU for 10,000 students will be around Rs. 3000 Crore.

- "…a total annual budget of close to $400 million (Rs. 2400 Crore)- Philip G. Altbach & N. Jayaram (23 Oct 2008) [81]

Thus in 2014, the operational cost of WCU in India would be around Rs. 3000 Crore.

3.2.3. Long Term Financing

The promoters of a new university usually announce with enthusiasm the huge endowment dedicated to the establishment of the new institution, but the initial capital investment is only one part of the total project. It is essential to provide adequate support for the **first few years of operation** and to establish a thoughtful business model that allows the new institution to grow and endure in a financially sustainable manner. A variant of overambitious planning is assuming that a new institution can be launched in a matter of months, and that high quality teaching and research can be accomplished within a few years of establishing a new university. In reality, rushing through the initial phase of design and implementation can often lead to hasty decisions that can have an adverse effect on the quality and cost of the project. Furthermore, institution building is a long-term process that requires stable leadership, continuous improvement and patience. This is especially true when it comes to developing the robust scientific traditions needed to produce leading-edge research and technological applications. [84] [85] [86]

3.2.4. Total Project Cost

It is expected that the proprietor of the University must offer 100% financial help for initial Establishment Cost and must provide required financial support, at least for 2 decades, towards Operation Cost.

In two decades the total project cost (Establishment plus Operational cost for 20 years) would be around Rs. 70,000 Crore. The University can generate around 50% of the project cost and thus in two decades around Rs. 35,000 Crore financial help will be required. The University can generate more than 75% of required finance, if appropriate support is available from all corners and stakeholders, including regulatory mechanism.

For Self Sustainable Research University, the government will have to relax many rules and regulations like

- Tax policy
- Not-for-profit clause
- Full freedom etc.

I have mentioned many such issues in detailed in my book “113 Difficulties in Developing World Class Universities”.

Remember that, IITs spend Rs 3.4 lakh on a student yearly, while tuition fee is just Rs 90k, which shows our standing in a race of developing WCU. [87]

	Harvard Univ.	Stanford Univ.	MIT	Caltech	Princeton Univ.	Columbia Univ.	Chicago Univ.	Yale Univ.	Cornell Univ.	Univ Pennsyl-vania
Has a medical school	yes	yes	no	no	no	yes	yes	yes	yes	yes
Total enrollment Undergraduate graduate	19,789 7,539 12,250	14,454 7,800 6,654	10,320 4,136 6,184	2,172 896 1,276	6,673 4,695 1,978	23,650 8,959 14,691	13,400 4,400 9,000	11,359 5,242 6,117	20,334 13,655 6,679	19,265 10,047 9,218
Undergraduate/graduate ratio	0.6:1	1.2:1	0.7:1	0.7:1	2.4:1	0.6:1	0.5:1	0.9:1	2.0:1	1.1:1
No. of international students	3,546	2,971	2,724	--	1,202	4,065	--	1,817	3,253	2,440
%of international students	18	21	26	--	18	17	--	16	16	13
no. of faculty (include research faculty)	2,000	1,749	1,581	1,147	1,146	3,224	2,160	3,236	3,241	4,238
Student faculty ratio	9.9:1	8.3:1	6.5:1	1.9:1	5.8:1	7.3:1	6.2:1	3.5:1	6.3:1	4.5:1
No. of staff	--	8,788	8,199	2,671	5,291	9,198	12,460	8,005	9,925	13,025
Faculty staff ratio	--	0.2:1	0.2:1	0.4:1	0.2:1	0.4:1	0.2:1	0.4:1	0.3:1	0.3:1
Annual revenue (US$ billion)	2.6	2.3	1.8	--	0.9	2.1	1.1	--	1.9	--
Annual revenue per student (xUS$000)	131	159	174	--	135	89	82	--	93	--
Annual expenditures (US$ billion)	2.6	2.3	1.8	--	0.9	2.1	--	1.7	1.9	4.3
Annual expenditures per student (xUS$000)	131	189	174	--	135	89	--	150	93	223

Table 3.2: The statistics of top 10 Private US Universities (2005) [83]

	UC – Berkeley	UC – San Diego	UC – Los Angeles	UC – San Fran-cisco	Univ Wisconsin - Madison	Univ Michigan –Ann Arbor	Univ Washington - Seattle	Univ Illinois - Urbana Champaign	Univ Minnesota – Twin Cities	Univ Colorado - Boulder
Has a medical school	no	yes	yes	yes	yes	yes	yes	no	yes	no
Total enrollment Undergraduate graduate	33,076 23,206 9,870	24,668 19,872 4,796	38,598 25,715 12,883	2,800 -- --	41,588 28,583 13,005	36,047 24,828 11,219	42,757 30,921 11,836	40,360 29,294 11,066	50,954 34,281 16,673	29,258 24,710 4,548
Undergraduate/ graduate ratio	2.4:1	4.1:1	1.2:1	--	2.2:1	2.2:1	2.6:1	2.6:1	2.1:1	5.4:1
No. of international students	--	--	--	--	3,571	--	--	2,189	3,663	1,170
% of international students	--	--	--	--	9	--	--	5	7	4
no. of faculty (include research faculty)	1,889	--	3,326	--	2,060	5,007	3,360	3,312	--	2,090
Student faculty ratio	17.5:1	--	11.6:1	--	20.1:1	7.2:1	12.7:1	12.2:1	--	14:1
no. of staff	20,399	22,000	--	--	13,710	17,569	20,102	4,588	--	--
Faculty staff ratio	0.1:1	--	--	--	0.2:1	0.3:1	0.2:1	0.7:1	--	--
Annual revenue (US$ billion)	0.9	0.6	0.8	0.4	1.7	1.2	2.2	--	1.3	0.8
Annual revenue per student (xUS$000)	28	26	21	169	41	32	51	--	27	27
Annual expenditures (US$ billion)	1.5	1.8	3.2	--	--	1.2	2.6	1.3	2.1	0.8
Annual expenditures per student (xUS$000)	44	74	83	--	--	32	61	33	41	27

Table 3.3: The statistics of top 10 Public US Universities (2005) [83]

	Univ Cambridge	Univ Oxford	Imperial College London	Univ college London	Univ Edinburgh
Total enrollment Undergraduate graduate	17,781 11,751 5,967	18,536 11,938 6,598	10,721 7,483 3,238	18,337 11,669 6,668	22,827 16,963 5,864
Has a medical school	yes	yes	yes	yes	yes
Undergraduate/graduate ratio	1.97:1	1.81:1	2.3:1	1.75:1	2.89:1
No. of international students	2,997	4,600	2,186	4,723	2,958
% of international students	17	25	20	26	13
no. of faculty (include research faculty)	--	1,346	2,856	4,080	--
Student faculty ratio	--	13.8:1	3.8:1	4.5:1	--
no. of staff	--	5,837	4,886	--	--
Faculty staff ratio	--	0.2:1	0.5:1	--	--
Annual revenue (US$ billion)	0.9	0.9	0.8	0.9	0.7
Annual revenue per student (xUS$000)	50	47	72	49	31
Annual expenditures (US$ billion)	0.9	0.8	0.8	0.9	0.7
Annual expenditures per student (xUS$000)	50	45	71	49	30

Table 3.4: The statistics of top 10 British Universities (2005) [83]

	Univ Bristol	Univ Sheffield	Univ Manchester	Univ Nottingham	Univ Birmingham
Total enrollment Undergraduate graduate	16,140 10,935 5,205	19,587 16,070 3,517	25,746 -- --	29,856 -- --	24,900 17,836 7,064
Has a medical school	yes	yes	yes	yes	yes
Undergraduate/graduate	2.10:1	4.57:1	--	--	2.52:1
No. of international students	--	3,820	4,489	--	4,303
% of international students	--	20	17	--	17
no. of faculty (include research faculty)	2,405	1,296	--	2,415	--
Student faculty ratio	6.7:1	15.1:1	--	12.4:1	--
no. of staff	1,284	4,273	--	2,835	--
Faculty staff ratio	1.9:1	0.3:1	--	0.9:1	--
Annual revenue (US$ billion)	0.5	0.5	0.7	0.6	0.6
Annual revenue per student (xUS$000)	29	29	27	19	22
Annual expenditures (US$ billion)	0.5	--	0.6	0.6	0.5
Annual expenditures per student (xUS$000)	29	---	26	19	21

Table 3.5: The statistics of top 10 British Universities (2005) [83]

3.3. How Existing WCUs Manage these Huge Financial Requirements?

The existing WCUs are generating around 60% Revenue from sources other than Tuition Fees and Govt. Aids. For example University of Chile, Pontifical Catholic University of Chile etc. [85] [88] [89]

Institution	Govt. budget	Tuition fees	Endowment income, donations, lottery, and corporate support	Competitive research funding	Consultancies, training, and contract research
Indian Institutes of Technology, Mumbai	70	5	5	5	15
Shanghai Jiao Tong University, China	40	10	5	15	30
Pohang University of Science and Technology, Korea	**6**	7	34	47	6
University of Chile	**11**	23	1	20	45
Pontifical Catholic University of Chile	**11**	30	7	4	48
Monterrey Institute of Technology, Mexico	**0**	77	13	3	7

Table 3.6: Funding sources (in Percentage) of few World Renowned Universities or Institutes [85]

The U C Berkeley is a Public Universities of USA. It generate only 40% of the total revenue from Government funds and Tuition Fees. It generates remaining 60% revenue from other sources.

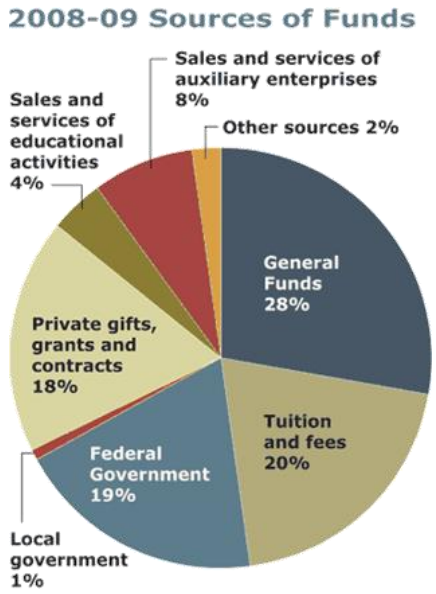


Fig 3.11: U C Berkeley: Sources of Funds [88]

Let's see few facts about WCU:

- In top 100 WCU, per faculty per year average research revenue generation is US$ 142,000 i.e. **Rs. 86 Lakh** (last but one line in the following figure).

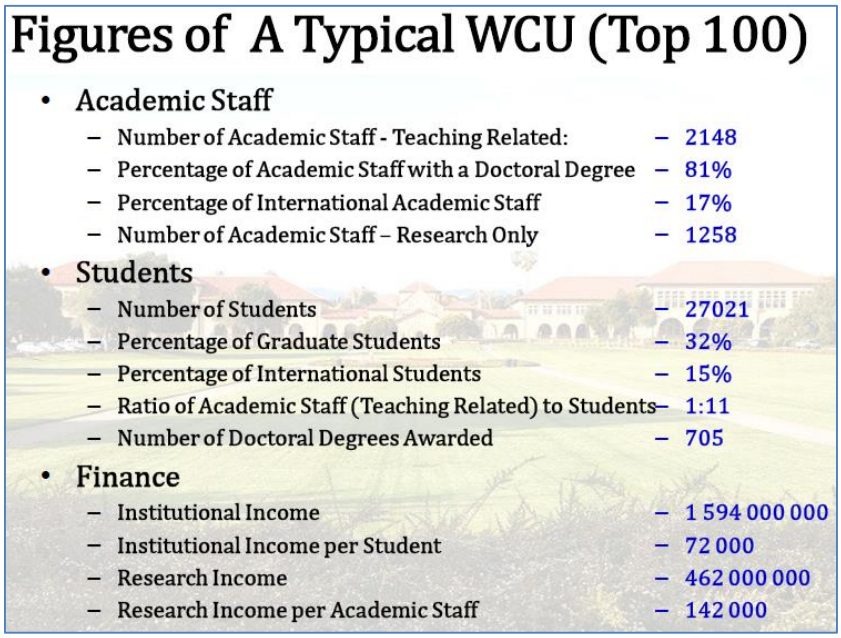


Fig.3.12: Statistics of Typical WCU [90]

- The maximum research projects of WCU are externally funded (see following figure).

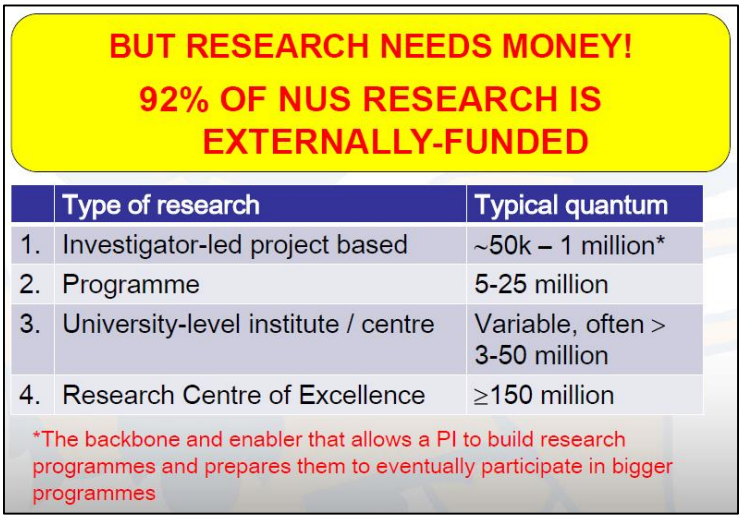


Fig. 3.13: National University of Singapore (NUS): 92% of research is externally funded [91]

- The financial requirements of WCU are very huge. **Nether government nor private players can provide full financial help.**

3.4. Academic and Non-academic Activities for Generating Revenue

The 60% Revenue can be generated through following Academic and Non-academic activities:

SN	Academic Activities for Revenue Generation	Related Topics	Covered in Books
1.	Income from Patents	• Develop Research Culture and Research University involved in teaching • Global Talent (Faculty and Students) • Innovative Culture	"Strategy to Develop World Class University" "Funding Techniques of World Renowned Universities"
2.	Government Research Funding		
3.	Fellowships, Scholarships		
4.	Income from Innovation and Creativity Centers		
5.	Industry Funding	Industry-Institute Interface and Partnerships	"Strategy to Develop World Class University" "Funding Techniques of World Renowned Universities"
6.	Income from Technology Transfer		
7.	Income of Incubation center		
8.	Consultancy Revenue		
9.	Short Term Training Programs	Academic Business Activities	"Funding Techniques of World Renowned Universities" "Strategy to Develop World Class University"
10.	E-learning Revenue Generation		
11.	Income from Franchise or Licensing		
12.	Income from Non-Degree Programs		
13.	Income from Services offered		
14.	Income from Software Development		
15.	Academic Collaboration and Partnerships		

Table 3.7: Academic Activities for Revenue Generation

SN	Non Academic Activities for Revenue Generation	Related Topics	Covered in Books
1.	Alumni giving	Alumni Association	"Strategy to Develop World Class University"
2.	Endowment		
3.	Donation for Long Term Investment		
4.	On Campus Business	Change the Not-For-Profit clause so that Universities can do the profit making activities to generate revenue. The profit earned should be used for development of the University. They can accumulate these funds to earned more revenue.	"Funding Techniques of World Renowned Universities"
5.	Off Campus Business		
6.	Premises Rent		
7.	Spare Capacity Utilization		
8.	Private Equity (PE)	Need For-Profit clause	"Funding Techniques of World Renowned Universities"
9.	Venture Capital (VC)		
10.	PPP Funding		
11.	FDI Investment		
12.	Government Infrastructure Funding	There should not be any obstacle for taping these resources.	"Funding Techniques of World Renowned Universities"
13.	Foreign Non-Governmental Funding Organization		
14.	Foreign Government Funding		

15.	International Student Market	Need national policy and government support	"Strategy to Develop World Class University"
16.	Admission Policy	Many issues	Covered in this book
17.	Cost Saving Options	Need strict vigilance	"Funding Techniques of World Renowned Universities"

Table 3.8: Non-Academic Activities for Revenue Generation

3.5. Proposed Finance or Business Model for Revenue Generation

To generate revenue through **Academic and Non-Academic activities** mentioned in above tables, the robust **Finance Model** is needed. These activities can be grouped in to following categories

- Global Faculty
- International Students
- Research University involved in teaching
- Industry Interface: Two Way Industry Partnership
- Alumni Association
- Academic Collaborations and Partnerships
- Culture of Innovation
- Admission Policy

The above mentioned activities and the Proposed **Finance Model** depends upon **many other systems** like

- Good Governance and Academic Freedom
- International Curriculum Design, Pedagogy and Academics
- Global Employability
- Internationalization
- Affordability
- International Accreditations
- Learning Powered by Technology
- Student's Experience and Learning Beyond Classroom
- Interdisciplinary and Multidisciplinary University
- Brand Name: International Teaching & Research Reputation
- World Class facilities, Residential Campus with amenities and support services

Out of these, many issues have already been discussed in much details in my previous book "Strategy to Develop World Class University".

3.6. Indian University: No Business Model for Revenue Generation

In India very few Universities have adopted revenue generation strategies other than tuition fees and government aids. But they could not yet developed successful Business Model to satisfy the need of world class education facilities and standards.

The revenue generation strategies must be part of **Business Model** or **Finance Model** of the University. In addition to this, the Business Model must be properly mapped to the **Governance Model** of the University. The Governance Model of Universities in India are as per respective University Act by the Government. Let's study the existing Governance Model of the various universities, which is as per respective University Act.

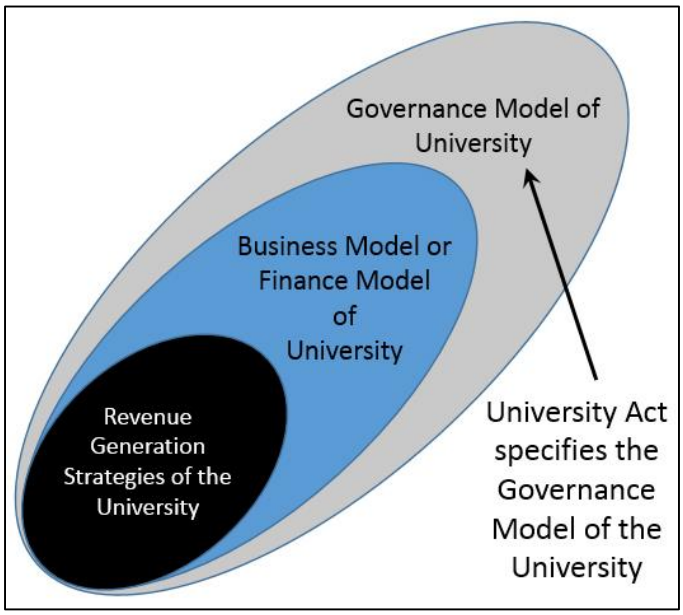


Fig. 3.14: University Act, Governance Model, Finance Model and Revenue Generation strategies of University

3.7. University Act and Governance Model of Indian Universities

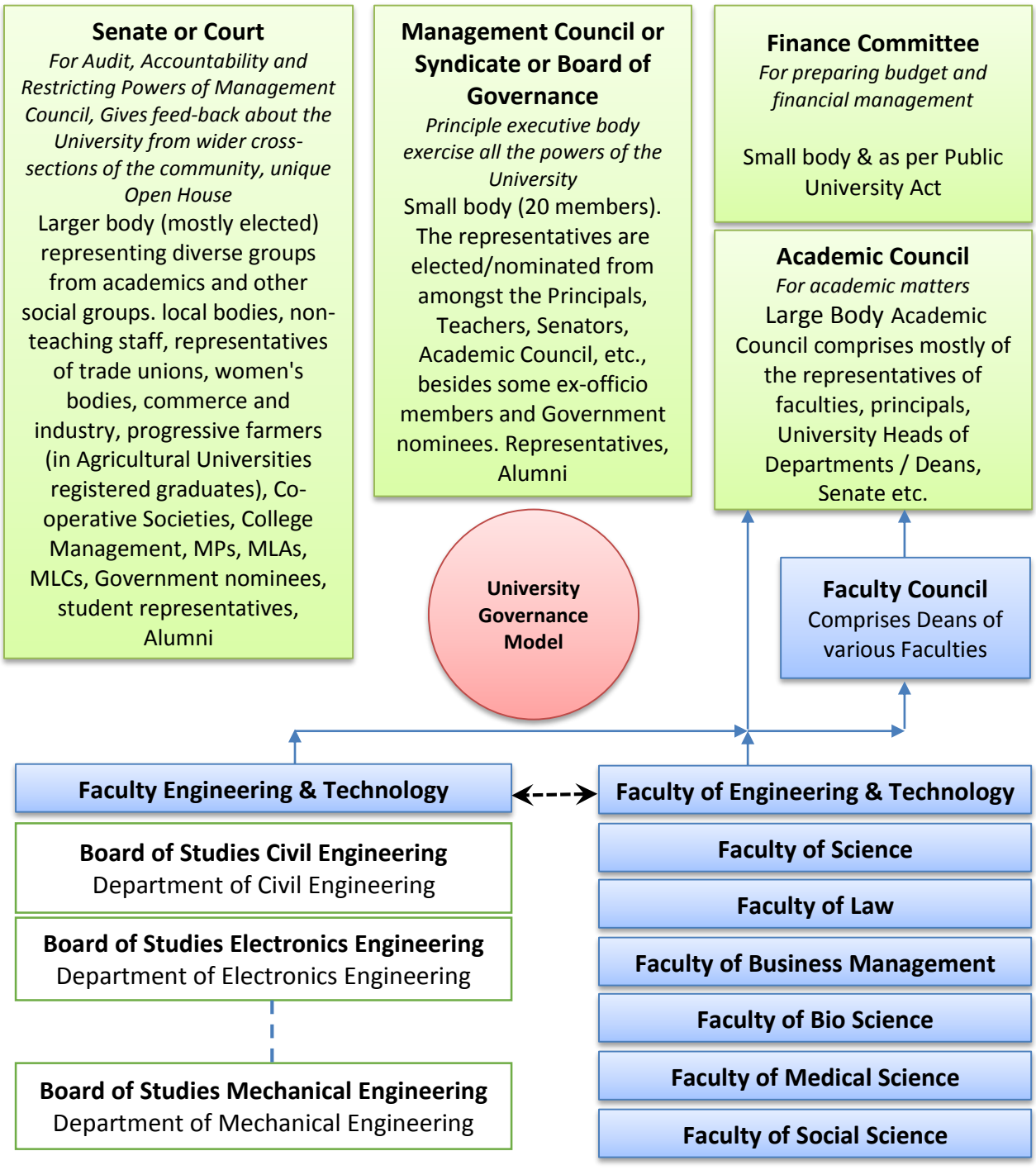


Fig. 3.15: University Governance Model or structure

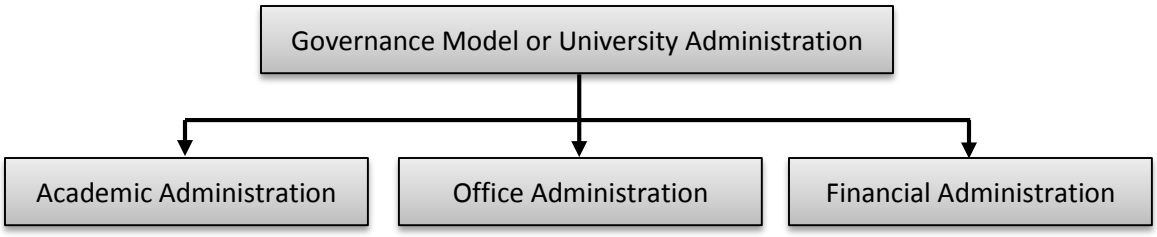


Fig. 3.16: University Administration

3.7.1. In India the University Act Decide Governance Model

The Government Act decides the governing framework of any University in India. For example in Maharashtra the governing structure of the State Universities is decided by Maharashtra Government's Public University Act of 1994. The proposed Maharashtra public university act 2011 is under consideration. [92] [93]

The Act specifies the details of Statutory (Authorities) of the University and also specify the Officers of the University (Chancellor, Vice Chancellor, Registrar etc.) along with duty and powers.

In this governance model of the University the Dean is a head of faculty (or School), Chairman is a head of BOS and HoD is a head of Department.

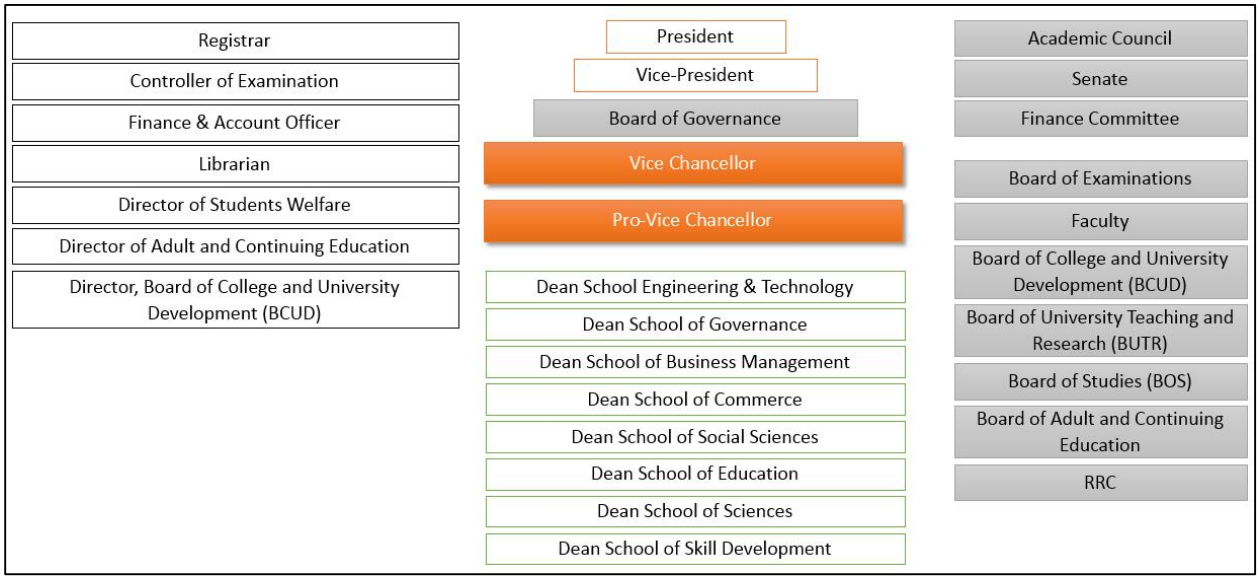


Fig. 3.17: Governance Structure of University as per Maharashtra University Act 1994

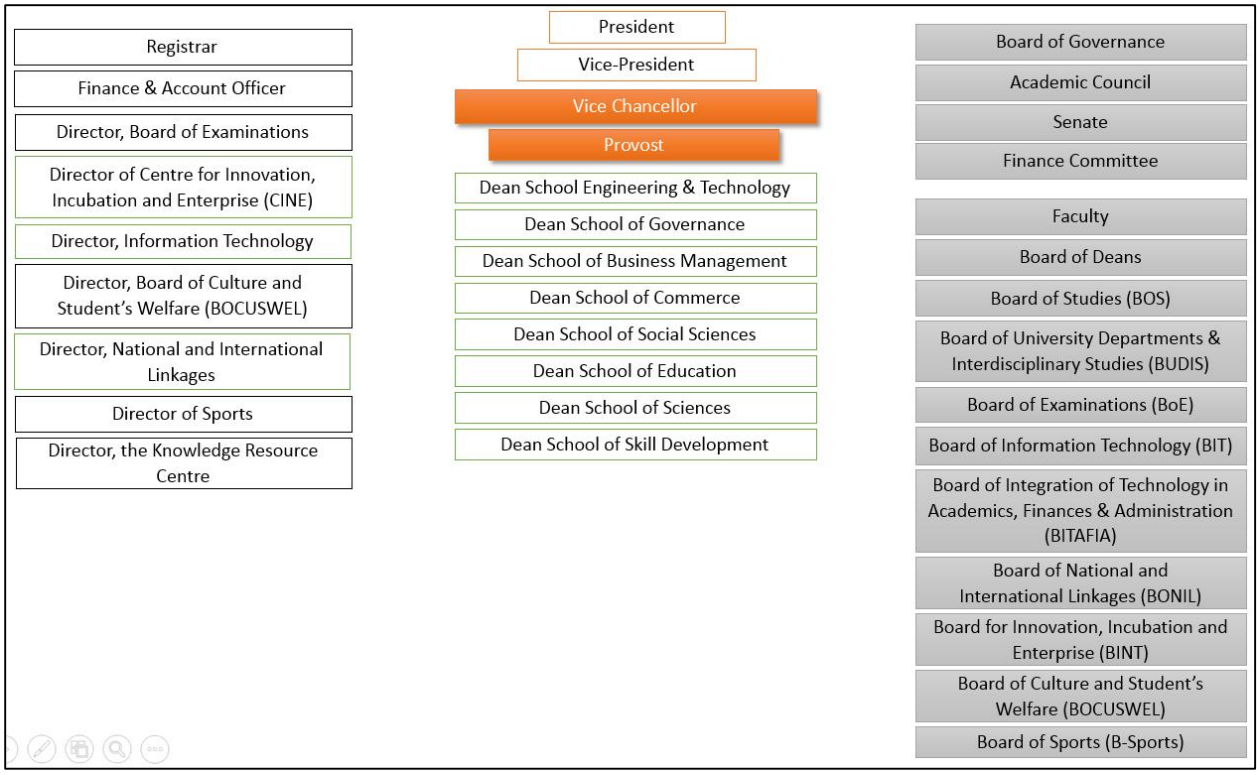


Fig. 3.18: Governance Structure of University as per proposed Maharashtra University Act 2011

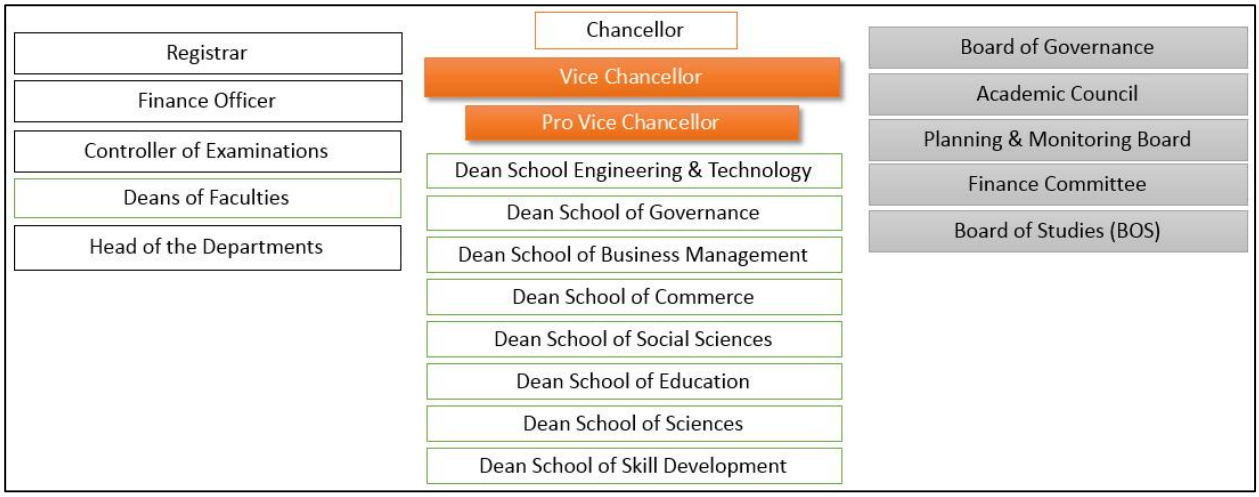


Fig. 3.19: Governance Structure of the Deemed University as per UGC (Institutions Deemed to be Universities) Regulations 2010 [94]

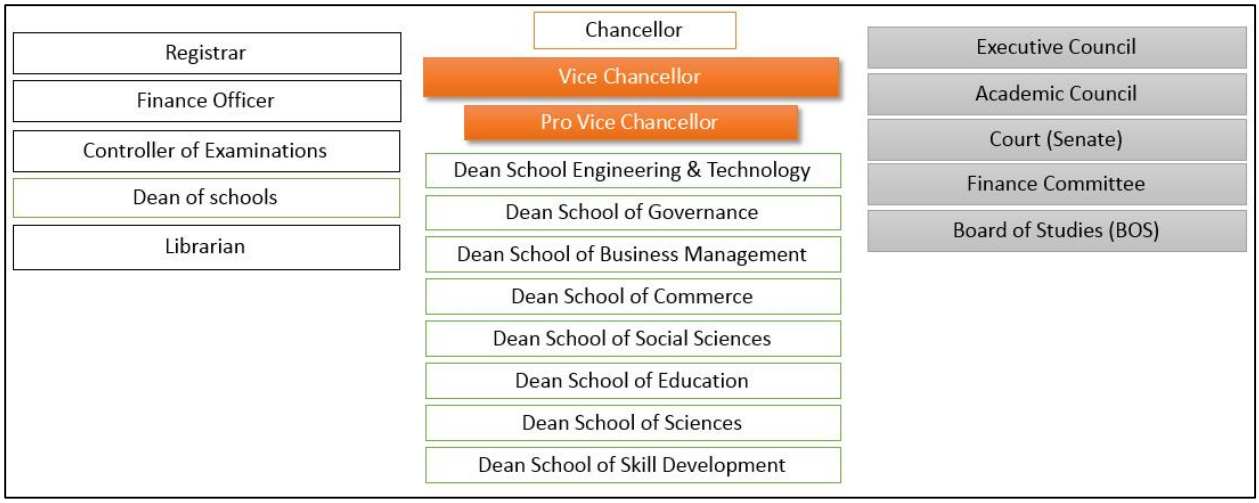


Fig. 3.20: Governance Structure of Central University as per Central University Act 2009 [95]

3.7.2. Statutory and Non-Statutory Bodies

In the Governance Model of the University, the Authorities and Bodies can be broadly divided into

- Statutory
- Non-Statutory

The University Act specifies the Statutory Bodies.

Among the Statutory Authorities, there are three major apex bodies viz.

- Senate (known as Court in some Universities)
- Management Council / Syndicate / Executive Council / Board of Governance
- Academic Council.

SN	Bodies	Function
Statutory Bodies which are University Authorities		
1.	Senate / Court	General policy making
2.	Executive Council / Management Council / Board of Governance / Syndicate	Decision making and implementation
3.	Academic Council	Framing of academic regulations and related matters
4.	Faculty	discipline based
5.	Board of Studies (BOS)	discipline based
6.	Finance Committee	
7.	Selection Committees	
8.	Research Recognition Committee (RRC)	Research discipline based
Non-Statutory Bodies		
9.	Committees appointed by the Authorities and or Vice-Chancellor	may or may not be permanent in nature

Table 3.9: Statutory and Non-Statutory bodies of the university

The Statutory Bodies are usually referred to as University Authorities. Their composition / constitution, power / functions and inter-relationship among them - are determined by the **Act of State legislature** or Parliament or left to be laid down by Statutes. There are other statutory bodies such as Faculty and Board of Studies, Finance Committee, Selection Committees etc., whose composition and authority are derived from the University Statutes. While the University System does not have much built-in flexibility in the role and constitution of its authorities, it has some say over other Statutory Bodies. Besides the above Statutory Bodies, there are the Committees appointed by the Authorities and or Vice-Chancellor. These are non-statutory in character and hence may or may not be permanent in nature. [96]

There are three broad streams in administrative work viz.

- Policy framing
- Formulation of procedures (rules and regulations) and
- Actual implementation

The University authorities (Executive Council and Academic Council), assisted by the respective bodies and committees, should have the purview of policy framing; formulation of the contingent rules and regulations of administrative procedures could be left to the bodies and committees; the actual implementation should be the responsibility of the Officers of the University.

The Executive Council (or Syndicate) and the Court (or Senate) have the responsibility of framing Statutes and regulation and dealing with all matters connected with the organization and administration of the University's affairs. [96]

3.7.4. Senate / Court

The Senate (or Court,), in many Universities, is **Supreme policy maker**; it is a large body consisting of **representatives from various social groups**. The function of the **Senate is not only statute making but also acting as a social forum where the University's performance is reviewed and appraised**; further it gives a semblance of **democratization of University administration and societal participation in its management**. Perhaps, Senate is a **unique Open House**, wherein we can get the **social feed-back about the University from wider cross- sections of the community**. But since a large proportion of its membership consists of academics (mostly in ex-officio capacities), the societal aspect does not get adequate representation in many Universities. [96]

The Senate is a larger body representing diverse groups from academics and other social groups, mostly elected. In some Universities the non-academic groups in the Senate include Local bodies, Non-teaching staff, Representatives of trade unions, Women's bodies, Commerce and industry, Progressive farmers (in Agricultural Universities registered graduates), Co-operative Societies, College Management, MPs, MLAs, MLCs, Government nominees, Student representatives, Alumni etc.

However, it is felt by some that the Senate does create noise; and it is suggested that the noise has some purpose. The Syndicate is compelled to be conscious of the impending and vociferous criticism it may have to face in an open general body such as Senate. So it has some **sobering**

influence and puts some **restraint on the executive power of the Syndicate** which would otherwise go unchecked. The very fear of criticism and exposure in the Senate is likely to mend the ways of the Syndicate. It is felt by some that **without a Senate we cannot ensure proper accountability and audit of the Syndicate's role**, though others feel that the final accountability reports should be enough. [96]

The powers of the Senate may include the following (as given for instance in Bharathiar. University & Bharathidasan University Acts, 1982):

1. To review from time to time, the broad policies and programmes of the University and to suggest measures for the improvement and development of the University
2. To advise the Chancellor in respect of any matter which may be referred to it for advice
3. To exercise such other powers and such other functions as may be prescribed in the Statutes.

The Statutes of Bharathidasn University (1983) as given under are more specific about the role of the Senate:

The Senate shall:

1. Consider Annual Report of the University
2. Consider the audited annual accounts of the University
3. Consider Ordinances made by the Syndicate
4. Consider regulations made by the Standing Committee on Academic Affairs
5. Consider the report on affiliated colleges presented by the Syndicate at the end of every three years".

It may be noted here that the Senate is to consider and discuss; its approval has not been made mandatory;

".... If any resolution is passed by the Senate, the Syndicate shall take action as it deems fit whenever necessary.... The Syndicate may either accept or reject the proposal contained in such resolution".

Thus, the above provisions of the Act / Statutes of one of the most recently established State Universities can serve as model frame to design the Senate to play a useful advisory / **recommendatory role from the social point of view**. Such a **'social-monitoring'** of higher education system becomes **logically necessary and relevant particularly in the Indian context** where a substantial part of the cost of higher education is borne and subsidized by the society. [96]

3.7.5. Executive Council / Management Council / Syndicate / Board of Governance

The Syndicate or Executive Council being the executive body, is a small body, usually consisting of not more than 20 members. The representatives are elected/nominated from amongst the Principals, Teachers, Senators, Academic Council, etc., besides some ex-officio members and Government nominees. [96]

Let's see the example of Singhania University. The Board of Management shall be the principle executive body of the University. The Board of management shall exercise all the powers of the University, not otherwise provided for by Statutes, Ordinances of the University and the Regulations for the fulfillment of the object of the University. All the movable and immovable

property of the university shall vest in the Board of Management and it shall exercise the powers and perform the function as under:-

- To provide general superintendence and directions and to control the functionality of the university by using all such powers as are provided by the act or the Statutes, Ordinances, Regulations or rules made there under
- To review the decisions of other authorities of the University in case they are not in conformity with the provisions of this Act or the Statutes, Ordinances, Regulations or Rules made there under
- To approve the budget and annual report of the University
- To lay down the policies to be followed by the University
- To manage and administer the finances, revenues, assets and properties of the University
- To supervise all administrative affairs of the University
- To create any post of teaching or any academic nature.
- To determine the terms and conditions of services of the teachers and other members of the academic staff
- To specify the qualification and the function of the teachers and other members of the academic staff
- To approve the appointment of teachers and other members of the academic staff on the recommendation of the Vice-Chancellor
- To specify the manner of temporary appointment of teachers and other members of the academic staff and approve such appointments
- To regulate and approve the appointment of Visiting Professors, Emeritus Professors, Fellow, Artists and Writers and to determine the terms and condition of such appointments
- To invest money in stock, funds on securities or in approved banks or other financial institutions or in the purchase of assets and properties in consultation with the Financial Committee
- To create administrative, ministerial or other posts after considering the recommendations of the Financial Committee and to specify the manner of appointments to such posts
- To receive of transfer any property on behalf of the University
- To constitute functional committee/bodies/authorities as may be considered necessary from time to time to achieve the objectives of the University
- To fix remuneration or allowances payable to any writer counselor, examiner, invigilator or pay other person.
- To delegate any of its powers to any officer or authority of the University and
- To do all such acts as are necessary to carry out the objects of the University. [97]

3.7.6. Academic Council, Faculties and Boards of Studies

The Academic Council deals with academic questions generally and is chiefly concerned with courses of study and the organization of teaching and examination. It co-ordinates the world of the various Faculties. The usual Faculties are those of Arts, Science, Medicine, Law, etc. **The head of Faculty is called the Dean** and is usually a Professor of the University. It is the Dean's business to attend to the framing and working of the various courses of study in his Faculty. **A Faculty usually has several Board of Studies to help it to frame syllabuses in different subjects, appoint examiners, etc.** These **Faculties consist of a number of Departments (e.g. English,**

Sanskrit, History, etc.) and each Department has its own Head or Chairman or Director who is responsible to the Dean. Quite frequently the Dean's only function is to preside at meetings of the Faculty, and maintain a general supervision over the various Departments of teaching. The Academic Council comprises mostly of the representatives of faculties, principals, University Heads of Departments/Deans, Senate, etc. [96]

3.7.7. Shared Responsibilities and Working

The authorities of the University system (Senate, Syndicate and Academic Council) **do not have mutually exclusive powers and functions**. **Most of the decisions taken by one authority are to be approved by or remitted to for information or ratification by other authorities**.

- Though the Syndicate is the apex executive body managing the administration of the University, it has to seek the policy approval and budget- sanction from the Senate.
- The Academic Council is primarily concerned with the academic curricula, syllabi and regulations. However, it does not have the ultimate authority over them as most of these are provided under Ordinances, which have to be approved by the Syndicate and not disapproved by the Visitor/Chancellor. [96]

3.7.8. Registrar

Registrar, is Secretary of the Senate / Court, the Syndicate / Executive Council, the Academic Council and the Faculties and conducts the official correspondence of these bodies. He is the custodian of the records, the common seal and such other properties of the University as may be committed to his charge. He represents the University in suits and proceedings. He enjoys the powers of attorney and verifies pleadings by himself or by proxy. He has the power to take disciplinary action against the employees belonging to the ministerial staff and to suspend them pending enquiry, to administer warnings to them or to impose on them the penalty of censure or the with-holding of increments.

The Registrar's role includes tendering advice, conducting negotiations, effecting conciliation and managing crises. He has, besides a host of undefined roles. He negotiates with employees' associations and deals with demonstrations and other forms of agitation. He has to be available all the time to the Vice-Chancellor for consultation. As secretary of the University bodies and otherwise, the Registrar comes into continuous contact with the academic community.

The office of the Registrar is very important in a University. He is generally the **executive head of the administration**. At the same time, he is **very much involved also in the non-administrative affairs of the University**. [96]

3.8. Governance Model of Autonomous Institutes

The UGC decide the governance model of the autonomous institutes. The governance model of autonomous institutes is almost similar to that of university governance model. As per UGC, the

governance model of autonomous institutes has following bodies for decision making and governance.

- Governing Body
- Academic Council
- Board of Studies
- Finance Committee

3.9. Proposed Extended Governance and Finance Model

The Finance model is a subset of Governance model of the University. The existing Finance Models of the Indian Universities are over dependent on public funding and Tuition Fees. These finance model followed the funding pattern of teaching university. To establish "Self-Sustainable Interdisciplinary World Class Research University" there is a need to extend the Finance and Governance model.

The extended finance model should help to generate revenue other than student fees and government aids for establishing WCU. That is, **the Extended Finance Model must incorporate the above mentioned academic and non-academic activities**.

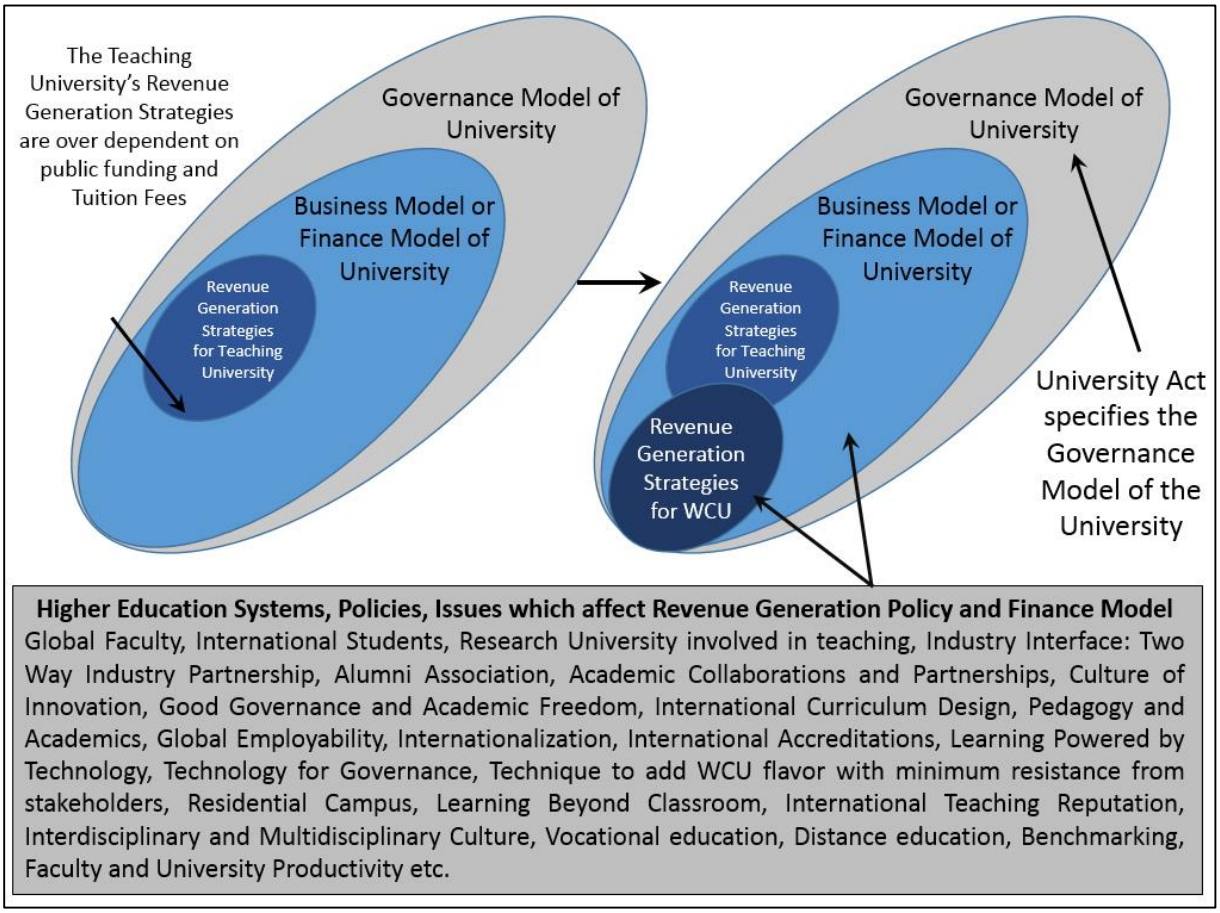


Fig. 3.21: Proposed Extended Governance Model and Finance Model of the University

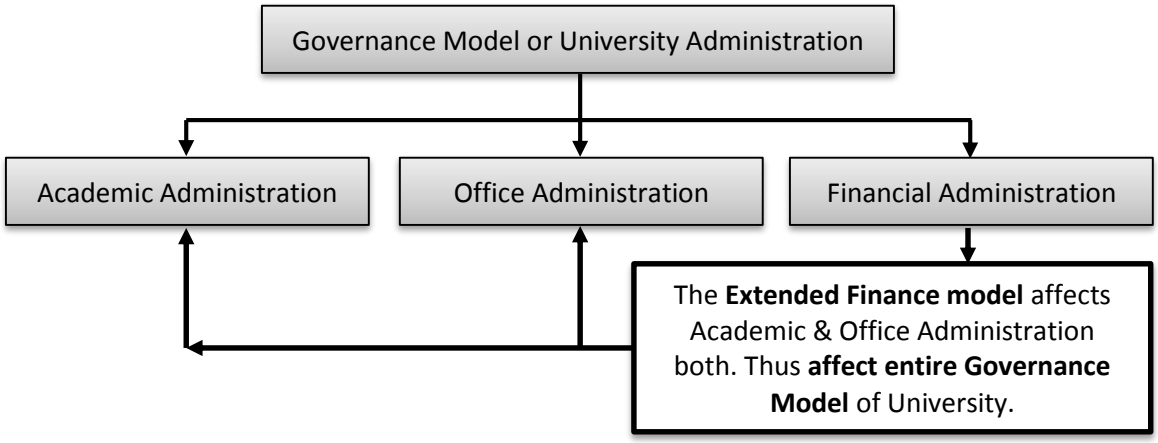


Fig. 3.22: Extended Finance Model will Affect Entire Governance Model of University

The above figure shows that, the Extended Finance Model affects Finance, Academic and Office Administration i.e. Entire Governance Model. Thus for Abundant Resources need huge finance The need of huge finance creates the need of new revenue generation policies, which create the need of Extended Governance Model.

The Extended University Governance Model as per Maharashtra University Act 1994, can be shown diagrammatically as follows (all issues can't be shown with the help of diagram)

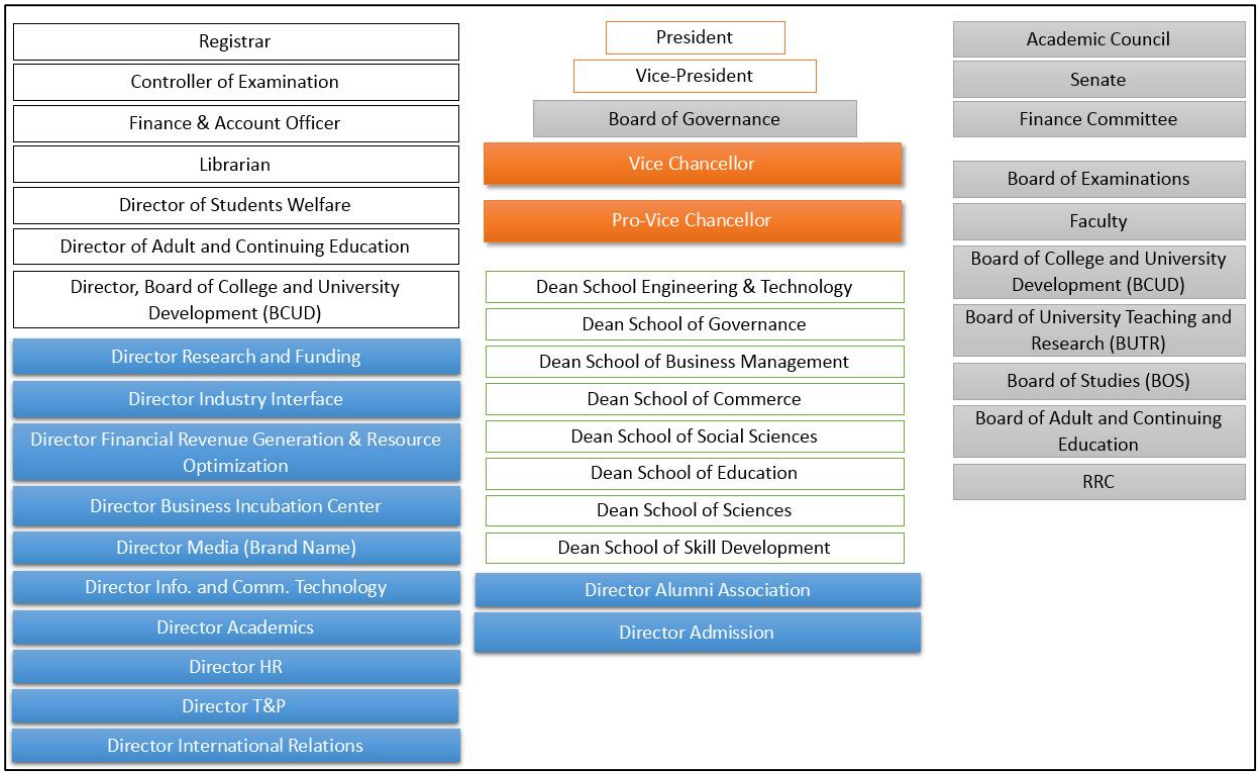


Fig. 3.23: Extended University Governance Model as per Maharashtra University Act 1994

The job responsibilities of all the post are given in Chapter 3 (pages 38-115) of the book "Strategy to Develop World Class University". The similar modifications can be done for Governance Model of Autonomous Institutes.

3.10. Distribution of Topics Related to Finance and Governance Model in My Series of Books on WCU

All the necessary topics related to Finance Model are covered in my book "Funding Techniques of World Renowned Universities"

I had covered following topics related to Financial Model and Governance Model in my book "Strategy to Develop World Class University"

1. Global Faculty
2. International Students
3. Research University involved in teaching
4. Industry Interface: Two Way Industry Partnership
5. Alumni Association
6. Academic Collaborations and Partnerships
7. Culture of Innovation
8. Good Governance and Academic Freedom
9. International Curriculum Design, Pedagogy and Academics
10. Global Employability
11. Internationalization
12. International Accreditations

The following topics are covered in my book "Technology-Storms Redefining World Class Universities"

13. Learning Powered by Technology
14. Technology for Governance

The obstacles and hurdles for developing WCU and models are covered in my book "113 Difficulties in Developing World Class Universities"

To avoid redundancy, in this book, I have not repeated the topics already covered in my previous four books. In this book I have covered the following topics

15. Technique to add WCU flavor with minimum resistance from stakeholders
16. Residential Campus
17. Learning Beyond Classroom
18. International Teaching Reputation
19. Interdisciplinary and Multidisciplinary Culture
20. Vocational education
21. Distance education
22. Benchmarking
23. Faculty and University Productivity

24. Student admission policy
25. State Government Laws and Location
26. Globalization and Financial aspects of WCU

All these issues, policies and strategies enhance the International Teaching & Research Reputation, Employability and Graduate Attributes or Educational Outcomes.

In next chapter, I would like to cover "How to introduce all these changes related to World Class Education and Excellent Graduate Attributes or Educational Outcomes without much resistance from all the stakeholders of the University or Higher Education Institutes".

Chapter 4: How to Introduce the World Class University Component without Any Resistance and with Little Structural Changes?

Developing World Class Education Facilities, Culture and Environment without any opposition from existing stakeholders of Teaching University system is the major problem faced by many Universities. People always oppose to major changes. I would like to propose new technique with the help of Center of Excellence, which can introduce the ***World Class Research University Component*** *without any opposition and without modifying existing structure. That is, Equity and Excellence can grow in parallel.*

Makhtar Diop, World Bank Vice-President for Africa said that "I am excited to support these pioneering ***centers of excellence*** *because they will be another step in building and nurturing specialized* ***world-class higher education institutions*** *on the continent." [98]*

4.1. Main Difficulty for Developing World Class University

I had mentioned almost every Bottlenecks, Barriers, Hindrances, Obstacles and Hurdles for establishing WCU in my book namely "113 Difficulties in Developing World Class Universities". I feel that, the main difficulty of developing WCU is "**Stakeholder's resistance to change the existing culture**". If you try to change the existing governing mechanism, teaching culture, curriculum, pedagogy or research culture then there is a possibility of strong oppose from every corner of the University and society.

The human beings always resist changes. Large-scale change – the shifting of strategies, implementation of new systems, significant revamping of structures and processes – is critical to the success of every company as well as country. There are various reasons for the opposition for the changes like

- Misunderstanding about the need for change
- Fear of the unknown
- Lack of competence
- Connected to the old way
- Low trust
- Poor communication
- Changes to routines etc.

The best examples are

- The 4 year degree course problem (June 2014) of Delhi University [99]
- IIT-JEE Joint Entrance Examination: Opposition from the Indian Institute of Technology (IIT) [100] [101]
- All India Single Pre Medical Test (PMT) i.e. National Eligibility and Entrance Test (NEET) [102] [103]
- The existing system always resists for changes. The recent example is "**Dr. Anil Kakodkar Recommendations for Financial Autonomy to IIT**". IIT directors are against Anil Kakodkar's recommendations and have told the HRD ministry that such a model will "strongly constrain the future growth of the IITs". Nuclear scientist Anil Kakodkar's model suggests that IITs' reliance on government funding must be curtailed. While this may assure greater financial autonomy to IIT's, the directors do not seem to agree. The IIT directors have pointed out that IITs are not just about teaching but are "strategic assets of the nation". They thus summed up their desire to remain funded by the government. This matter will be taken up at the IIT council meeting in September 16. The IIT directors have spoken on the Kakodakar Committee's recommendations on governance, autonomy and finances saying that "the proposed model is not consistent with the funding pattern of any reputed public research university." [104]

Jamil Salmi stated that "Managing the change from a well-known institution within the country to a global, world class institution is particularly **challenging** considering that there may be **some individuals who are well-entrenched in their comfort zones and thus may not agree with the idea of becoming world class**." [105]

4.2. Goals and Objectives: Need Mechanism to Make Changes Smoothly Without any Resistance

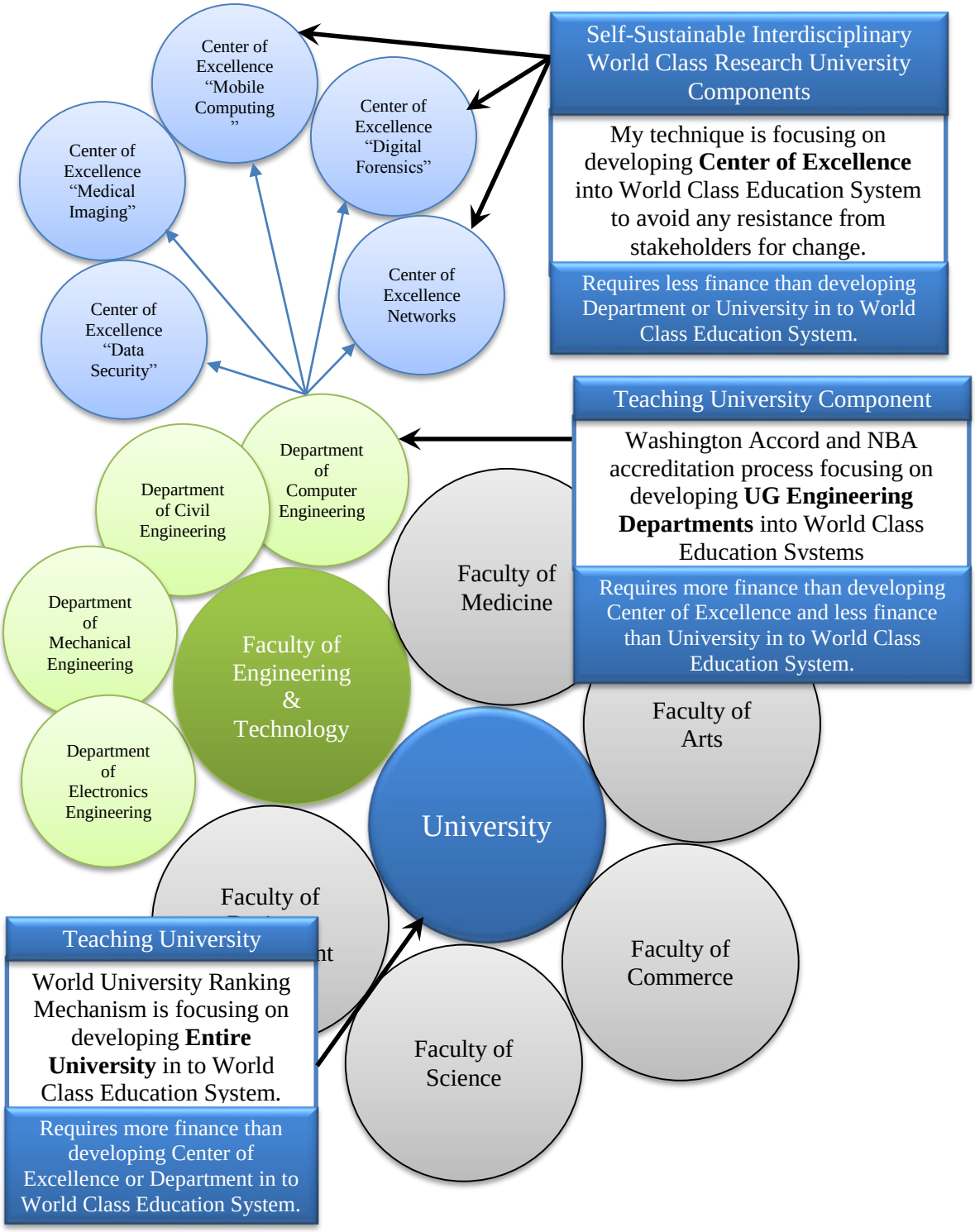


Fig. 4.1: Center of Excellence as a "World Class Self-Sustainable Interdisciplinary Research University" Component for developing WCU from Teaching University

The new branch of Business Management field, namely "Change Management", deals with stakeholder's resistance problems. In this chapter, I would like to present new mechanism for smoothly introducing World Class University Component into existing Universities through "Center of Excellences"

- Without reshaping current University Culture
- Without any resistance or opposition from existing stakeholders
- Encourage the healthy competitive atmosphere
- Can be initiated as per your need
- Can be adopted at your own pace. No timeframe for development.
- Can be introduced as per financial status or constraints of the University or Institute. No immediate huge financial requirements.
- Customizable solution
- Modular approach and can be adopted in phase wise manner or gradually, which facilitate step by step development of WCU
- Should not affect Governing Mechanism and no restructuring is required
- Within 5 years, assured tangible results on every front, if proper pace is maintained
- Can be easily adoptable in existing Regulatory Mechanism

My proposed mechanism can achieve these goals easily.

4.3. Center of Excellence for Capacity Building

The Lund University Sweden (OECD) had published an excellent 51 pages report namely "**Centres of Excellence as a Tool for Capacity Building**". The report stated that "Center of Excellence (CoEs) may be described as organizational environments that strive for and succeed in developing high standards of conduct in a field of research, innovation or learning. They are often highly attractive to research and development (R&D) investments and talent in their field. Therefore they possess the ability to absorb and generate new knowledge. Ideally they would distribute and utilize this new knowledge in the form of new capacity in their field, be it research results, innovations or talent. CoEs are typically geographically concentrated and focused on high potential/growth areas in science and industry, but they may also be virtual/distributed and consist of a network of co-operative partners with a coordinating centre. In terms of size, according to the operational definitions employed by some funders, CoEs can be anywhere from the local R&D group up to regional-level semi-cohesive triple-helix networks consisting of hundreds of researchers." [106]

Europe has public or private centres where **research and technological development (RTD)** is performed at a very high, often **world-class level**. Intuitively, such "**centres of excellence**" may be recognized because they **comprise and attract excellent researchers and developers, earning a reputation as a significant resource for the progress of science and technology and the spread of innovation**. Examples from the USA, such as Stanford University (which produced Silicon Valley), the MIT (with "Route 128" spin-offs), or Princeton University, suffice to demonstrate the role that centres of excellence can play. An outstanding European example is CERN. The concept of centres of excellence is interpreted and used in many different ways in

Europe. A simple definition could be: **"A centre of excellence is a structure where RTD is performed of world standard, in terms of measurable scientific production (including training) and/or technological innovation"**. In any case, it seems possible to list some key features which should be part of the concept:

1. A "critical mass" of high level scientists and/or technology developers;
2. A well-identified structure (mostly based on existing structures) having its own research agenda;
3. Capable of integrating connected fields and to associate complementary skills;
4. Capable of maintaining a high rate of exchange of qualified human resources;
5. A dynamic role in the surrounding innovation system (adding value to knowledge);
6. High levels of international visibility and scientific and/or industrial connectivity;
7. A reasonable stability of funding and operating conditions over time (the basis for investing in people and building partnerships);
8. Sources of finance which are not dependent over time on public funding. [107]

Centres of excellence in RTD evolve continuously. Together with a well-educated workforce, they are essential for endogenous economic growth as well as to attract private investment; the argument of proximity to excellent research centres is becoming a major element in decisions by multinational companies to locate production sites. RTD activity itself more and more attempts to capture and make best use of frontier knowledge in multidisciplinary dimensions (global change, food safety, learning, ageing, etc.). Although physical concentration of excellent researchers is still a key factor in RTD productivity, advanced ICT tools progressively allow effective interaction in networks. [107]

4.4. Case Studies

My concept of developing WCU through Center of Excellence is slightly different than these case studies.

Makhtar Diop, World Bank Vice-President for Africa said that "I am excited to support these pioneering **centers of excellence** because they will be **another step in building and nurturing specialized world-class higher education institutions on the continent**." [98]

I would like to quote few Universities and Premier Institutes having number of disciplines but known for their specialization i.e. Center of Excellence.

4.4.1. Singapore University

Research Centers of Excellence (RCEs) program is launched to establish world-class research centres in **Singapore universities**, to attract top academic research talent and to enhance graduate education as well as undergraduate education in the universities and train quality research manpower for Singapore. Five RCEs have been thus far funded, with an average input of about **100 million dollars**. Each RECs has **about 100 to 150 research scientists and engineers**. These five funded programs include the Center for Quantum Technologies, the Cancer Science Institute

of Singapore and the Mechanobiology Institute at NUS, and the Earth Observatory of Singapore and Singapore Center for Environmental Life Sciences Engineering at NTU. [108]

Fig. 4.2: National University Singapore: Center of Excellence [91]

4.4.2. Ohio University, USA

Ohio University Centers of Excellence. The Ohio Board of Regents, issuing a bold challenge to strive for greatness, called on each state university to establish Centers of Excellence – defining those areas of study and research it excels in, then committing to concentrating and building on those strengths to gain world-class recognition in the field. Ohio's Centers of Excellence position the University System of Ohio to be **a magnet for talent and a leader in innovation and entrepreneurial activity**. The Centers accomplish this by developing distinct missions that are recognized by students, faculty and business leaders, while eliminating unnecessary competition for resources, students and faculty within the state. Ohio Centers of Excellence are **important economic drivers, generating public and private investment**, attracting top-flight intellectual talent, and creating an energized, entrepreneurial environment that retains top graduates. Ohio's universities have risen to the challenge. **More than 50 Centers of Excellence have been established**, with additional proposals being evaluated. **The Centers of Excellence program encourages universities to work together and with private sector businesses to bring continuous improvement to the effort of positioning higher education as a catalyst for innovation and business sustainability.** The Center of Excellence categories represent key industrial areas in which future job growth can be expected.

- Advanced Energy
- Biomedicine & Health Care
- Agriculture, Food Production & Bio products
- Advanced Transportation & Aerospace
- Enabling Technologies: Advanced Materials & Sensors
- Cultural & Societal Transformation [109]

4.4.3. World Bank: CoE in Seven Countries of Africa

The World Bank's Board of Executive Directors has approved US$150 million to finance 19 university-based Centers of Excellence in seven countries in West and Central Africa. These competitively selected centers will receive funding for advanced specialized studies in science, technology, engineering and mathematics (STEM)-related disciplines, as well as in agriculture and health. [98]

4.4.4. Saudi Arabia

The Saudi Government has funded and encouraged Universities to establish centers for research excellence Setup four CoE's in the areas of nanotechnology, corrosion, renewable energy, and refining and petrochemicals. [110]

4.4.5. George Washington University

The George Washington University, **Center for Excellence in Public Leadership** (GWU-CEPL) was founded in May of 1997 as the **Center for Excellence in Municipal Management**. The Center was housed in the Department of Public Administration within the School of Business. In response to the District of Columbia's significant transition to self-governance from receivership, the School's then-Dean, David Fowler, worked in collaboration with the City Administrator and partners such as the Fannie Mae Foundation, the Cafritz Foundation and the World Bank to develop a program to train and develop middle managers in the DC government. The resulting program, the Program for Excellence in Municipal Management (PEMM) was the first non-state accredited Certified Public Manager Program in the nation. In 2005, the Center changed its name to the Center for Excellence in Public Leadership, reflecting its expanding work with the federal, local and municipal governments. [111]

4.4.6. IIT Mumbai: Centre of Excellence in Nano-electronics

The **Centre of Excellence in Nano-electronics (CEN) at Indian Institute of Technology Bombay** was established in the year 2006. CEN is a collaborative project between IIT Bombay and IISc Bangalore. It is funded by the Ministry of Communication and Information Technology (MCIT), Government of India. CEN offers multidisciplinary research program involving faculty from various departments. The center focuses on the design, fabrication and characterization of traditional CMOS nano-electronic devices, novel material based devices (III-V compound semiconductor, spintronics, opto-electronics), micromechanical systems, Bio-MEMS, solar photovoltaics and polymer based devices. CEN is a resource formed to serve academic, industrial and governmental researchers in the field of nanoelectronics from across the country. The center also offers support to perform on-site fabrication using its equipment. The center's objective is to create technically sophisticated manpower for nanoelectronics research, including inter-university network. In addition to the research activities, CEN is also involved in developing technologies that can be commercially availed by the industries. [112]

4.4.7. IIT Madras: Center of Excellence in Urban Transport

A Center of Excellence in Urban Transport has been recently established at IIT Madras. The center will undertake cutting-edge research and development activities for solving Urban Transport's most pressing problems and challenges. The Centre is located in the Department of Civil Engineering at IIT Madras, and is coordinated by a group of faculty from the Transportation Engineering Division. [113]

4.4.8. IIT Delhi: Center of Excellence in Cyber Systems and Information

The Center of Excellence in Cyber Systems and Information Assurance is created to provide leadership in establishing a regional presence in the area of Cyber Systems and Information Assurance by fostering state of the art research, and to provide training of manpower in order to improve the posture of information assurance awareness locally, regionally and nationally. [114]

4.4.9. Mumbai, Symbiosis, BHU, ISM University, IIT Roorkee, NIT Trichy

- **Mumbai University** is known by its Chemical Technology department (UDCT)
- **Symbiosis University** is known by its Business Management courses
- **BHU** is known for Ceramic Engineering and Metallurgy
- **ISM University** is well known for Mining Engineering
- **IIT Roorkee** is known for specialization in Civil Engineering
- **NIT Trichy** is well known for its specialized programs in Welding Engineering, which are flourished in collaboration with Welding Research Institute of B.H.E.L, Tiruchirappalli.

4.4.10. Punjab University

Panjab University (India's Top Ranking University by Times Higher Education World University Ranking) has been awarded with the coveted recognition of establishing a "Centre of Excellence on Application of Nanomaterials, Nanoparticles and Nanocomposites" by the UGC. With the focus area designated as Biomedical Sciences, the proposed interdisciplinary Centre involves symbiotic contributions by key functionaries hailing from assorted disciplines of Physics, Chemistry, Chemical Engineering, Biomedical Sciences, Pharmaceutical Sciences, Biotechnology, Nanotechnology, and beyond. Primarily, as per the mandate of the UGC, the Centre aims at carrying out research on finding innovative nanotechnological solutions for combating a series of diseased states, and transferring the technological know-how to the pertinent industry. [115]

4.4.11. World Bank Funding to Indian Universities or Institutes under TEQIP

The list of Center Excellence under TEQIP II (under Sub-Component 1.2.1) allotted for various institutes in India are as follows. [116]

SN	Name of the State	Name of the Institution	Name of the Centre of Excellence
1	Andhra Pradesh	Andhra University College of Engineering, Vishakhapatnam	Challenges of Nano-Technology for 21st century generation - Indian perspectives in global scenario
2		JNTU College of Engineering, Hyderabad	Disaster Management
3		Osmania University College of Technology, Hyderabad	Intensification of Chemical and Bio-processes
4		SVU College of Engineering, Tirupati	Atmospheric Remote Sensing and Advanced Signal Processing
5	Jharkhand	Birla Institute of Technology, Mesra, Ranchi	Bio-resources and Bio-prospecting
6	Karnataka	BMS College of Engineering, Bangalore	Advanced Materials Research
7		RV College of Engineering, Bangalore	Macro-electronics
8		PES Institute of Technology, Bangalore	Knowledge Analytics & Ontological Engineering (KAnOE)
9		Siddhaganga Institute of Technology, Tumkur	Applied Research and Nano Technology
10	Maharashtra	College of Engineering, Pune,	Signal and Image Processing
11			Smart Renewable Energy Systems
12		Shri Guru Gobind Singh ji Institute of Engineering & Technology, Nanded,	Signal and Image Processing
13		Institute of Chemical Technology, Mumbai	Process Intensification for process industries
14		VJTI, Mumbai	Complex and Nonlinear Dynamical Systems
15	Punjab	Thapar University, Patiala,	Environment & Energy Management
16	Tamil Nadu	Govt. College of Technology, Coimbatore	Alternate Energy Research (CALER)
17			Environmental Studies
18	Uttarakhand	College of Technology - GB Pant University of Agriculture & Technology, Pantnagar,	Energy Studies in Industries and Agro Systems of Uttarakhand (Energy Management)
19	Uttar Pradesh	HBTI, Kanpur	Applied Research, training & education in Lipid Science
20	West Bengal	Bengal Engineering and Science University - Howrah	Micro-structurally Designed Advanced Materials Development
21		Faculty of Engineering and Technology - Jadavpur University, Jadavpur	Phase Transformation and Product Characterization
22		University College of Technology University of Calcutta	Systems Biology and Bio Medical Engineering
23	UT Chandigarh	PEC University of Technology, Chandigarh	Industrial and Product Design SPC
24	CFIs	MANIT Bhopal	Geo-informatics (Remote Sensing, GPS & GIS)
25		NIT Durgapur	Advanced Materials
26		VNIT Nagpur	Combeded Systems: hybridization of communications and Embedded Systems
27		NIT Rourkela	Practical Renewable Energy System
28			Orthopedic Tissue Engineering & Rehabilitation
29		SVNIT Surat	Water Resources and Flood Management

30		NIT Warangal	Sustainable Energy Studies

Table 4.1: Center Excellence under TEQIP II [116]

4.5. New Mechanism: Grow Parallely Teaching University & Self-Sustainable Interdisciplinary WCU Components

Establishing new WCU is an easy but time taking process. Converting existing Universities to WCU may require less time but it is a challenging and difficult task. To change the existing culture is a major problem. Thus I feel that one should find the **midway**. If we could introduce the way to run the old (conventional courses in teaching university) and new system (world class research oriented courses) parallely then it is possible to follow the path of WCU quickly without much resistance. That is, grow parallely both the components. The components are:

- **Conventional Component "Teaching University Component"**: The Core Department will follow the current style of functioning and continue to work like teaching university.
- **Introduce New Component "Self-Sustainable Interdisciplinary World Class Research University Component"**: Establish "Self-Sustainable World Class Research University Component" through Center of Excellence for each department.

This **parallel process** gradually develops WCU **without affecting, pressuring or overloading** the existing system and can be developed as per financial status and fund generation capabilities of the University. This process **wouldn't discard** the existing University Governance model. Only extension of existing governance model is required. I feel that, this is a more realistic solution. For example, in the **School of Engineering & Technology**, for the **Department of Computer Engineering & IT**, we can **develop few Centers of Excellence** as follows:

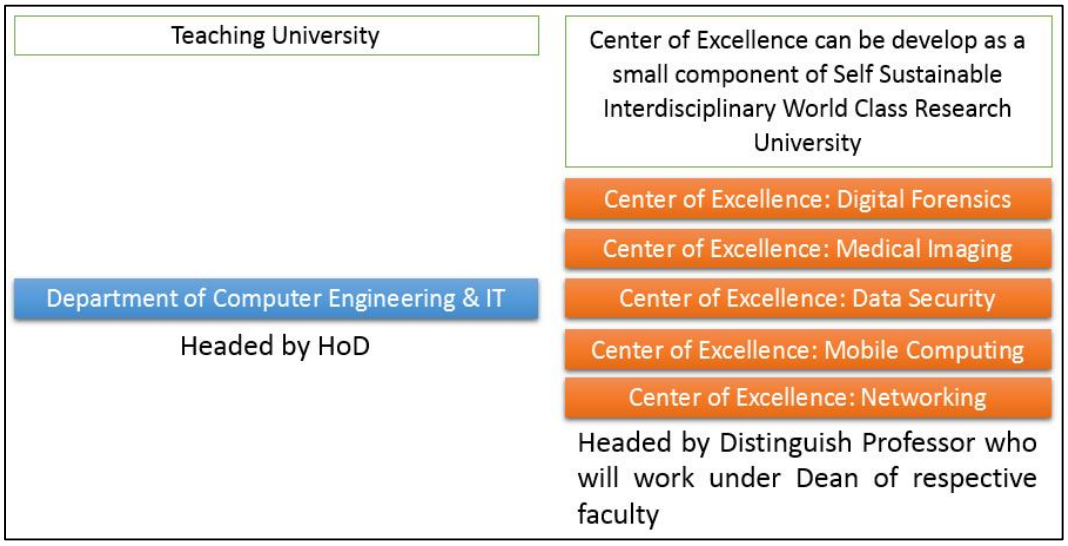


Fig. 4.3: Center of Excellence as a WCU Component

4.6. Core Department: Teaching University Component

The **Core Department** of (for example, Computer Engineering & IT) will run in a conventional style

- Will have only conventional (Routine courses) UG / PG / PhD programs and everything as per current trends and norms
- Can have BE (Second shift / Evening Shift) with more economical fees structure
- Faculty positions will be called "Teaching Faculty"
- Moderate Fee structure or Current Fee Structure

4.7. Center of Excellence: Self-Sustainable Interdisciplinary World Class Research University Component

The Centers of Excellence will be Specialized Research Centers of the Conventional Department. The centers will be **Self-Sustainable Interdisciplinary World Class Research Units.** The silent features of Center of Excellence will be as follows.

Timeframe

- Center Excellence can be developed as per our convenience and financial status of University

Finance

- Only 40% revenue should be generated through tuition fees or government aids. Must manage 60% revenue from industry / government / society through Excellence, Research, Innovation, which will be re-invested for developing the center
- Seed money and first three year operational cost will be given. After that the center must generate its own resources
- Student Fee Structure of Centers will be higher than fee structure of routine courses run by core department.

Choice of Center

- Choose the Center of Excellence in such a way that
    - Require Minimum investment
    - Have Maximum Demand or Employability
    - Required minimum efforts to establish
    - Subject of National and International Importance so that the Government and Industry will be ready to support
    - No shortage of any resources like faculty, students, R&D infrastructure etc.

Activities of the Center

- These Centers can have multiple specialized UG / PG / PhD / Dual Degree / Long Term Training Certificate Programs (with credits) / Short Term Training Certificate Programs (with credits) / Vocational programs / Diploma / PG Distance Mode (like WILP BITS Pilani) / Multidisciplinary and Interdisciplinary Degree Programs as per the needs of the industry

Faculty

- Faculty positions will be called "Research Faculty"
- Salary structure will be as per performance and revenue generation of the center. It will vary from center to center.
- Faculty-Students ratio 1:10
- Faculty Productivity (as per productivity they will get flexible salary component):
    - Revenue Generation
    - Number of Research papers in high impact journals
    - Number of international patents
- Faculty composition
    - Research Faculty
    - Industry Experienced Faculty
    - Foreign / NRI faculty

Curriculum Design

- Can have Tri Semester courses for covering 30% more courses and obtaining B.E. (Honors) degree for higher employability.
- Can have Integrated MBA courses customized for respective centers (for example the petroleum center can have integrated degree program for BE (Petroleum) with MBA (Petroleum Management)
- UG: PG ratio should be 50:50 for better research output.
- The curriculum will be well suited to industry and designed by persons from industries. The curriculum must be updated as per need of industry.
- Internationalization of curriculum
- The training for enhancing employability attributes must be considered.
- The education and training activities must be given appropriate weightage.
- "Learning beyond Classroom (LBC)" must map in to curriculum design and proper weightage must be assigned.
- Flexible Inter University Credit system (Few credit points can be obtained from premier institutes like IIT-GN or any foreign university)
- Multiple entry exit options
- Hybrid courses and Flipped Classroom
- To enhance the training facilities for greater employability, the Advanced Vocational Education can be a part of this center

Intake Capacity

- The total student strength will be as per industry manpower requirements. Every students must get placement in pre-final year.

Collaborations

- Each program must be developed with foreign university collaborative arrangements
- At least one program should be a dual degree program
- Each program must have multiple "industry active partnerships"

Distance Learning
- Must have at least one PG program like Work Integrated Learning Programmes (WILP) BITS Pilani (distance learning mode)

International Accreditation
- Each program must be internationally accredited

Research
- Each center must have at least 10 major industrial projects and 10 government research projects

Multidisciplinary / Interdisciplinary
- Must have multidisciplinary and interdisciplinary programs, subjects and research culture

Innovation
- Must have innovation center with tangible results and deliverable outputs

Students Composition
- Regional (30%)
- Outside State (60%)
- International students (10%)

The "Center of Excellence" should be unique selling point for your University. It should be a center of attraction for international fraternity. In short, the Teaching University and Research University components should be run simultaneously in a same campus i.e. in each department. Slowly the culture of conventional courses will enhanced through healthy competition. It is easiest feasible way to establish WCU in India and developing countries.

4.8. New Mechanism: Can it achieve All the Goals?

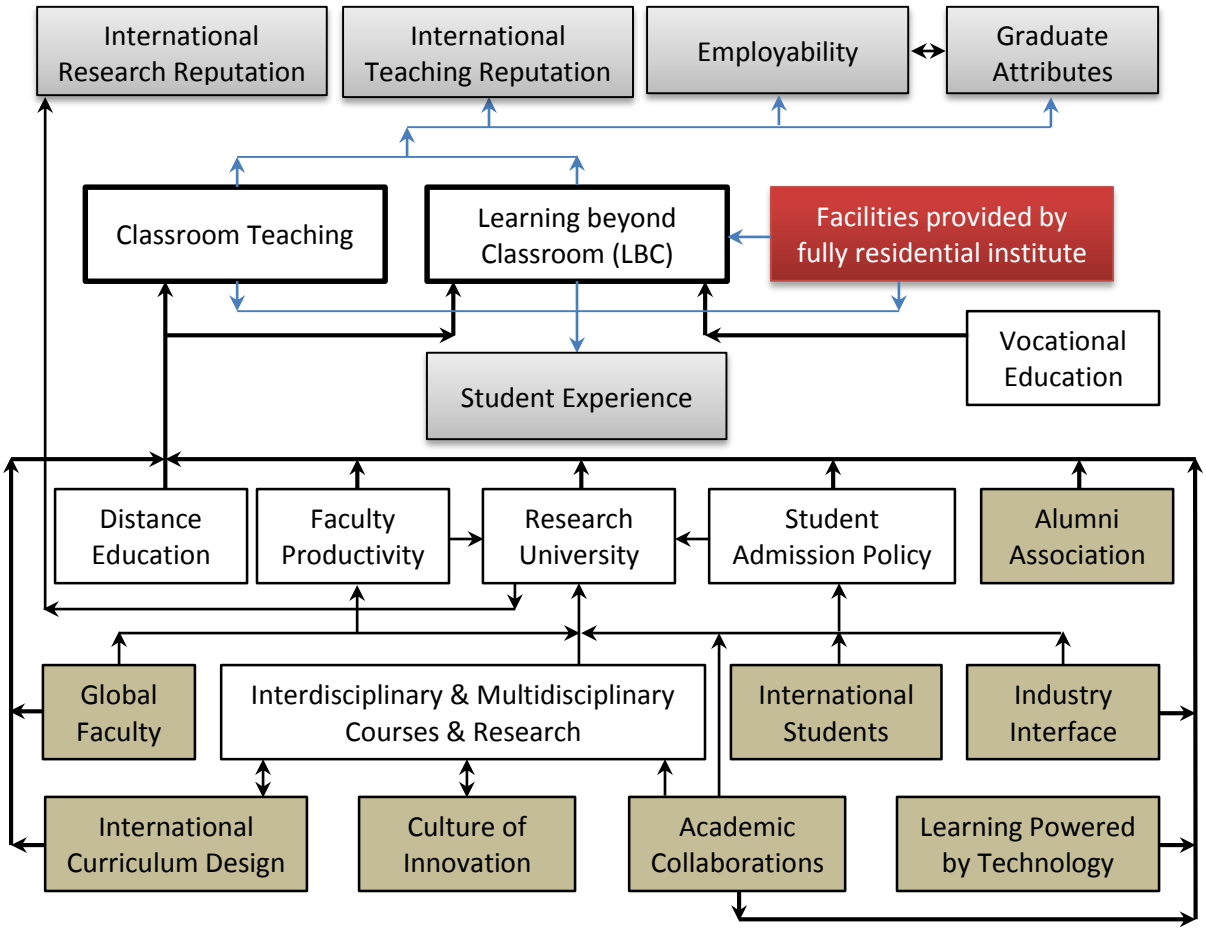
The new mechanism can certainly achieve all the objectives and goals mentioned in earlier section. The new mechanism
- It wouldn't affect Governing Mechanism. The organization restructuring is not required. It wouldn't change current University Culture at department level. Thus there will be negligible resistance or oppose from existing stakeholders
- It can create and encourage the healthy competitive atmosphere between old and new systems.
- It can be initiated as per your needs and can be adopted at your own pace. There is no timeframe for development of new WCU component. It can be introduced as per financial status or constraints of the University or Institute and there is no immediate huge financial requirements. It's a customizable solution. It's a modular approach and can be adopted in phase wise manner or gradually, which facilitate step by step development of WCU
- If proper pace is maintained, then within 5 years, assured tangible results can be obtained at every front.
- Can be easily adopted in existing Regulatory Mechanism

In the next chapter, I would like to highlight “The relationship of Better Graduate Attributes or Educational Outcomes and Fully Residential Campus”.

Chapter 5: Residential Campus: Most Noticeable Attributes of Highly Ranked Universities

*One of the **most noticeable attributes of the most highly ranked universities** – those in the top twenty – and one that has repercussions down to the level of the culture of the institution, is that they are **primarily residential** for undergraduates at least. Many institutions further down the rankings have large percentages of students in residence or have students living in university-run accommodation close to the campus. [117]*

*President Eli Capilouto, University of Kentucky, USA stated that "**Residential campuses will continue to be critical to higher education** and to preparing a competitive **21st century workforce**. When students live on campus, they **do better academically and socially**. They graduate at much higher rates. They make deeper connections to faculty and are involved in ways that further help them navigate college and prepare for the careers that follow. So, that combination -- the most technologically advanced learning options in the context of a residential campus that fosters interdisciplinary education -- will help set the course for the **success of American education and our economy in the future**". [118]*



5.1. Huge Government Funding but Unable to Produce Desired Results: Non-Residential Campuses Underutilize the Resources

The government is providing huge funding for improving the quality of education like TEQIP, RUSA etc. With the help of World Bank the government has funded total Rs. 3819 Crore in "Technical Education Improvement Programme" (TEQIP) Phase I & II. In both the phases the project objectives are excellent and execution is up to the mark. In 2013, the government of India has launched the ambitious 1 lakh crore plan "Rashtriya Uchchatar Shiksha Abhiyan (RUSA)" for reforming state higher education system. I have discussed this scheme in detail in my book "113 Difficulties in Developing World Class Universities" (in Chapter 9, pages 237-243). The objectives of this scheme are also excellent. [339] [340] [341] [342]

In spite of these huge funding and sincere efforts, the objectives of **World Class Institute** and **substantial enhancement in student's employability** could not be yet fulfilled.

I observed that, most of the funding goes to Non-Residential campuses. These Non-Residential campuses underutilize the resources and thus can't produce the expected results.

The residential campuses have better chances of getting the desired results, **provided they adopt the "Learning beyond Classroom (LBC)" and classroom teaching techniques at par with global standards**, which I have discussed in next chapter.

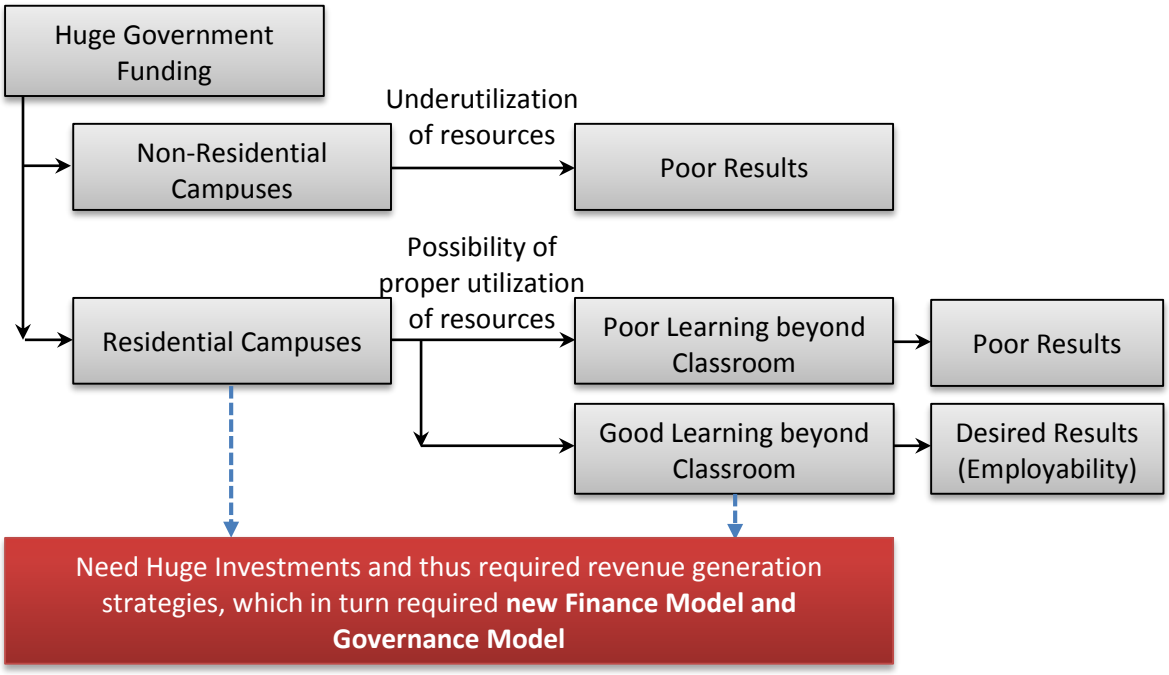


Fig. 5.1: Role of Residential Campus for achieving goals of Government schemes

5.2. Fully Residential Campus

The residential campus provide accommodation to faculty, staff, students and guest. It consist of:

- Well-furnished Students hostels (Girls, Boys, Undergraduate, Post graduate & Research scholars, International students)
    - Dormitories
    - Suites
    - Apartments
- Faculty and Staff Accommodations
- Guest Houses

Facilities and Services at fully residential campus can be as follows:

1. 24 Hour Helpdesk services
2. Banking and ATM services
3. Beauty salon
4. Cafeteria
5. Cinema Theater
6. Communication services
7. Community Center
8. Computing
9. Conference rooms
10. Counseling and Psychological Services
11. Departmental Store (Text books, Electronics gadgets, Daily needs etc.)
12. Dining halls
13. Disability services
14. Electrical services
15. Elevator
16. Emergency management
17. Garden
18. Generator and Power backup
19. Gymnasium and fitness facilities
20. Health (Routine medical care, Emergency Medical Services, medical consultations, Pharmaceuticals, Nursing services and Ambulance)
21. Heating & Air Conditioning
22. Hospitality
23. Hostel Library
24. Hot and Cold water services
25. Housekeeping and Cleaning services
26. Indoor and Outdoor Sports facilities
27. Intercontinental food services
28. International Office
29. Internet and Wi-Fi connectivity
30. Intranet
31. Kitchen Rooms (with all appliances like Microwave Ovens, Refrigerator, Mixer etc.)
32. Laundry
33. Parking

34. Postal and Courier services
35. Prayer Rooms
36. Pre Arrival Information and services (for newcomers)
37. Reading rooms and Study Lounges
38. Recreation rooms
39. Recycling and Waste Management
40. Repairs & Maintenance
41. Residence Education Services and Peer Mentors (Academic & Support)
42. Safety (Fire services, Evacuation Procedures for Students with Disabilities, Electrical, Campus Alert for potential weather conditions, safety threats and other hazards, smoke detectors, fire alarms, etc.)
43. School for children
44. Security (security personals, CCTV, Surveillance systems, Access control, After-dark Escort Service, etc.)
45. Swimming pools
46. Transportation (Shuttle Bus Service, Taxi etc.)
47. TV Lounges, Cable and Dish-TV

The Universities are publishing handbooks for residential campuses. You can read the "Living on Campus Handbook" of Louisiana State University, USA. [119]

5.3. Advantages of Residential Campus

In 2009, the Australasian Survey of Student Engagement (AUSSE) has published the report "Engaging College Communities: The impact of residential colleges in Australian higher education". They have presented wonderful analysis of residential and non-residential students. [343]

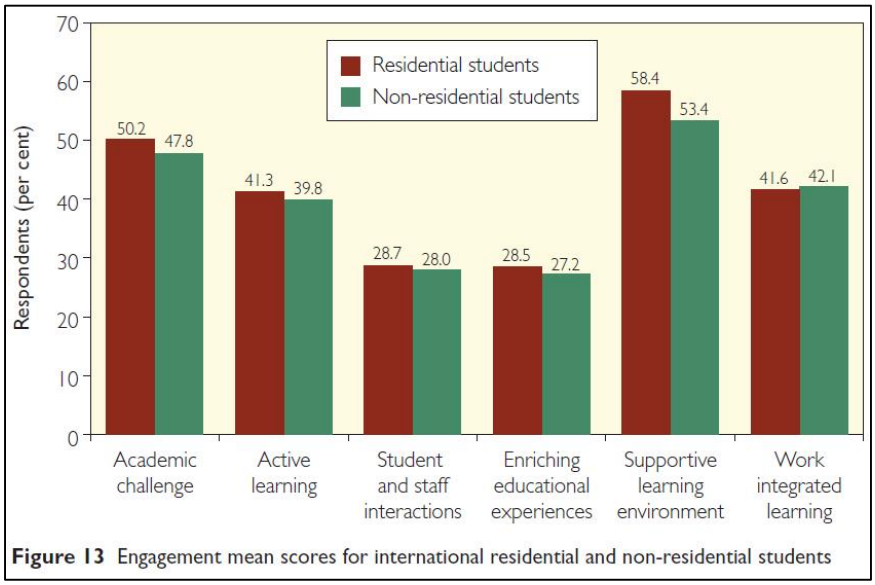


Fig. 5.2: Engagement mean scores for international residential and non-residential students [343]

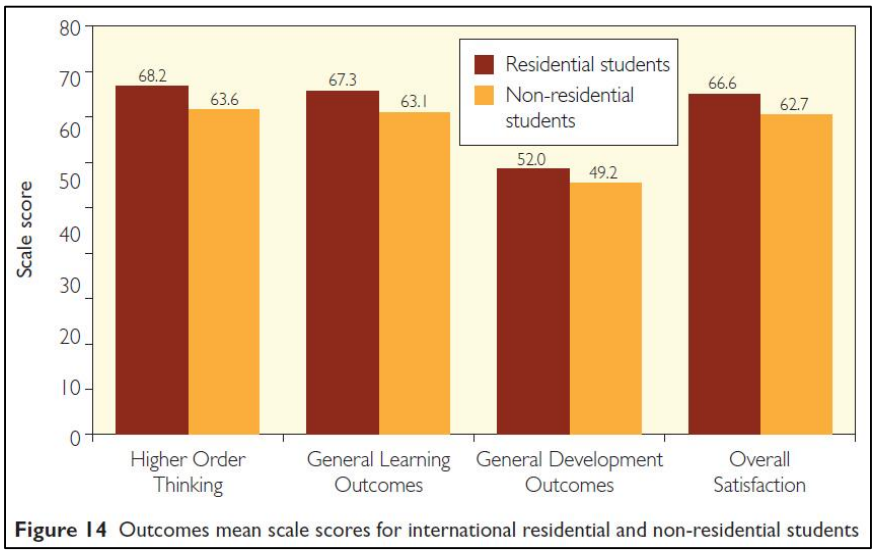


Figure 14 Outcomes mean scale scores for international residential and non-residential students

Fig. 5.3: Outcomes mean scale scores for international residential and non-residential students [343]

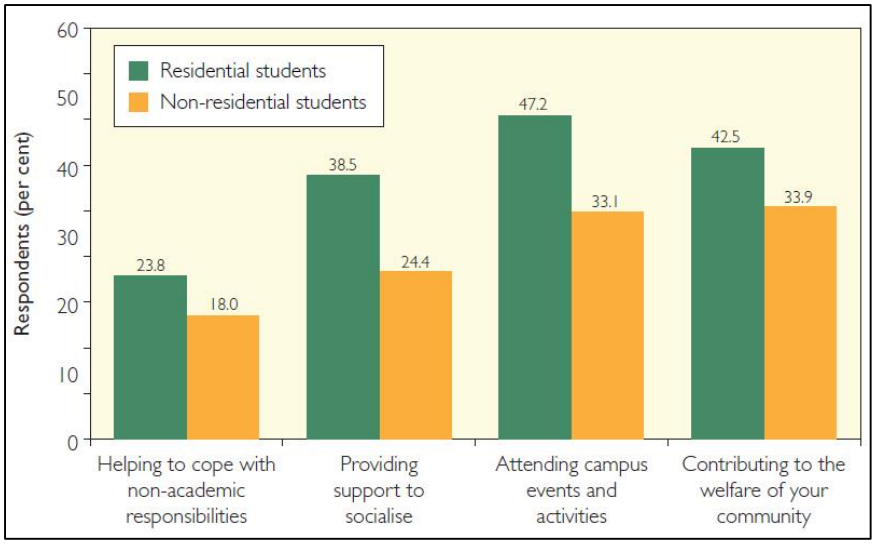


Fig. 5.4: Institutional emphasis on academic and non-academic support [343]

When students are in residence on a college campus, their learning extends far beyond the classroom…. the value of the residential experience as an integral part of a college student's education. Applying what has been learned in the classroom to the living environment makes an extraordinary contribution to students' education in ways that cannot be replicated in an online experience. [344]

Vanderbilt University, USA: Vanderbilt's mission is clear. It must offer students and faculty the most energizing, diverse, and supportive living and learning environment among great research universities. With its resources Vanderbilt has an extraordinary opportunity to create this unique

and distinguished **learning community**. This community, in turn, can provide an important foundation for Vanderbilt's future by drawing to campus the best students and faculty. To do so, however, will require that Vanderbilt embrace the educational principle that much of learning, personal growth, intellectual challenge, and mentoring occur **outside of the classroom**. Vanderbilt must be known as a University not simply where knowledge is conveyed in the classroom, but where **knowledge is created in a broad campus-wide environment** that values intellectual challenge, produces serious inquiry and diverse viewpoints, and is **not limited by traditional boundaries**. [345]

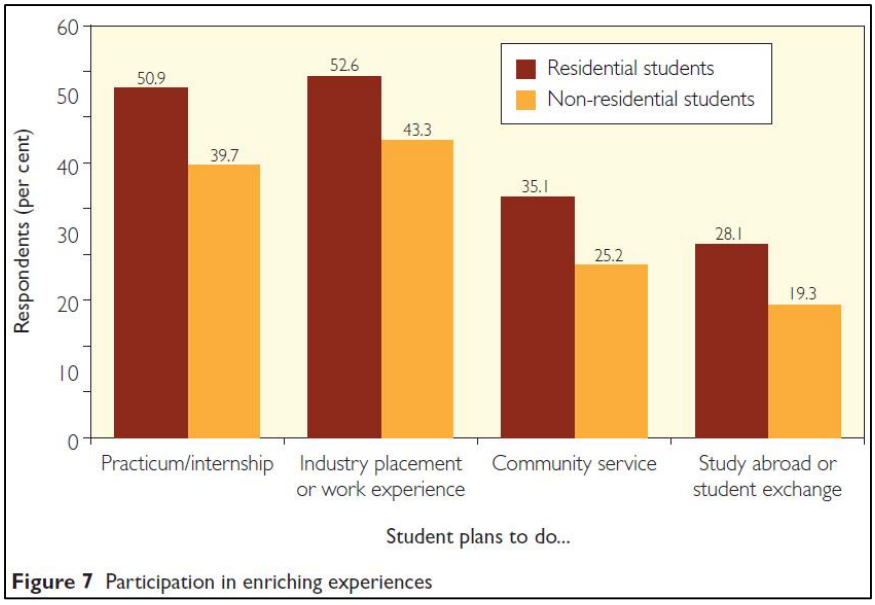


Fig. 5.5: Participation in enriching experiences [343]

The advantages of residential campus are as follows:

5.3.1. Student Experience

The Residential campus provides "**24 hours Educational Experience**" to the students whereas Non-Residential campus is unable to provide it. Education does not stop outside of the classroom walls. More than 80% of your time will be spent outside of the classroom, within the residence halls and it can be utilized. On this issue more details are covered in next chapter.

Jeffrey Selingo, Editor, the Chronicle of Higher Education stated that "Most 18-year-old's are not ready for the working world, and some are not even ready for a college campus. The four years of college turn adolescents into young adults and through the campus experience—living with different people, participating in activities and athletics, and being responsible for one's self—gets them ready for life… Most of us who went to residential colleges can name a professor or two or other advisers who played a role in **shaping our life** and perhaps still do to this day. While mentors exist in online classes, the face-to-face interactions on residential campuses are invaluable to the maturing process". [120]

Ana Hernández, Dean of housing and residential education, University of South Florida stated that "Living on campus is an important step for any student in **building a solid foundation for success in college and beyond**. More than convenience, it is about making connections, building community and finding one's place both academically and socially at an institution of higher education. Residential students are invested and involved in campus life and are more likely to be satisfied with their university experience, develop a **strong affinity** to the institution and persist and progress at a higher rate than those who have never lived on campus". [121]

5.3.2. Learning Facilities

Research shows that students who live on campus tend to have a higher GPA, are more involved in college, and tend to graduate more often. The Residential Campus generally provides facilities, which are not available to off-campus students.

- 24x7 R&D laboratory support for research work
- Access to digital library
- Availability of research staff
- Interdisciplinary environment.
- Hostel Computer Labs, Printing facility and High speed internet
- The interaction of teachers and student continuous beyond classroom and even after official duty hours.
- The residence hall staff can contribute to your academic success. They can plans programs on topics such as improving study skills and time management.

5.3.3. Student Networking with Global Talent and Establishing Community

The Residential campus provides number of opportunities for networking of global talent as well as research environment.

- Routinely, the Residential Life staffs intentionally coordinate weekly/monthly activities and programs to enhance the learning that takes place outside of the classroom environment. These staff can help to introduce the new people and new perspectives to the students residing in campus. As a result, the students will have the opportunity to make connections and friendships from all over the world. [122]
- Living on campus puts the students right in the middle of the action and fun. The opportunities to participate in educational, cultural, social and physical activities and events are endless. Just as academics are an important part of student's education, residential life activities also provide the students with an important aspect of the total college experience. The students can live with a wide variety of students. The residence halls are a perfect forum for learning more about yourself and others from different cultures, ages, ideas, personalities and ethnic backgrounds. There are leadership and employment opportunities throughout the residential life. [122]
- At some universities with extensive residential accommodation a diverse range of students and staff live, eat, study, work, socialize and take part in extra-curricular activities together. Students in residence on campus can be immersed in an intellectual community that

encompasses a broad range of disciplines. Colleges can be used to introduce innovative educational programs and to target particular segments of the potential student market. [122]

- Advantages of residential colleges include a strong sense of community, opportunities to interact with faculty and students outside of your major, and a dorm that feels more like home. The idea is to link academics (study) and daily life, so that dorm life supports and adds to students' intellectual and social development. [122]
- The **University of Chicago** helps maintain a strong base of high-quality, affordable housing for our students, staff, and neighbors. Sixty-five percent of faculty and 3,000 staff members live in neighborhoods surrounding the campus. The University owns and maintains 2,000 rental units primarily for student and faculty housing. [117]
- At **MIT** there is an interesting initiative – the Hosts to International Students Program – designed to make international students feel part of the community and literally part of the 'family': As many as 60 international students from about 30 countries participate in the MIT program annually, and are matched with about 80 Boston area families who are alumni, staff, and friends of the Institute. The goal is to give students access to a support system when they are so far from home. Host families can pick up students at the airport, invite them to dinner, take them shopping, give them birthday parties, or call them before exams, letting them know that while they are far from home, they are not alone. [117]
- **Keeping alumni in the university community**: US universities especially strongly encourage their alumni to remain active members of the university community. Some universities provide a sophisticated range of benefits and incentives for alumni to keep in touch and to volunteer their time and expertise The universities deliberately develop a culture of 'giving back' and strategically position the relationship between students and alumni so that students understand that they are indebted to those who have gone before them and feel obligated to 'give back' in turn, to help future students Alumni expertise is used in a range of ways including student recruitment, mentoring students, providing careers advice, arranging internships, and serving on committees. The alumni of American universities, in particular, are often very much a part of the university community or 'family'. US universities seem to be very good at instilling in each new cohort of students a strong sense of belonging or connectedness, but also obligation to their alma mater and this tends to result in greater involvement and giving back by alumni. Many leading universities and colleges in the world, especially in the US, rely on their alumni not only for philanthropic gifts but also as volunteers. The University of Chicago is a good example: alumni are encouraged to stay in close contact with the University community and to provide direct help to current students and to fellow alumni. [117]
- **Fostering local community relationships**: Some institutions recognize their responsibilities within the economy and structure of the city or town in which the university is situated. These universities work in partnership with the local community to their mutual benefit. One of the reasons a university has a vested interest in the local community is because a large number of its employees live there. [117]

5.3.4. Convenience, Affordability, Safety and Security and Time Management

- Access to live-in staff that care about students and are always available for support, assistance and advice.

- Short walk away from classes, professors, the library, academic resources, recreation facilities, games or an organization meeting.
- The students and staff need not waste time sitting in traffic or driving all around trying to find a parking space and wasting your valuable money. In big cities, traveling is very exhaustive and time consuming. If faculty and student stay in the campus then that energy and time can be utilized for productive work.
- Living on campus is a great value and affordable solution. Students get facilities with affordable price like
    - laundry facilities
    - meeting rooms
    - TV lounges
- Normally the Public Safety Officers and the residence hall staff offer assistance 24 hours a day. The Residence Halls and several campus buildings generally have security cameras in central locations to monitor daily activities in these buildings and to provide additional safety measures. [122]

5.3.5. Research Culture, Faculty Productivity and Resources Utilization

The non-residential campus affect research benefits like

- Unable to tap Research Income
- Hamper the Scientific knowledge output of research: publications
- Hamper the commercially relevant knowledge output of research: Patents

Normally in Non-Residential campuses the faculty works only during official hours and reluctant to work after office hours. This hampers the research activities on the campuses. The costly research resources couldn't utilized properly. In spite of good faculty it's difficult to get good research output. The competitive culture automatically develops in Residential campuses. Initially few faculties actively involved in research. They work day and night. Other faculty automatically follow them. With the same salary, institute gets more productive results.

The Residential Campus helps to create very conducive academic environment. Normally such campuses are fertile land for research environment. In such campuses the faculty is evolve in research and other curricular activity beyond office hours. Without this culture the research environment can't be developed.

The best research universities, public or private, offer outstanding undergraduate experiences to their students. They offer highly integrated and effective student services. They ensure a campus 'climate' that welcomes diversity and difference and guarantees equal access to campus opportunities to all qualified students. They offer intellectually challenging and adventurous academic programs that enable students to achieve a set of commonly shared learning outcomes as well as expertise in a particular area of study. They don't only teach students about the subject matter of a discipline, they teach students how to do the discipline (to think like a philosopher, an economist, an engineer). They involve their students in real research. They are deeply committed to engage, stimulating and challenging undergraduate teaching. They offer students a personally and intellectually rewarding experience of the university 'beyond the classroom' and they involve

their students in the lives of their cities (and in the world). They foster in their students a lifelong dedication to their alma mater. Many private and public research universities have created undergraduate research opportunity programs. In these programs, students as early as first year work with a faculty member on the faculty member's research projects. They carry out significant research tasks, and may be mentored and supervised not only by the faculty member but by other members of the research team (original emphases). [67]

5.3.6. Can Attract Global Talent

The non-residential campuses are unable to attract global talent i.e. international faculty and students.

5.3.7. To Implant the Global Employability Attributes

All the employability attributes couldn't develop through classroom teaching-learning process. To develop overall personality, which is globally employable, needs training beyond classroom. The residential campus can provide this most needed student experience.

5.4. National Benchmarking study: Residence Life

Residential life at a small campus can be a very different experience from that of a larger university, though we often seek the same kinds of learning outcomes from the residential student experience. Our Residence Life National Benchmarking study (in partnership with ACUHO-I, and part of the NASPA Assessment & Knowledge Consortium) **shows a small but significant difference between campus size and several important goals of student participation in residence life programming and events**. Let's focus on two important skills highlighted in student affairs and academic affairs: **communication**, and **critical thinking/problem solving skills**. [348] [349]

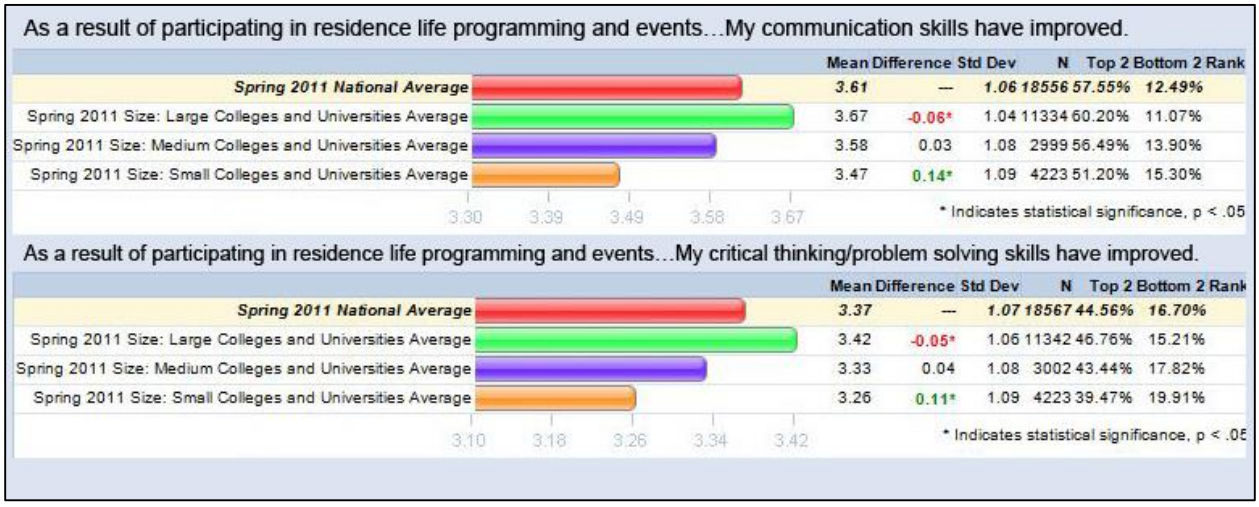


Fig. 5.6: Comparison of Skillset of small and large residential campus with National Benchmarking [348] [349]

Students from small institutions consistently fell below the national average in perceived improvement in communication and critical thinking skills as a result of attendance in residence life programs. Similar results are shown for other levels of skill development. The first thing that comes to my mind is the availability of resources. Given that smaller institutions may have fewer resources to achieve these goals, perhaps more focused attention on connecting learning outcomes with programming and events is necessary. If fewer events are available to the student body to participate in, more effort could be paid to ensure that each program touches upon a multitude of goals and learning objectives. [348] [349]

5.5. Non-availability of Residential Campus Affects So Many Factors

Many Indian Universities in Public or Private sector neglect the issue of Residential Campus. The authorities gives low priority to this issue because of

- Budgetary constraints
- Not willing to invest
- Interested to focus on local students
- Land is not available for Residential campus
- Land is very costly
- Unable to understand the importance of the issue

The Residential campus is the vital component for developing WCU. The non-availability of residential campus affects so many factors which are essential for establishing “Self-Sustainable and Affordable World Class Research University” like

- Unable to implant the Global Employability attributes
- The Student Networking couldn’t be established
- Resources Underutilization
- Hamper the Scientific knowledge output of research: publications
- Hamper the commercially relevant knowledge output of research: Patents
- Unable to tap Research Income
- Faculty Productivity will be drastically reduced.
- Unable to attract International Students
- Unable to attract International faculty
- Affects Affordability
- Residential Campus provides more Safety and Security to the students
- In initial stages of the university, if the residential campus couldn’t be developed then it is very difficult to convert the teaching university in to Research University. Once the staff members start residing in city area and purchase the residential accommodation then it is most difficult to bring them back to residential campus. Sometimes these staff members are involve in commercial activities and gives secondary importance to main job.

- Unable to develop Research Culture. Normally in Non-Residential campuses the faculty works only during official hours and reluctant to work after officer hours. This hampers the research activities in the campuses.
- The competitive culture automatically develops in Residential campuses. Initially few faculties actively involved in research. They work day and night. Other faculty automatically follow them. With the same salary, institute gets more productive results.
- Affects Student Experience and Learning beyond Classroom. In short, the Residential campus can provide **platform** for "**24 hours Educational Experience**" whereas Non-Residential campus provides "8 hours Educational Experience" to the student community.

5.6. Experience and Opinions of Various WCU

The following table shows the percentage of student in Residential Campuses of Top ranking WCU

Leading University	% Student in Residential Campuses
Harvard	98
Cambridge	Near 100
Yale	88
Caltech	92
Oxford	Near 100
MIT	91
Stanford	95
Columbia	94
Princeton	98
U C Berkeley	35
Pennsylvania	64
Cornell	46

Table 5.1: Percentage of student staying in Residential Campuses [117]

The majority of the **top ten universities in USA have over 90 per cent of their undergraduates living on campus**; many more institutions have high percentages of students in residence or have students living in university-run accommodation very close to the campus. [123]

In the UK and the US it is widely accepted (by students, by parents and by educational institutions) that undergraduates will 'go away' to university. The US leading universities highlighted this issue prominently.

5.6.1. Saint Louis University, USA

National research shows that students who live on campus perform better academically and graduate earlier than their off campus counterparts, so it is up to each student to take full advantage of this amazing opportunity. Living on campus will provide you with many new freedoms and personal choices, an experience in which you will meet student from across the country and around

the globe, develop life-long friendships, and establish a connection to our diverse campus life. [124]

5.6.2. Massachusetts Institute of Technology (MIT) USA

"But there is even less doubt in my mind that the residential university will remain an essential element of our society, providing the most intense, advanced and effective education. Machines cannot replace the magic that occurs when bright, creative young people live and learn together in the company of highly dedicated faculty. "The residential research-intensive university will not only survive, it will prosper. If anything, its importance will grow as we continue to provide access to the brightest young men and women regardless of their social and economic backgrounds". [125]

5.6.3. University of North Carolina (UNC) USA

Research shows that students who live on campus are retained at a higher average and perform better academically. Living on campus will provide you with lots of opportunities for learning, growing and meeting new friends. [126]

5.6.4. St. Cloud State University USA

Research shows that students who live on campus tend to have a higher GPA, are more involved in college, and tend to graduate more often. Living on campus you have easy access to academic support resources such as The Write Place, computer labs, the Miller Center (Campus library), and faculty offices. [122]

In the next chapter, I would like to introduce you the most important factor for Excellent Graduate Attributes or Educational Outcomes namely “Learning beyond Classroom”, which is solely depends upon fully residential campus.

5.7. Few Important Suggestions

5.7.1. Raised FSI for Educational Institutes

Most of the time the educational institutes drop the plan of residential campus just because of land problems (due to scarcity, cost etc.). To solve this problem, the government can raise Floor Space Index (FSI) for few buildings, especially for educational institutes in big cities.

5.7.2. Develop Residential Campus Using PPP Model

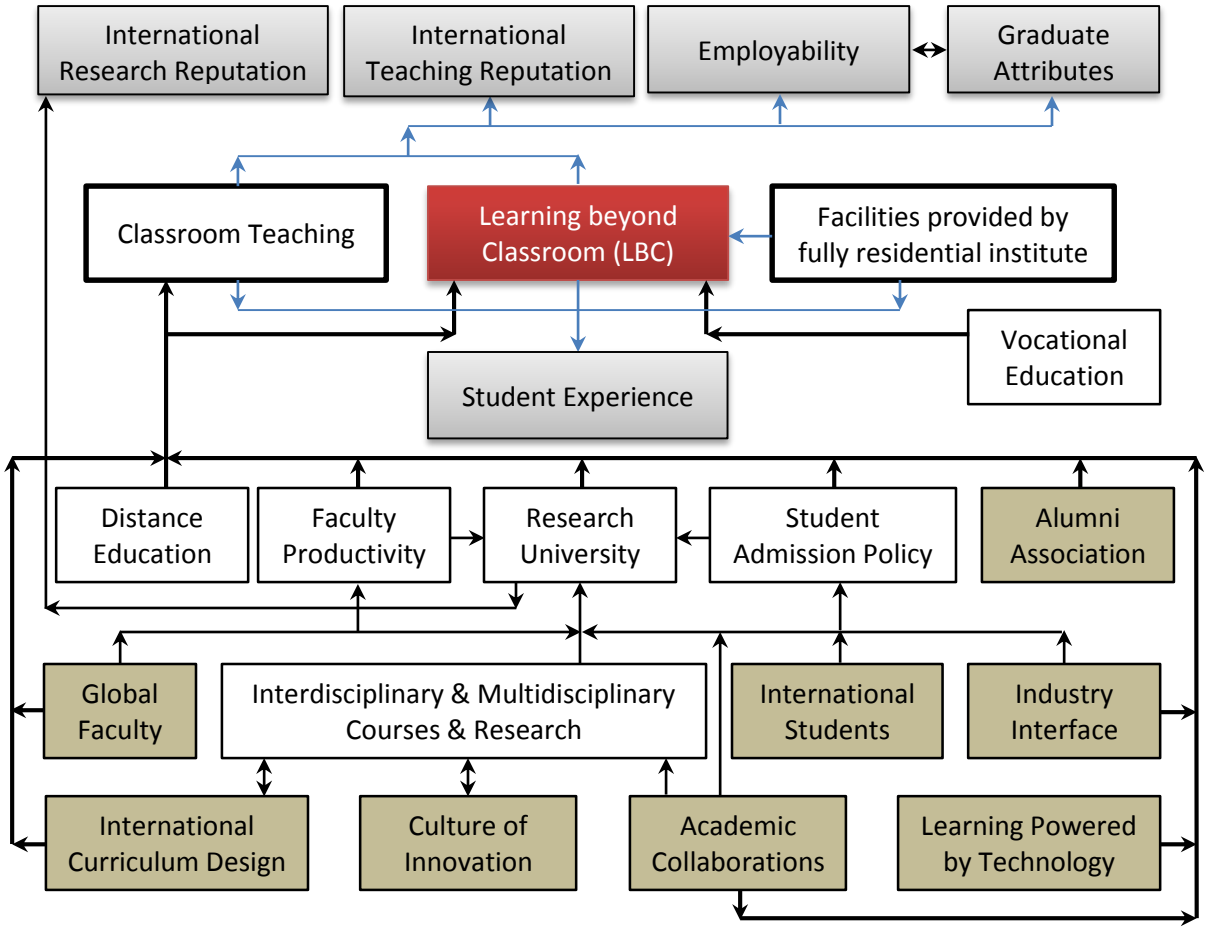
The Residential campus is a costly affair. To avoid this huge investment, the institutes can opt for Public Private Partnership (PPP) Model to build this costly infrastructure.

Chapter 6: Learning beyond Classroom (LBC), Student's Experience and Employability

The "Student Experience" is vital aspect of WCU and solely depends upon Classroom Teaching, Learning beyond Classroom (LBC) and facilities provided by fully residential institute. The **employability** depends upon LBC and Classroom Teaching.

The Indian Institutes and Universities are mostly Teaching-Universities and normally are bothered about Classroom Teaching during office hours. The LBC activities are conducted at very small scale and mostly used as a marketing tool i.e. organize events for branding through newspapers. In addition to this, for affordability, the institutes normally reluctant to spend on LBC activities and facilities of the institute, which hamper employability, student experience and in turn brand name and reputation of the institute or university. Many universities have Residential Campuses but LBC component is missing. These missing components can drastically reduce the employability, research revenue and revenue generation capability of the institute, sometimes below 40%.

Employability is about the development of a range of attributes and skills at university that can be transferred into situations beyond university study. 'Careers' is a subset of employability. [127]



6.1. Student Experience, Learning Beyond Classroom & Residential Campus

The contribution of Residential Campus and Learning beyond Classroom in Total Student Experience.

Fully Residential Campus
Easily available Learning Facilities: The residential campus provides many convenient facilities for self-learning like easily approachable round the clock library facility, laboratories, internet and intranet, academic support etc. which can enhance the skill set and help to increase the employability.
Student Networking
Convenience
Affordability
Safety
Security
Increase the Time Management and efficiency of the students
The research scholars, UG PG students and Faculty stay in same campus thus there is a possibility of more interaction, which can enhance the Research Culture
The faculty can stay and work even after working hours and there is a possibility of enhancing the Faculty Productivity.
The students, faculty and staff can work round the clock and thus there is a possibility of optimum Resources Utilization.
The residential campus is most important facility to attract Global Talent
Fully residential campus is the **basic requirement** for the "**Learning Beyond Classroom**" activity through which the student's **Global Employability Attributes** can be enhanced.

Table 6.1: Contribution of Residential Campus in Student Experience

Learning Beyond Classroom
24 hours Educational Experience
Fully residential campus is the **basic requirement** for the "**Learning Beyond Classroom**" activity through which the student's **Global Employability Attributes** can be enhanced.

Table 6.2: Contribution of "Learning beyond Classroom" in Student Experience

6.2. Learning-Beyond-Classroom at World Renowned Universities

Almost every WCU has adopted the "Learning-Beyond the Classroom or Campus (LBC)" techniques for overall development of the students and for preparing them for Global Employability. Let's see few examples.

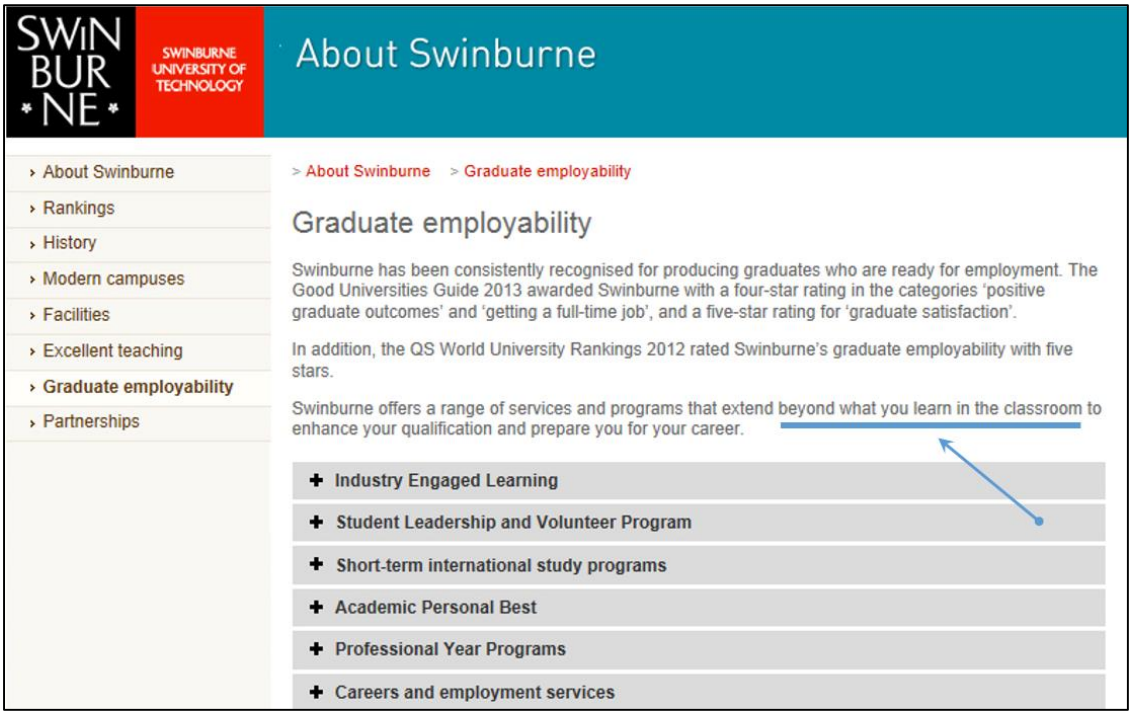


Fig. 6.1: Swinburne University, Australia: Employability & LBC [232]

Fig. 6.2: University of Minnesota, USA: LBC Activities

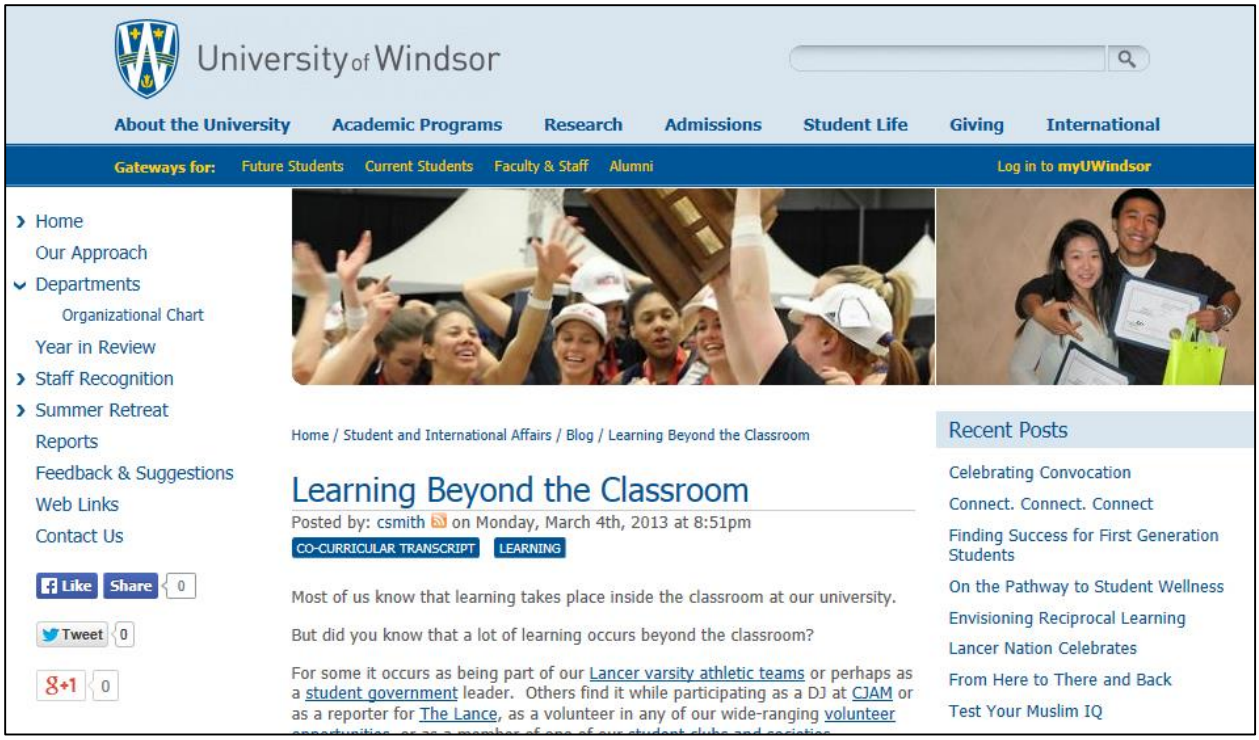


Fig. 6.3: University of Windsor, Canada: LBC Activities

6.2.1. Harvard University

At Harvard: 'There is fairly universal agreement that **much of the value of a Harvard education lies in things learned outside the classroom** and in the relationships established with others in the community, especially with fellow students.". There are more than 250 student-run organizations at Harvard. [55]

6.2.2. University of Ulster, UK

Employability is at the heart of Ulster's student experience. Our courses are designed with your future career in mind; we deliver **specialist employability training** across subject areas; we are one of the biggest UK providers of work placement; we provide an extensive range of **careers support services** throughout your studies and beyond. Our courses are developed in **partnership with employers to ensure the skills, knowledge and experience** you gain match the needs of your chosen profession. Employability is **integrated** into our teaching to help you to get the most from what you have learnt and to understand its application in the **workplace**. A period of **work placement**, or **study abroad**, is available for most of our courses. This provides the opportunity for you to gain valuable **real-world experience** and to **build contacts in the industry**. We provide an **extensive range of support services** to help make you **ready for work** and to find employment. Our award winning Career Development Centre (CDC), located on each campus, offers friendly and impartial support with career planning and provides advice on developing your employability skills. The integration of employability into the Ulster student experience helps

better prepare our graduates for the competitive job market. One can access a range of services up to 3 years after the graduation from Ulster. [128]

6.2.3. Texas State University, USA

Texas State will establish a Learning Beyond the Campus (LBC) Center that provides a comprehensive experiential learning program for all students. Off-campus learning opportunities will create enthusiastic and motivated students, enhance their academic and career decision-making skills and produce graduates who are well-equipped to establish themselves as productive citizens of a rapidly changing world. This initiative emphasizes that student's interactions with faculty and external mentors during their university careers elevate and provide invaluable experiences to their professional careers. Networking opportunities via internships, student research and study abroad experiences strengthen the university's long-term relationships with students, alumni and external constituents, thereby supporting and establishing a legacy of giving back. The LBC goals of Texas State University are:

- Integrate service learning across the curricula; student learning will include more skills and knowledge related to common job opportunities in their fields
- Expand and coordinate internship and externship opportunities; students gain practical work skills
- Expand and promote international study, international exchange and National Student Exchange programs; increase student learning in terms of international / global life and work skills and knowledge as well as languages
- Organize and train all advisors to integrate experiential learning opportunities into the academic plans of all students.
- Expand the mentoring program to include alumni, parents and other off-campus mentors; as a result, students' learning will benefit from experienced professionals
- Create a co-curricular transcript or portfolio in the new Student Information System
- Secure a Ronald McNair grant to encourage our undergraduates from underrepresented groups to attend graduate school.
- Provide an exceptional undergraduate experience (university shared value)
- Offer opportunities to interact with a diversity of people and ideas (a university shared value); increase diversity in student learning
- Cultivate (and increase student learning in terms of) character and model integrity, respect and ethical behavior, beyond the boundaries of the classroom (a university shared value)
- Provide exposure to potential life-careers; students learn increasingly about their career options
- Recruit and retain students who are attracted to this enhanced learning program.
- Solidify external relations and support [129]

6.2.4. Western New England University, UK

There are number of innovative techniques to carry out the Learning Beyond Classroom activities. The Examples LBC Experiences of the Western New England University, UK are as follows. [130]

- Taking a leadership position in a student group

- Taking on a special project with a sports team, including assistant coaching or acting as a team captain
- Assisting with research in a lab or institute
- Attending a conference related to student leadership development, coursework, or your discipline
- Mentoring a student in the Springfield Public Schools
- Internships, study abroad, or course-based experiences that would incorporate an LBC opportunity
- The engineering Senior Design Project
- Individual workplace experience, on or off campus
- Working at camps (i.e. Western New England Soccer Academy, Basketball Camp, Baseball Camp, and the Golden Bear Lax Camp)
- Peer Advisors, Resident Advisors, Life Skills Mentors, and the Resident Hall Association
- Community service projects with athletics, student groups, or CARE
- Attending the Accounting/Finance Lecture Speaker Series
- Participating in ROTC
- Acting as a First Year Seminar Assistant
- Working with WNE Police student patrol
- Working at the Polling Institute
- Participating in January Workshops
- Assistant coaching
- Camp counseling
- Course-based projects
- First Year Seminar Assistants
- Summer jobs
- The Big E
- Travelling
- Tutoring and Mentoring [130]

6.2.5. Purdue University, USA

The Learning Beyond Classroom (LBC) program comprises contains 3 modules. They are as follows. [131]

Module 1: Career and Professional Development

- Entrepreneurial certificate
- Career exploration experience: Seminar
- Create YouTube Video
- Attend Departmental research seminar
- Entrepreneurial Activity
- Internship
- Job shadow
- Science Ambassador
- Participate in Science-based organization

- Science-related job
- Science-related publication
- Attend Scientific meeting/poster session
- Undergraduate research

Module 2: Service, Citizenship, and Leadership
- Intensive leadership development experience
- Interactive service learning in the community
- Resident Assistant
- Teaching assistant; tutor
- Work as student employee in campus leadership role

Module 3: LBC Experience with Domestic and International Diversity

- Interactive service learning with another cultural group
- Domestic or international diversity event or performance
- Domestic or international diversity organization
- Global Science Partners
- International or domestic mentoring program
- Study Abroad [131]

6.2.6. Eastern Michigan University, USA

The LBC program of this university stated that "A university education is about more than just classes. Students involved in activities outside of the classroom have higher retention rates and more positive educational experiences. Learning-Beyond-Classroom encourages students to obtain hands-on experience and to learn about professionalism; it also provides a way to apply classroom knowledge". The LBC activities are classified under 6 groups.
Group 1: Self and Well-Being
Group 2: Community Service, Citizenship and Leadership
Group 3: Cultural and Academic Activities and Events
Group 4: Career and Professional Development
Group 5: International and Multicultural Experience
Group 6: Undergraduate Research [132]

6.3. List of LBC Activities to Enhance Employability

The toughest challenge is to inject and enhance the employability attributes through various LBC academic activities, processes and persons. The academic culture consists of variety of processes, practices, activities, methods like
- Mapping of LBC into curriculum
- Teaching
- Training for Personality Development

- Technical Trainings
- Research
- Hands-on Training
- Assessment and Evaluation
- Co-curricular activities
- Extra-curricular activities
- Academic Collaborative Activities
- Laboratory Practical beyond syllabus
- Events like
    - Conferences
    - Workshops
    - National Seminars
    - Students Competitions
        - Technical
        - Debate
        - Essay
    - Youth festivals and Camps
    - Cultural programs
    - Discussion forums
- Management and organization of student activities and involvement in Clubs, Chapters, Associations, Cells, Centers
- Business Game modules
- Case studies, group work and presentations
- Training for the interview techniques like
    - Group discussions
    - Phycology tests
- Intercultural awareness training and encouraging cross-cultural integration on campus
- Poster sessions, criticism and reflective learning
- Authentic Problem Based Learning
- Field Based Learning
- Technology Supported Teaching Learning
- Work-based learning and Industrial Experience: Some professional experience as an integral part of their degree programme like
    - Work placements
    - Internship programs
    - Part-time/casual work
    - Joint research
    - Work-based learning-Project
    - Part-time work –University Job Shop
    - Vacation work
    - Volunteer Activities
    - Short Professional Placements
    - Mentoring
    - Work Shadowing
    - Graduate Advantage

  - Graduate Internships –paid and voluntary
  - Organized work experience as part of a programme of study: This may include long placements on sandwich courses, short placements on other courses, and clinical or practice programmes on some professional degrees. It ranges from doing an actual job, through shadowing a worker in a job, to carrying out a work-based learning project. Some may be paid; some may not. It may also include credit for year-long placements unconnected to a specific programme; for part-time, term-time or vacation work; or for voluntary (unpaid) work.
  - Organized work experience external to a programme of study: This includes national programmes, which arranges project-based placements in small companies and not-for-profit organizations, which recognizes and accredits skills developed through part-time employment, voluntary work or student activities. It also includes more local schemes of these kinds.
  - Ad hoc work experience external to a programme of study: This includes part-time jobs that students set up for themselves, for earning rather than learning purposes. In addition to the vacation work that most students have traditionally undertaken, around 60% of full-time students now work during term-time, and do so for an average of 10-14 hours per week
- Very strong volunteer culture like
  - Mentors
  - Student Tutors
  - Community Volunteers
  - Peer Mentors
- Using short 'buzz-group' discussions within lecture-group sessions.
- Self-audits (e.g. of personal and career management skills)
- Role-play (e.g. recruitment personnel, mock interviews)
- Peer review (e.g. of CVs or of assignments)
- Card-sort exercises (e.g. devising a sequence of decision-making activities)
- 'Snowballing' activities which begin with pair-based work, progressively combining to produce a larger-group response to the challenge set
- Problem-based methods
- Supplementing lectures with on-line peer discussion groups or tutor-managed discussion forums
- Self-directed learning
- The assessment methods used for career development learning need to reflect the learning goals of the programmes. Methods can include
  - Reflective essays or reports
  - Learning logs and portfolios, including action plans
  - Group or individual projects
  - Group or individual presentations
  - Direct assessment of CVs, applications and interviews
  - Written examinations
- Internationalization activities by International Office
- Instructional scaffolding: The concrete slab needs support until it can support its own weight. Similarly to train swimmer initially the support of air tubes helps a lot. This civil engineering and swimming techniques can be applied to extend "the learning by doing process" and known

as Instructional scaffolding. To learn beyond the existing capacity of the learner, the initial support is provided **t**o learner, process which is tailored to the needs of the student with the intention of helping the student achieve his/her learning goals. These supports are gradually removed as students develop autonomous learning strategies, thus promoting their own cognitive, affective and psychomotor learning skills and knowledge. Instructional scaffolding is a learning process designed to promote a deeper level of learning

- Experimental learning or Learning by Doing
- Student's Forums and Chapters of Each Department
- Disability Cell
- Language Cell (LC)
- Study Abroad
- Women Development Cell (WDC)
- Physical Education and Sports
- Learning Resources Centre (LRC) activities and facilities
    - Video Repository
    - Audio Lecturer Repository
    - Podcast library
    - Simulation and Animation library
    - Game Labs and Game based Learning
    - Digital Library: E-books and E-Journals
- Business Incubation Center (BIC)
- Community Development Center
- Center of Excellence of Each Department or Discipline
- Research Centers of Each Department or Discipline
- Innovation Centers
- Career Exploration for Jobs and Higher Education
- Alumni Association
- Parent Association
- National Cadet Corps (NCC)
- National Social Service (NSS)

In the following sections, I would like to highlight few important LBC activities, which need special attention for enhancing the standard of Indian Higher Education system.

6.4. Technology Supported Teaching Learning Outside the Classroom

I have covered this topic in sufficient depth and devoted total 9 chapters (Chapters 1 to 9, pages 1-198) for this issue in my book "Technology-Storms Redefining World Class Universities".

6.5. Learning Communities or Special Interest Groups (SIG)

Research results here and at programs across the United States show that students who take part in a learning community earn higher grades, makes friends faster, and graduate at higher and faster rates than students who don't participate. [133]

The Learning communities create many opportunities like

- The opportunity to come together with students who share a common academic purpose, encouraging the strong development of college-level study and learning skills.
- Enrollment with your neighbors in common introductory engineering classes
- Free, tutor-assisted study halls in science and math
- Out-of-class programme like lectures from successful alumni, student professional club demonstrations, and career information in science and technology. [134]

Few important aspects of Learning Communities are:

- Learning community programs address a decreasing sense of community in some university environments
- Learning communities are intended to make the university seem 'smaller'
- Learning communities support students' academic, personal and professional growth and success
- Students in learning communities may also live together in residential halls
- Learning communities often integrate academic components and co-curricular experiences
- Students working together in interdisciplinary learning communities are able to make connections across disciplines and to take relevant ethical issues into consideration
- Learning communities are intended to be academically and socially supportive; to help students meet new people on campus; to help students connect in- and out-of-class experiences; to help make the transition to university and later to the workplace easier; and increase students' involvement in the university community
- Academic staff involved in learning communities may also build mentoring relationships with each other
- Learning communities may allow students to relate their university learning to larger personal and global goals
- Some institutions have learning community dedicated spaces which may be open 24 hours and available for study and/or socializing.
- Residential learning communities create a more academically supportive environment for students in the residence halls.
- Residence halls at Syracuse University range in size from 250-600 students, with eight out of the twelve North Campus residence halls housing over 400 students each. To enhance the residential experience, Syracuse University has developed several academic and interest specific learning communities where students live together in a residence hall and take one or more courses together. This creates smaller and more unifying communities in the residence halls. [117]

The potential benefits of living in a learning community include:

- Enhanced academic and social opportunities,

- Improved GPA,
- Improved connection to faculty,
- Greater involvement in learning,
- Increased satisfaction with your SU experience, and
- Increased persistence to graduation. [135]

The advantages of being in a learning community include:

- Contact with students who have similar academic goals
- Common courses
- Common place of residence
- Career exploration
- Introduction to university resources
- Peer mentoring and/or tutoring
- Faculty mentoring and involvement
- Participation in department club or other organization
- Leadership development
- Exposure to international and/or diversity issues
- Special programs to acquaint students with campus life
- More collaborative learning environment [135]

6.5.1. Purdue University USA

The Learning Communities available to students for College Engineering at Purdue University are: [136]

- Air Force ROTC: The Air Force ROTC of Purdue Learning Community is designed to bring together freshmen AFROTC students who have the ultimate goal of becoming Officers in the United States Air Force.
- Engineering for the Planet: The Engineering for the Planet Learning Community is designed for first-year engineering students interested in protecting and enhancing the environment and designing products so that every aspect of daily life has the least environmental impact possible.
- EPICS: The Engineering Projects in Community Service (EPICS) Learning Community places first-semester students in the award-winning EPICS program to design engineering-based solutions for some of the most pressing needs of the local community
- Global Engineering Cultures and Practice: At Purdue, our Global Engineering Cultures and Practice Learning Community welcomes first-year engineering students who want to develop leadership skills in the context of an increasingly interconnected and rapidly changing world.
- Network: The Network Learning Community provides an exciting learning environment for first-year engineering students to develop a strong engineering support network.
- Around the World (in Global Texts and Religions): Join this LC to learn about enhancing global understanding and the ability to address current individual and national strife.
- Engineering Honors: The Engineering Honors Learning Community is designed for first-year engineering students participating in the Honors College. This year-long experience will allow you to live, study, and interact with a small group of fellow honors students

- First-Year Engineering Bands and Orchestras: The First-Year Engineering Bands and Orchestra Learning Community is open to all first-year band and orchestra students who are enrolled in the College of Engineering.
- IDEAS Wanted: Engineering students interested in exploring engineering-related multicultural themes through community involvement. If this sounds like you, consider the IDEAS (Introducing Diversity through Engagement and Service) Learning Community!
- Psychology: Join other first-year Psychology students with your interests as they begin exploring human behavior and the mind. Through active LC participation, you will bring your classroom education to life.
- Entrepreneurship and Innovation: If you have an interest in learning how businesses launch, compete and grow, consider the Entrepreneurship & Innovation Learning Community (ELC).
- Future Naval Officers of Purdue: The Future Naval Officers of Purdue Learning Community is devoted to building a solid foundation for future Navy and Marine Corps Officers.
- Law and Literature, Past and Present: How far does the law express what is just or good? In this learning community you will explore questions like this and the conflicts that arise from them. [136]

6.5.2. Ohio University USA

Learning communities at Ohio University are a collaborative effort between University College, the Office of Admissions, the Office of the Registrar, Institutional Research, the Office of Information Technology, the Division of Student Affairs, the College of Arts and Sciences, the College of Business, the Scripps College of Communication, the Patton College of Education, the Russ College of Engineering and Technology, the College of Fine Arts, and the College of Health Sciences and Professions. [137]

A learning community (LC) is a group of students who take a common set of courses together or share a common experience around their academics. Participants in a LC develop a deeper understanding of the courses' subject matter while they build relationships and learn together outside of the classroom. In most learning communities, students are enrolled in two required general education courses as well as a freshman seminar. Learning communities within our Biological Sciences, Mathematics and Chemistry areas partner a peer-led tutoring lab (PLTL) with some of the more difficult science courses. For University College undecided students, the instructor for the freshman seminar may also serve as the academic advisor. Some of our learning communities are residentially-based, which means that participating students not only take courses in common but also live in either the same residence hall or the same residential area of campus. [137]

There are five objectives for the LC program at Ohio University:

- Create learning-based peer networks
- Improve the academic success of first-year students
- Improve student retention from the freshman to sophomore year
- Increase student satisfaction with Ohio University
- Increase student-faculty interaction outside the classroom [137]

The objectives, have been/are being met through the following programmatic elements: Students are enrolled in two to four thematically linked courses, including a learning community seminar, in the Fall Semester. The courses, with the exception of introductory course, count toward students' Tier 2 requirements or major requirements. In most LCs, students live in a shared living environment for a common residential experience. An administrator or faculty member from the college teaches the introductory course. Students participate in out-of-class activities, in most instances organized by a Learning Community Leader, that include involvement of faculty members from the linked courses. [137]

6.5.3. University of Housing, Illinois USA

Located throughout the University Housing residence halls, Living-Learning Communities provide the opportunity to become part of a unique experience, with programs and facilities to support the interests of the community members. More detailed information is available at website of the university [138]

6.5.4. University of Michigan, USA

When academics or personal interests intersect with the living environment, students grow and learning is enhanced. The University of Michigan offers a variety of residential living/learning programs that allow students with similar interests or goals to live and study together in community and to meet students from other countries, cultures and backgrounds. Many of these Michigan Learning Communities are housed in the University's residence halls and provide a smaller, more intimate environment for the exploration of a specific field of study. By thinking, studying, living and learning with others who share and understand their aspirations, students can maximize both their academic and personal experiences at Michigan. Each of the programs listed here is associated with a U-M academic department. Complete details can be found on each program's website. [139]

- Global Scholars Program: The Global Scholars Program prepares sophomore, junior, and senior University of Michigan students to be interculturally competent global citizens, champions for meaningful change and innovative leaders of tomorrow.
- Health Sciences Scholars Program: For students interested in exploring a broad range of career opportunities in the health fields.
- Honors Program: Offers special depth and academic challenge to highly motivated students in the College of Literature, Science and the Arts.
- Living Arts: Brings together students and faculty in engineering, architecture, the visual and performing arts and other fields to explore innovation, creativity and collaboration.
- Lloyd Hall Scholars Program: Students interested in writing and the arts can explore their creative passions through composition, the visual arts and cultural and social involvements.
- Max Kade German Residence: Sophomores, juniors and seniors: Learn and practice German in an informal setting, attend cultural events and even travel to Berlin, Vienna, Munich or Hamburg.
- Michigan Community Scholars Program: For students with an interest in community service and a commitment to academic excellence, civic engagement, leadership and social justice.

- Michigan Research Community: Offers first-year students all the benefits of a UROP research partnership with a faculty member in an area of their choosing, as well as a small, diverse and supportive residential community.
- Residential College: A small LSA four-year program that offers an engaging student community with an emphasis on languages, writing and the arts.
- Women in Science and Engineering Residence Program : A community of students with academic and career interests in the sciences, technology, engineering, mathematics and health fields. [139]

6.5.5. Indian Context

I found few of the universities and institutes in India have formed the Special Interest Groups (SIG) in the following disciplines

- Computer Engineering
  - Digital Forensics
  - Data Mining
  - Information Security
  - Software Engineering
  - Soft computing
- Electronics & Communication Engineering
  - Networking
  - VLSI
  - Embedded
  - ANN and Fuzzy Logic
- Mechanical Engineering
  - Mechatronics
  - Robotics Automation and Control
- Civil Engineering
  - Earthquake Engineering
  - Building Planning and Designing
  - Structural Engineering
- Business Management
  - Product & Brand Management
  - Industrial Relations
  - International Human Resource Management
  - Taxation
  - Security Analysis

6.6. Faculty, Staff and Students Clubs and Extra-curricular Activities

Leading University	Number of Student Organizations
Harvard	369

Cambridge	400+
Yale	500
Caltech	80
MIT	404
Stanford	590
Columbia	350
Princeton	227
Chicago	400
Pennsylvania	371
Imperial College	300+
Cornell	864

Table 6.3: Number of Student Organizations [117]

Fig. 6.4: Hampton University USA Student Organization [140]

Many universities encourage students to take part in as wide a range of extracurricular activities as possible. They organize, and enable students to organize, a wide range of cultural, intellectual and artistic events. One of the advantages of extracurricular activities is that they can promote interaction between diverse groups of students. Students are able to gain experience developing, promoting, governing and administering clubs and societies.

There are variety of clubs available in universities like:

- Pen and Magazine Club
- Photography Club
- Nature and Wildlife Club (NWC)
- Drama Club
- Yoga and Meditation Club
- Eco Club
- Chess Club
- Painting and Art Club
- Health Club
- Athletics Club
- Classical and Western Music Club
- Movie Club
- Indian Traditional Dance Club
- Social Awareness Club
- Math Club
- Sun Technologies Club
- Programming Club
- Linux Users Group
- Electronics Hobby Center
- Renewable Energy Club
- Global Warming Club
- Creative Design Club (CDC)
- Robotics Club
- Adventure Club
- Debating Club
- Food Glamour Club
- Hacker's Club
- Cricket Club
- Table Tennis Club
- Badminton Club
- Volleyball Club
- Mobile Technology Club
- Astronomy Club
- Student Investment Management Club

6.7. Experimental Learning

The most effective experiential learning opportunities are intentionally linked to the academic goals of a course or a cluster of courses, and derived from situations where students get a chance to put the theory they've learned in the classroom into practice. Experiential learning refers to a broad spectrum of educational experiences, such as

- Study abroad programs
- Community service
- Fieldwork
- Sensitivity training groups
- Workshops
- Internships
- Cooperative education involving work in business or industry
- Undergraduate participation in faculty research.

6.7.1. Field Based Learning

Effective teaching and learning can occur both inside and outside of the university classroom. While a traditional university course takes place in the lecture halls and labs of the academic institution, some course instructors extend the learning environment beyond the university classroom and into the 'real world.' Many professions, such as teaching and health care, require these out-of-classroom learning experiences and use professionals within the field as on-site instructors. The co-operative education model requires students to develop practice knowledge and skills within a work environment. For other academic areas of study, such as geoscience, these out-of-classroom experiences are not always required, but are seen as extremely beneficial for student learning. Out of- classroom learning activities are commonly identified in the literature as

- Internships
- Fieldwork placements
- Clinical education
- Field-based learning
- Experiential education or
- Service learning

These out-of-classroom, non-laboratory activities with specific learning objectives, goals, and evaluation criteria will be referred to as field-based learning. [141]

Field-based learning involves the integration of theory and practice and provides an opportunity for the student to apply classroom knowledge to a 'real life' setting. Students learn directly from role models within their professions and other subject matter experts, and develop their own professional competencies, skills, and attitudes. Students are thus 'socialized' into the profession. There is also an opportunity to network with many experts in their fields, which can lead to the provision of professional references and possible opportunities for future employment and mentorship. In addition, students learn more generic work and 'people skills' such as working collaboratively with others, communicating effectively, taking responsibility, and prioritizing assigned tasks. In this way, students gain marketable skills to aid in their search for employment after university. [141]

Field-based learning offers the opportunity for 'hands-on' kinesthetic learning; a welcome alternative for many students to the typical visual and auditory learning approaches prevalent in the classroom. By addressing different learning styles with varied teaching methods, educators can provide an enriching and rewarding experience for more students. Field-based learning also allows students to experience different job and work settings, aiding in their search for careers that match

their goals, interests, and abilities. In this way, students are able to explore career options. For students with disabilities, field-based learning provides an opportunity to address disability issues in a work setting. These students learn to advocate for themselves and create novel solutions to problems they encounter. They can also become more fully aware of their personal strengths, which can help them build confidence. [141]

6.7.2. Participation in Research

Students who have experiences in the Undergraduate Research area will:

- Learn to carry out self-directed or independent learning projects.
- Collaborate with or be mentored by a faculty member.
- Appreciate the value of learning for self-understanding and actualization.
- Appreciate the value of intellectual and critical engagement with local and global issues. [142]

The undergraduate research activities can be carried out at Research & Development Cell (RDC)

- Some leading universities are striving to link all their academic programs to strong research experiences thus improving the teaching/research nexus
- Some universities have undergraduates work with academics on their current research and/or allow students to design and conduct their own research projects, supervised by an academic
- Some research programs for undergraduate students are integrated into semester coursework; other research opportunities take place over summer
- Meaningful research opportunities are being provided for first-year students
- At some leading research universities students undertaking research can earn academic credit, or pay, or work as volunteers
- Students gain experience at all stages of the research project, including writing proposals and presenting findings
- Research opportunities allow for meaningful interaction with academic staff, who often act in a mentoring capacity
- Some leading institutions also provide opportunities for off-campus and overseas research
- MIT runs the Undergraduate Research Opportunities Program (UROP), which is aimed at cultivating and supporting research partnerships between undergraduates and faculty. It is one of the earliest programs of its kind in the US (created in 1969) and it invites undergraduates to participate in research as the junior colleagues of MIT faculty. [117]

6.7.3. Study Abroad Opportunities

- Many universities are proactive in enabling and encouraging students to study, take up internships, conduct research or take part in community service work overseas
- Some universities offer credit for study or work abroad
- Students are being particularly encouraged to apply for opportunities in non- English speaking countries
- Alumni can provide resources and expertise to enable study/work abroad opportunities for students

- Universities in the UK are being encouraged to adopt study/work abroad opportunities as policy; to make their study/work abroad programs as flexible as possible; and to set up credit transfer systems so that valuable student experiences are properly accredited and acknowledged on academic transcripts
- Many universities are setting up study/work abroad offices and centres, dedicating interactive web pages to study/work abroad, arranging study abroad 'fairs', speaker series and discussion sessions. [117]

6.7.4. Community / Service Learning

Great societies develop great Universities. Thus University must connect to the society. Then society will help to build great University.

"Service Learning and Community Engagement" is a method of encouraging student learning and development through active participation in thoughtfully organized service that is conducted in, and meets the needs of, a community.

- Eastern Michigan University, USA specified the LBC activities under this category i.e. "Work as a student employee in a campus leadership role" as follows
    - Admissions Visit Program Student Coordinator
    - Campus Life Involvement Corps
    - Cellar Roots Editor
    - Center for Student Involvement Reception Desk Manager
    - Community Service Officer (CSO)
    - Echo Editor
    - Echo Sales Manager
    - Dining Services Manager
    - Holman Success Center Supplemental Instructor/Tutor
    - Housing Resident Advisor
    - OTEAM (Orientation Team)
    - REC/IM Supervisor
    - Resident Advisor
    - Student Body President or Vice President
    - Student Center Information Center Manager
    - Student Center Building Manager
    - Student Program Coordinator/LGBT Resource Center
    - Student Program Coordinator/Women's Center
    - Student Program Coordinator/Center for Multicultural Affairs
    - Student Program Coordinator/VISION [132]
- Community service learning is an integral aspect of a university education in many leading universities in the US and Canada especially
- Large numbers of students, academic and general staff across faculties are engaged in community service on a regular basis

- Many universities are proactive in leading and assisting community efforts to improve education, health care, the revitalization of neighborhoods and fostering economic development in their local areas
- Many universities approach student education holistically, aiming to produce graduates who are civic leaders and engaged in their communities in addition to being well educated
- Students are being encouraged to put the theory they learn in the classroom into practice in local, provincial, national and global contexts [117]

6.7.5. Entrepreneur Development Activities

The entrepreneur development activities can be carried out at following cells and center.

- Entrepreneurship Development Cell (EDC)
- Industry Institute Partnership Cell (IIPC)
- Incubation Center

6.8. Student Support Services

Many leading institutions are developing a comprehensive approach to mental health care throughout the university community; they are also introducing a range of proactive strategies to improve specifically the general climate of mental well-being in the student community; they may also ensure that academic and general staff, mentors and advisors are aware of issues around mental wellbeing and are equipped with strategies to enable them to help students get professional advice. [117]

University student support services usually offer assistance with a range of issues including

- Academic
- Accommodation
- Anxiety
- Careers
- Cultural
- Dental
- Depression
- Health
- Immigration
- Jobs
- Learning support
- Mental health
- Money matters
- Residences
- Security
- Spiritual

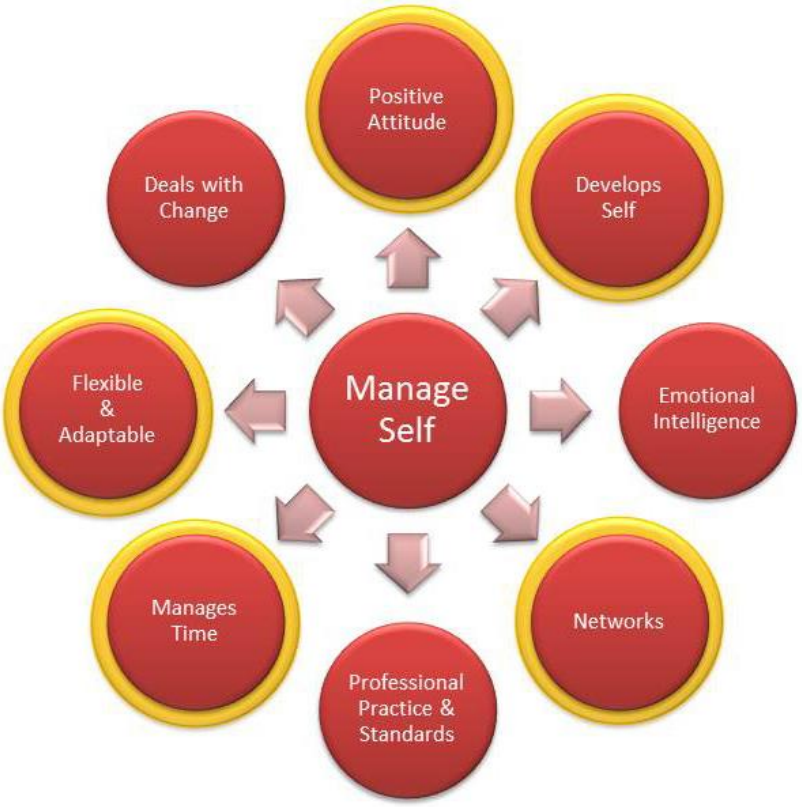
6.9. Indian Universities: Need to Focus LBC

Most of the Indian Universities and Institutes of Higher Education are neglecting the issue of LBC, resulting in high rate of unemployability. The following authorities need to pay serious attention to this most neglected issue.

- Planning Commission and Policy makers
- Central Regulatory Authorities
- State Government authorities
- Fees Fixation or Regulation Committees
- Funding Agencies
- Board of Managements and Authorities of Universities and Institutes

6.10. Implant Employability Attributes in to Academic Activities

In fact, teaching process should not start without implanting the Employability attributes to curriculum design and overall academics, which include Learning Beyond Campus (LBC) activities. Unfortunately the serious efforts in this direction are missing in most of the universities in India. Let's see following employability model by Great Graduate UK. [143] [144] [145] [146]


Positive Attitude
Develops Self
Emotional Intelligence
Networks
Professional Practice & Standards
Manages Time
Flexible & Adaptable
Deals with Change
Manage Self


Solves Problems
Planning & Organisation
Decisive
Manages Risk
Technical Skills
Commercial & Business aware
Manages resources
Sets & meets goals
Manage Task

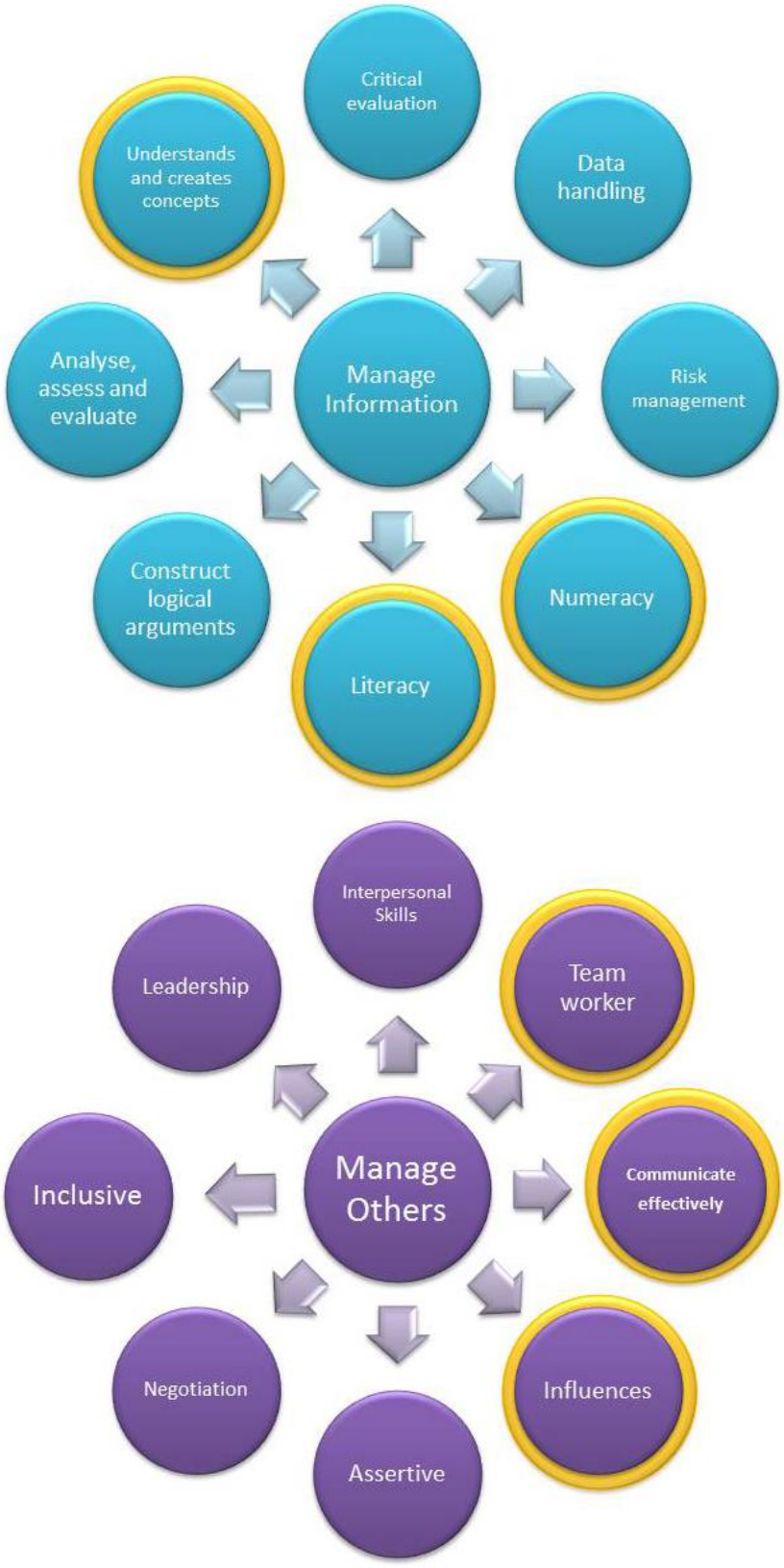


Fig. 6.5: Employability Model [146]

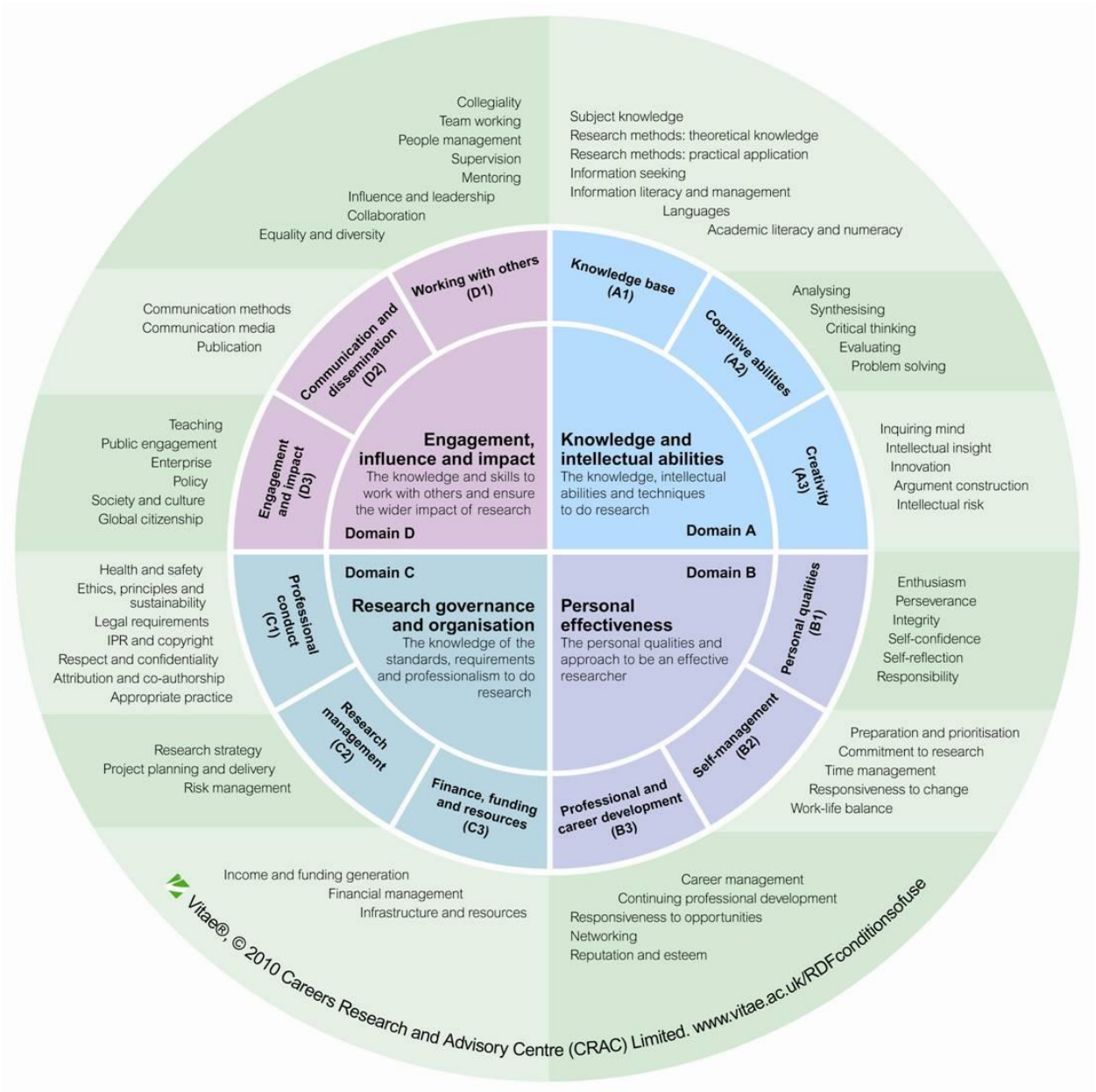


Fig. 6.6: Queen Mary University of London views on skills training [147]

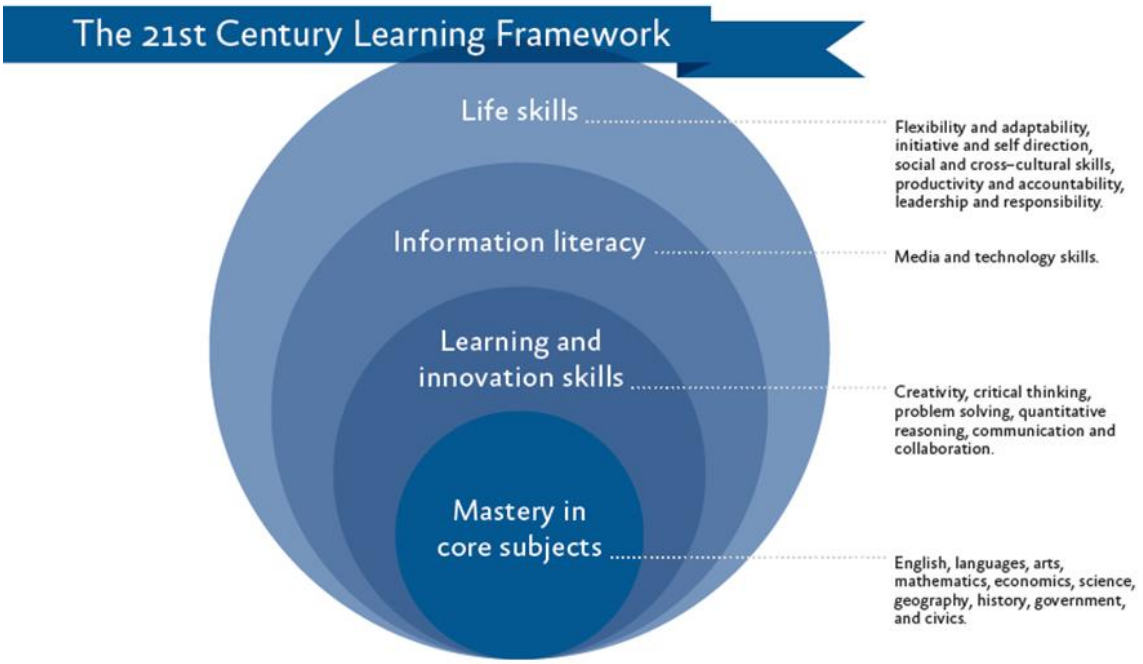


Fig. 6.7: The 21st century Learning Framework [148]

The list of 174 Employability attributes are as follows:

SN	Employability Attributes
	Personal Attributes
1.	Ability to Deal with Pressure
2.	Adaptability: ability to respond positively to changing circumstances and new challenges
3.	Balanced Attitude to Work and Home Life
4.	Character and core values
5.	Commitment
6.	Common sense
7.	Cooperative nature
8.	Critical, Conceptual and Reflective Thinking
9.	Curiosity
10.	Emotional Intelligence: sensitivity to others' emotions and the effects that they can have
11.	Enthusiasm
12.	Ethical Standards
13.	Fitness for work
14.	Flexibility
15.	Honesty
16.	Integrity
17.	Intellectual openness
18.	Loyalty
19.	Motivation
20.	Personal Presentation
21.	Positive Self-Esteem
22.	Power of concentration
23.	Reliability

24.	Sense of Humor
25.	Tolerance
26.	Wide Exposure
	Communication Skills
27.	Chairing a meeting
28.	Demonstrating empathy
29.	Language skills: Fluency in English & other languages
30.	Foreign language competence
31.	Influencing Abilities and Personal Impact: Convincing others of the validity of one's point of view
32.	Interpersonal relations: Establishing relationships & using networks (Working with, Building of, and Leading the Team plus Relationship Building)
33.	Listening and Understanding: focused attention in which key points are recognized
34.	Logically summarizing information or data
35.	Persuading & negotiating effectively: discussion to achieve mutually satisfactory resolution of contentious issues
36.	Arguing for and/or justifying a point of view or a course of action
37.	Persuading effectively and tactfully, being assertive
38.	Presentation Skills: Clear and confident presentation of information to a group
39.	Reads and comprehends well or Reading effectiveness: the recognition and retention of key points.
40.	Sharing information and proposing ideas
41.	Speaks clearly and directly, express ideas and feelings and judgment
42.	Understanding Body Language and Non Verbal Communications
43.	Understanding the needs of customers/clients
44.	Numerical skills or Numeracy: ability to use numbers at an appropriate level of accuracy
45.	Written communication: Writing appropriately for different audiences and according to needs of audience
46.	Explaining: orally and in writing
	Teamwork Skills
47.	Team work: can work constructively with others on a common task
48.	Apply team work skills to a range of situations
49.	Be responsible for own work and team goals
50.	Clarifying team roles & performing agreed tasks
51.	Coaching, mentoring & motivating others
52.	Collaborating & contributing to team results
53.	Conflict resolution: both intra-personally and in relationships with others
54.	Coordinating Capabilities
55.	Define role in a range of teams
56.	Demonstrating leadership as appropriate
57.	Experience Working in Diverse Global Environment
58.	Giving & receiving constructive feedback
59.	Identify team strengths
60.	Positive influence on others
61.	Recognizing own strengths & limitations
62.	Work well on own and in a group
63.	Working effectively with people of different ages, gender, race, religion or political persuasion
64.	Ability to work cross-cultural group
	Problem Solving Skills
65.	Problem solving: selection and use of appropriate methods to find solutions
66.	Ability to Analyze Complex Facts and Analytical Skills
67.	Ability to Plan and Think Strategically
68.	Analyzing facts & testing assumptions
69.	Applying a range of strategies to problem solving
70.	Critical analysis: ability to 'deconstruct' a problem or situation.
71.	Defining the problem & contributing factors
72.	Designing contingencies

73.	Developing & evaluating a range of options
74.	Developing creative, innovative &/or practical solutions
75.	Evaluating processes & outcomes
76.	Implementing & monitoring solutions
77.	Making realistic decisions & action plans based on data
78.	Problem Identification, getting to the heart of problems and Problem Solving Attitude
79.	Resolve customer concerns
80.	Resolving customer concerns in relation to complex issues
81.	Showing initiative in identifying & solving problems
82.	Solving problems independently & in teams
83.	Using mathematics including budgeting & financial management to solve problems
	Initiative & Enterprise Skills
84.	Ability to see the bigger picture
85.	Able to suspend judgment and explore options
86.	Adapts to new situations
87.	Assessing the competitive advantage of ideas
88.	Being creative, initiating ideas & innovative solutions
89.	Commercial Awareness : operating with an understanding of business issues and priorities
90.	Demonstrating political, commercial, environmental, cultural, etc sensitivities
91.	Determining the commercial viability of ideas
92.	Developing strategic goals
93.	Generating a range of options
94.	Identifying customer or client requirements
95.	Identifying opportunities not obvious to others
96.	Liaising with stakeholders & sponsors
97.	Makes effective use of information
98.	Marketing & selling a product or service
99.	Recognize need for change
100.	Transfer ideas and concepts into action
101.	Translating ideas into action
102.	Using a range of business communication methods
	Planning & Organizing Skills
103.	Ability to Cope With Uncertainty
104.	Being resourceful, taking initiative & making decisions
105.	Collecting, analyzing & organizing information and data
106.	Defining specifications & quality standards
107.	Developing Professionalism
108.	Effective decision making: Choice of the best option from a range of alternatives
109.	Establishing clear & attainable project goals & deliverables
110.	Establishing evaluation criteria & participating in continuous improvement
111.	Managing people - training, developing, motivating, giving feedback, supervising
112.	Managing tasks - delegating, coordinating, monitoring
113.	Prioritizing (Managing time & priorities) – setting milestones and ability to rank tasks according to importance
114.	Planning: Planning the use of resources including time, people, finances and materials as well as setting of achievable goals and structuring action
115.	Reporting on progress & outcomes
116.	Risk management & contingency planning
117.	Thoroughness and attention to detail
118.	Understanding basic business systems & their relationships
119.	Political sensitivity: appreciates how organizations actually work and acts accordingly
	Learning Skills or Cognitive Skills
120.	Able to manage own learning
121.	Academic Excellence

122.	Acknowledging the need to learn in order to accommodate change
123.	Applying learning to 'technical' issues e.g. learning about products & 'people' issues e.g. interpersonal and cultural aspects of work
124.	Being open to new ideas & techniques
125.	Being prepared to invest time & effort in learning new skills
126.	Being willing to learn in any setting – on & off the job
127.	Conceptual Ability
128.	Contributing to the learning community at the workplace
129.	Having enthusiasm for ongoing learning
130.	Information retrieval skills: ability to access different sources
131.	Learning How to Learn and Unlearn
132.	Research and discovery skills
133.	Sharing knowledge & experience in the workplace
134.	Using a range of mediums to learn – mentoring, peer support, networking, information technology (IT), courses
135.	Willingness for Lifelong Learning
136.	Willingness to learn: commitment to ongoing learning to meet the needs of employment and life.
	Technology Skills
137.	Computer literacy: ability to use a range of software
138.	Applying IT as a management tool
139.	Being willing to learn new IT skills
140.	Financial Management
141.	Having a range of basic IT skills
142.	Having the appropriate physical capacity
143.	Having the occupational health and safety knowledge to apply technology
144.	Relate technology to work
145.	Short Term Training of Various Essential Technologies
146.	Using IT to organize data
147.	Global awareness: in terms of both cultures and economics
148.	Applying subject understanding: use of disciplinary understanding from the HE programme
	Self-Management Skills
149.	Self-management: ability to work in an efficient and structured manner
150.	Articulating own ideas & vision
151.	Care for self
152.	Demonstrating resilience
153.	Discipline Nature
154.	Evaluating & monitoring own performance
155.	Handling One's Own Workload
156.	Having a personal vision & goals
157.	Having knowledge & confidence in own ideas & vision
158.	Independence: ability to work without supervision
159.	Initiative: ability to take action unprompted
160.	Self-Motivation
161.	Manages personal and professional boundaries
162.	Operates independently
163.	Personal involvement
164.	Positive thinking
165.	Self-awareness: awareness of own strengths and weaknesses, aims and values
166.	Self-confidence: confidence in dealing with the challenges that employment and life throw up
167.	Taking and Shouldering responsibility
168.	Think outside the box, Imagination and Creativity: ability to be original or inventive and to apply lateral thinking
169.	Time Management
170.	Working ethically and Ethical sensitivity: appreciates ethical aspects of employment and acts accordingly

171.	Working under pressure and Stress management or tolerance: ability to retain effectiveness under pressure
172.	Reflectiveness: the disposition to reflect evaluative on the performance of oneself and others.
173.	Acting morally: has a moral code and acts accordingly
174.	Coping with complexity: ability to handle ambiguous and complex situations

Table 6.4: Employability Attributes

The employability attributes are needed as per the job requirement. Thus it is not necessary to enhance all the employability attributes.

6.11. Personal Development Plan (PDP)

For global employability, the T&P Division must maintain the Personal Development Plan (PDP) of each student from the day one of the institute. The LBC participation and employability skill development activities must reflect in PDP. For global employability the international industries ask to submit this document at the time of interview. The PDP reflects the level of efforts taken by student and institute for enhancing employability attributes. It is very scientific process and adopted at most of the universities in developed countries. The detailed information is available in my book "Strategy to Develop World Class University". [149] [150] [151]

6.12. Coordination of LBC activities: Most Complex Job

The coordination of hundreds of LBC activities is not an easy task. Many University Authorities are involved in managing this job. The Dean Student Affairs is responsible to coordinate, schedule and manages the LBC activities along with authorities mentioned above. He will inform and encourage the students to participate in these huge range of activities for enhancing employability. The coordination activities are as follows:

1. Training and Personality Development should be coordinated by Director, T&P division. He should provide the audio-video recordings of these events to the Director, Learning Resource Center (modified form of library) for uploading at Campus Intranet.
2. Student Functions, Departmental Forums, Various Cells etc. are controlled by Dean, Student Affairs. He will be responsible to provide the audio-video recording of the speeches in these events to the Learning Resource Center.
3. Dean Academics should provide the daily audio-video recordings classroom teaching, guest lectures, seminars etc. to the Learning Resource Center.
4. Basic and Advanced Vocational training activities are under the Director, Vocational Training Division. Along with Dean Academics, he is responsible to plan the overlapping activities, which are helpful for enhancing employability of UG / PG academic courses. He should provide the audio-video recording of training activities to Learning Resource Center.
5. Distance Education mode activities mainly controlled by Director, Distance Learning. His job is develop the digital contents especially for E-learning and M-Learning. These digital learning modules are uploaded at Data Centers (Server room) and managed through websites (Learning Management System) or through Intranet of the University. Thus the activities are carried out

under the supervision of Director, Data Center. In the campus, these modules are available at Learning Resource Centers. Thus content management and offline / online (through Intranet) content distribution is responsibility of Director, Learning Resource Center.

6. The business management games are vital component of Management education and available at Game Labs. The in-charge of this lab is responsible for game development software, maintain the Game Repository and providing access to online educational games.
7. The in-charges of Virtual and Remote Control Labs should maintain and provide the access to virtual experiments to students across the campus and network institutes. He is also responsible to give access to various Virtual and Remote Control Labs of World Renowned Universities.
8. The Director, Learning Resource Center should provide the access to Audio-Video Repositories, Language, Business and Technical Podcast Repositories, Simulations and Animation Repositories, Education TV serials like HOUSE MD, e-books, e-journals etc. The in-charges of these centers are responsible for management and maintenance of these resources. In addition to this, the in-charges of these labs are responsible to maintain the exhaustive list of free online learning resources of WCU.
9. The in-charge of Coursera and Massive Open Online Courses (MOOC) activities will design the hybrid courses & Flipped Classroom along with Dean, Academics and respective Heads of the Departments.
10. Bring your own device (BYOD) (also called bring your own technology (BYOT), bring your own phone (BYOP), and bring your own PC (BYOPC)) means the policy of permitting employees to bring personally owned mobile devices (laptops, tablets, and smart phones) to their workplace, and use those devices to access privileged company information and applications. The in-charge BYOD will maintain this computing environment along with Director, Data Center for LBC activities.
11. The in-charge Cloud Computing Center should provide the Cloud Services to LBC activities.
12. The Teaching Studios are equipped with hundreds of software and involved in online teaching learning activities mainly for Flipped Classrooms. The in-charges of these studios should provide the access to these studios for LBC activities.
13. The in-charge of Teaching-Learning activities through Social Media should provide and manage these activities for LBC.
14. Director, Industry Interface should be responsible to provide industrial training, industrial exposure and interaction, shadow jobs etc. activities for LBC.
15. Director, Incubation Center will also arrange the activities for LBC.
16. The Director, International Relation should be responsible to arrange and manage the LBC activities for International Students. In addition to this he will also coordinate the International activities for students along with Director Alumni Affairs and Dean Academics.
17. Director, Alumni Affairs should be responsible to involve alumni for arranging LBC activities.
18. Director Sports should be responsible for arranging sports and LBC activities for physical development of students.
19. Director, Community Services manages the LBC activities for developing campus communities and extension services for society.
20. Dean Research is responsible to provide research experience to undergraduate students through various LBC activities in coordination with research centers of various departments. He is also responsible for student participation in research events.

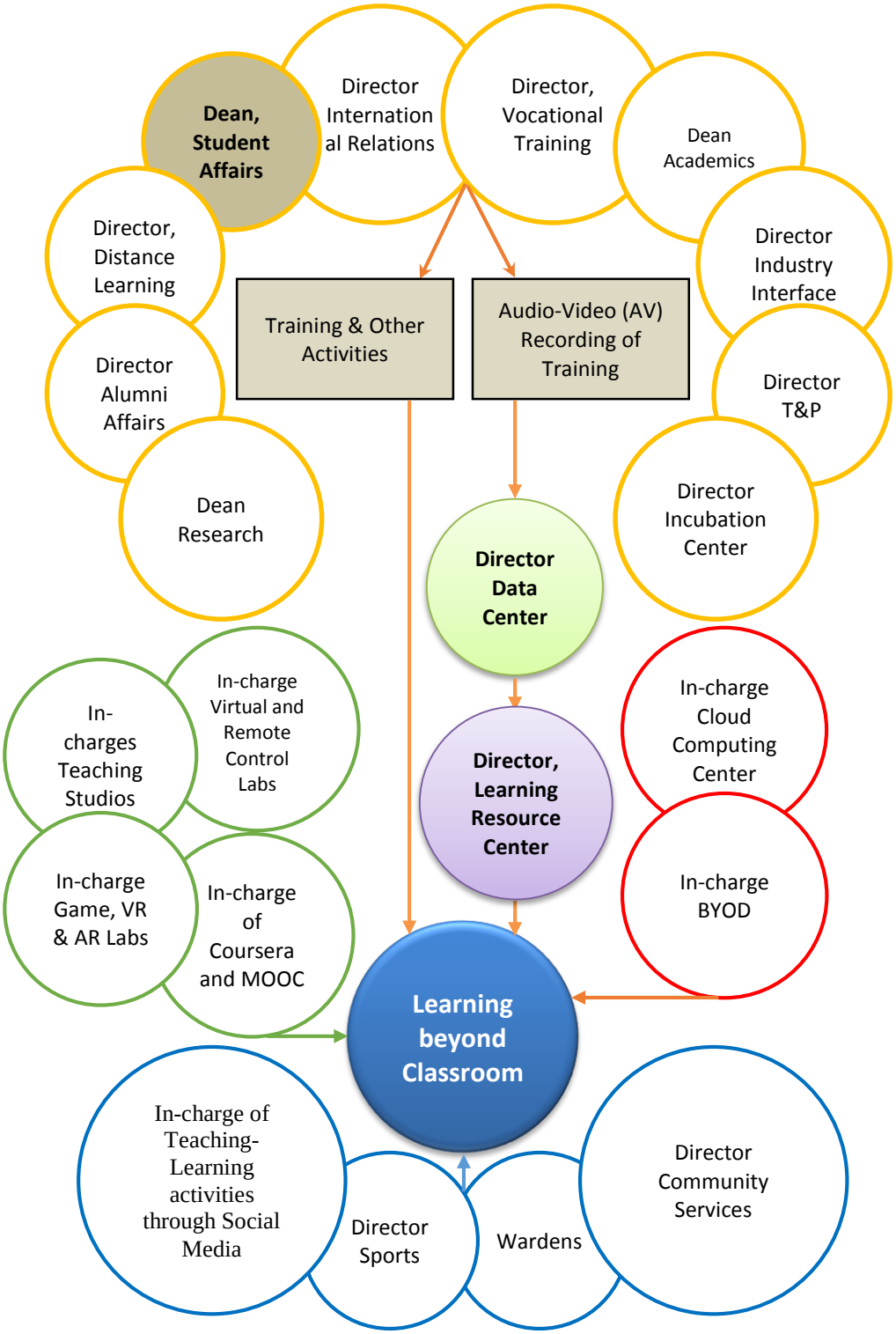
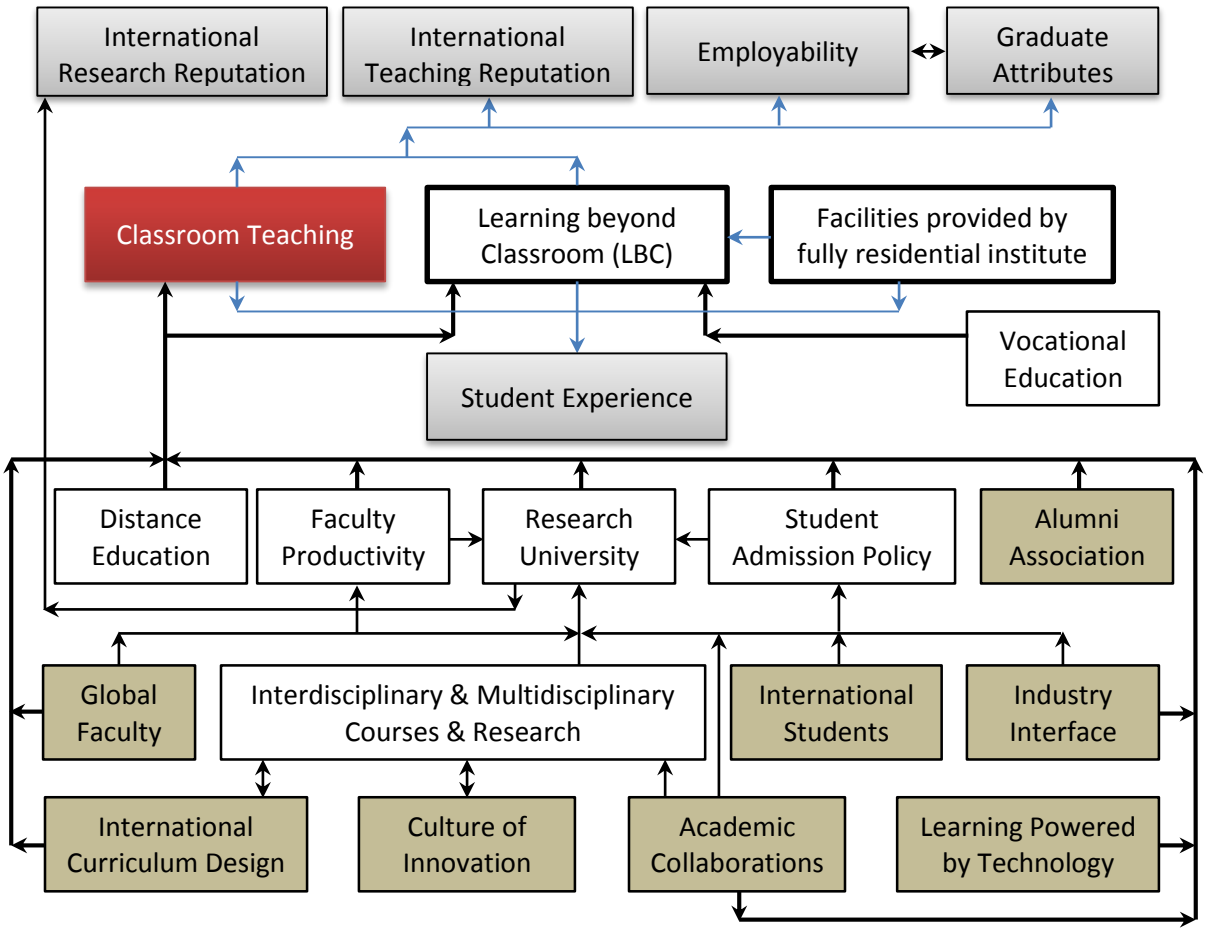


Fig. 6.8: Dean Student Affairs is the controlling authority for LBC

Chapter 7: International Teaching Reputation, Employability and Graduate Attributes Depend upon Classroom Teaching & LBC



7.1. International Teaching Reputation Policy: University of Bath UK

University of Bath, UK is ranked 11th in the world in the 'QS top 50 universities under 50'. University of Bath Learning and Teaching Strategy from 2011-12 to 2013-14 is follows.

- Promote critical intellectual enquiry and independent academically rigorous learning in a supportive educational environment
- Sustain and advance the international recognition of the University for the Quality of teaching.
- Provide our students with direct experience of leading edge of research in their discipline or field and to develop their research and technical skills
- Promote the application of knowledge and skills such that the students should be capable of making significant contributions as employees and citizens
- Give our students opportunities to learn through internships and placements in a wide variety of different settings in the UK and internationally
- Promote flexible learning provision in order to respond to student diversity and, at postgraduate level, to the needs of practicing professionals
- Challenge and support the students in helping them achieve their full potential
- Work with the students in building and developing our learning environment to make it as stimulating, relevant and satisfying as possible
- Ensure that the graduates will be capable of making useful contributions in a global intellectual and economic environment
- Support and reward excellence in teaching in order to build the reputation of the University and its staff
- Work with regional partners to widen participation, encourage social mobility and provide options for progression into, and through, higher education
- Develop a portfolio of continuing professional education to meet the needs of employers and individuals [152]

7.2. Institutional Teaching and Learning Strategy 2010-15: University College London (UCL)

The Institutional Teaching and Learning Strategy 2010-15 of University College London (UCL) (4^{th} Top Ranking World Class University as per QS World University Ranking 2013) is as follows: [49]

- Deliver an internationalized curriculum across all disciplines
- Design and deliver programmes which foster entrepreneurship, teamwork and leadership skills, with an eye to preparation for future employment
- Explore the use of innovative learning and teaching environments, including digital spaces and London as an extension of the UCL campus
- Harness the potential of new methodologies and tools for learning, including object-based learning and undergraduate research activity
- Use its discipline breadth to encourage innovation in course content through increased multidisciplinary and interdisciplinary collaboration

- Prepare students for the global employment market through an emphasis on language skills and communication, by promoting study abroad to all students and by prioritizing careers guidance
- Encourage students to recognize the potential for learning in a range of contexts, including through extra-curricular activity, employment and volunteering, and to develop the skills they will need to continue as learners far beyond their time at UCL.
- The ILTS commits UCL to exploring innovative ways of realizing its ambitions for the student experience, including through the introduction of short courses delivered during the post-examinations period, the introduction of a new interdisciplinary degree 'the Bachelor of Arts and Sciences', and the establishment of a Steering Group for Innovations in Teaching
- UCL will also prioritize improvements in areas which are of particular importance to students' perceptions of the quality of their teaching, such as assessment and academic feedback. This extends to providing outstanding pastoral support for all, particularly first-year students and those who join UCL from overseas
- Teaching is fundamental to the success of a university, yet its contribution is often understated and undervalued. UCL will work to raise the profile of teaching excellence across the university, and, in particular, to ensure that outstanding achievement is appropriately recognized and rewarded. UCL will support cross-fertilization of teaching practices across disciplines, and provide staff with opportunities to make development of their teaching skills relevant to their academic ambitions more generally. It will also explore ways of supporting professional development in teaching which take account of the considerable pressures on academic staff time
- Create a virtual online resource for teaching and learning which will include comprehensive resources for CPD [153]

7.3. European Commission Report

Report to the European Commission on "Improving the quality of teaching and learning in Europe's higher education institutions" (June 2013) stated that "One major change in recent decades is the massive internationalization and even globalization of science, economics and politics. This development is likely to continue, accelerate and expand into ever more sectors of our public and private life – predominantly in the labor market – driven not only by the exponential growth of world trade, global capital investment and human mobility, but even more so by new media. This development will not only impact on the content of traditional subjects ('the international dimension') **but also change the ways of delivery and reception**. Any serious discussion about teaching and learning within the perspective of lengthening lifespans – most of Europe's students today will live to see the year 2080 – has to deal with the impact of globalization on education, including higher education". [351]

In short, **global competitiveness** and **global cooperativeness** are **core aims for teaching and learning** which aim to equip students for peaceful and healthy lives in the 21st century. For our higher education institutions, that means that 'Internationalization' – which has long been seen as a 'luxury add-on' – must move into the very centre of the university or college strategy and development. At the same time, the definition of 'internationalization' which has often been

limited to the recruitment of international students, **must be extended into a new holistic approach, where its impact on the overall quality of programmes and graduates is reflected in the globally interconnected and intercultural learning outcomes**. In practice, this means

- Student and staff mobility (incoming and outgoing)
- The international dimension of curricula
- The internationalization of the campus
- A positive and efficient approach to foreign language learning
- Transnational delivery of courses and degrees (offshore branches, distance education, MOOCs), international networks
- Alliances and partnerships and so forth.

This should be put together to form an explicit 'Internationalization Strategy' of universities and colleges, which in turn, must be an integral part of the overall mission and strategy of the individual higher education institution. [351]

In this report there are 16 recommendations. The 4th recommendation is quite relevant for Indian HE sector. It stated that "All staff teaching in higher education institutions in 2020 should have received certified pedagogical training. Continuous professional education as teachers should become a requirement for teachers in the higher education sector". [351]


REPORT TO THE EUROPEAN COMMISSION on
Improving the quality of teaching and learning in Europe's higher education institutions

6. Checklist: lead questions for quality teaching and learning

Questions for institutional leaders and managers

Teaching and learning as part of the institutional profile

> What strategies or benchmarks do I use for enhancing the quality of teaching in my institution? How do I incorporate these into my institution's profile and mission, to make it clear to staff and students that my institution is affirming the importance of teaching and developing its quality?

Support to teaching staff

> What steps do I take to ensure that an individual teacher feels empowered and supported in developing their teaching skills and making the most of new modes of teaching and

Fig. 7.1: Report to the European Commission 2013: Checklist: Lead question for quality teaching and learning [351]

7.4. University of Melbourne: Teaching International Students

Classroom teaching is not an easy task. After few years of experience every teacher thinks that he understood the magic of teaching. Let's see the complexities of teaching international students.

While teaching international students with diverse background the different teaching strategies are needed, which includes the language and cultural issues as well as practical suggestions. Many of these students are originally from countries where English may be spoken as a second or third language, or where English is only learnt as a foreign language in school. Thus after joining the foreign university the international students may suffer from problems like [154] [155]

- Stereotype learning
- A presumed reluctance to talk in class
- A preference for rote learning and
- An apparent lack of critical thinking skills

Thus they may not acquire the desirable qualities for succeeding in higher education. To avoid this problem the more attention is needed on issues like:

1. Internationalizing the curriculum
2. Teaching and Learning
3. Assessment
4. Encouraging participation in small group work
5. Preparation for small group discussion
6. Encouraging contributions in class
7. Adopting an educative approach to plagiarism
8. Supporting students in developing critical thinking skills
9. Explaining assessment expectations [154] [155]

7.4.1. Internationalizing the Curriculum

In the content of the syllabus, the Topics and resources with a more international flavor may be selected. [154]

When designing course materials do you:

- Consider the diversity of student backgrounds? (e.g. culture, disability and gender)
- Include opportunities for a positive engagement with other cultures and practices?
- Include text and materials that reflect diversity of perspective and experience?
- Endeavor to have your materials available before the commencement of classes?
- Plan to communicate your subject content using a variety of complementary media? (ie text, audio, web resources and video)

Does your material:

- Acknowledge and value the diversity of knowledge and experience of the students?
- Encourage students to recognize different ways of learning/knowing?
- Examine the implications of diversity as part of the theory or practice being studied?
- Ensure "assumed knowledge" is made explicit in the stated pre-requisites of the course?
- Include culturally diverse and inclusive visual images? (if relevant) [155]

7.4.2. Teaching and Learning

Consideration needs to be given to how the content will be taught to enhance learning for students

Have you:
- Provided equitable opportunities for all students to communicate in the classroom?
- Modeled inclusive approaches as to how you communicate with students in classroom?

Do you:
- Use plain English? Avoid jargon, slang and culturally specific jokes and anecdotes.
- Avoid cultural stereotyping and use intercultural examples/case studies where possible?
- Use inclusive communication practices? (e.g. repeating questions made by students to the rest of the class, speaking only when facing the class and verbalizing textual information)
- Provide paraphrases and glossaries for essential technical terms?
- Encourage students to use their backgrounds as a learning tool? How do you build on student diversity as an educational resource?
- Actively discourage racist, sexist and cultural inappropriate discourse and language?
- Provide adequate warning/practice time if you want students to present in the class?
- Talk about everybody's difference while discussing diversity? [156]

Understanding lecture content can be difficult for international students. Listening is an active rather than a passive skill, especially for the second language learner. They are processing the words, attempting to understand the main ideas presented and drawing on what they already know to make sense of the material presented in the lecture, in their second language. This is especially true for first year undergraduate and postgraduate international students, who are developing their English language skills and learning in a western university environment. There are strategies that can be used in the design and delivery of the lecture that can assist in making the conventional lecture more accessible for international students: [154]

- Outline the main points of the lecture and make links to other topics covered in the subject or material to be covered in tutorials. Highlight key questions or issues that will be addressed during the lecture. Concept maps are useful as they offer a visual representation of the content and how it relates to other areas in the course.
- Provide a lecture outline with the main points to be covered to assist students to follow the lecture and guide their note taking. This can be put on the web for students to download and supplement the PowerPoint slides that are usually available to students.
- Explain any relevant background information that may assist students in understanding key concepts.
- Define any new or unfamiliar words or concepts, and provide opportunities for clarification.
- If slang, jargon and culturally specific humor are used in the lecture, explain the meaning for students who may not understand it. This is important with first year students, although by third year this should be less of an issue.
- Summarize the important information at certain stages in the lecture.
- Use international examples or case studies where possible.

- Record the lectures using i-lecture, so that international students can listen to them again. This will assist students to clarify points that they may have not understood due to English being their second or third language.
- Conclude the lecture by summarizing the main points and highlighting ‘take home’ messages. [154]

7.4.3. Assessment

Do you:

- Explicitly communicate the subject’s academic requirements in a timely, consistent way and provide models of good and bad assessment?
- Make clear the subject content under assessment, the criteria by which students can demonstrate the subject objectives and how it will be assessed? (eg. previewing new topics in the context of other parts of the subject or summarizing the topic’s main points)
- Communicate your willingness to provide flexibility in assessment for reasons such as illness or religious commitments and outline the process students need to follow?
- Decode assignments early and provide explicit guidance about expected format?
- Ensure exam materials are in plain English and are free of culturally biased examples?
- Ensure that the range of teaching and assessment methods employed actually cater for the diversity of learning styles among students in the cohort?
- Communicate the relative marks that grammar and vocabulary will have in an assignment compared to the content and structure of the argument?
- Incremental tasks and provide reflective feedback so that students can develop a foundation on which to build skills and knowledge? [155]

7.4.4. Encouraging Participation in Small Group Work

It has been widely observed that international students may appear hesitant in contributing to group discussions. This is not necessarily because this is their preferred learning style. International students often report that they would like to participate but lack the confidence to do so. This could be in part due to their lack of familiarity with how to contribute to an academic discussion or their perceived lack of English language skills. Contributing to discussions can be seen as a risky undertaking if the students are not comfortable with their English language ability or are unfamiliar with the cultural conventions for ‘breaking into’ the conversation. Academics may need to create ‘safe’ learning environments where students feel that they can make a contribution. Creating opportunities for participation in class where students feel supported can be achieved by incorporating some of the following strategies:

- Use appropriate information/tools to gather information about the cultural composition of your class? (e.g. prior learning, languages spoken, preferred learning styles)
- Use icebreakers such as small-group activities to help students get to know you and each other.
- Create an environment which facilitates student interaction (e.g. a quiz or re-arrange furniture)
- Use random rather than self-selection techniques for group work to ensure that students work across cultural boundaries and are not isolated.
- Communicate a process for students to address any problems arising in group work activity.

- Communicate the process by which students can seek advice, support or guidance for any language or other difficulties arising through the course of their studies. [155]

7.4.5. Preparation for Small Group Discussion

- As second language learners of English, students need to be given adequate time to prepare responses. One strategy that can be used is to ask students to prepare some responses for the next tutorial or seminar. Set key questions with the reading material so that students can prepare their answer before the class. This will give them greater confidence in contributing to any discussion.
- It is important to make expectations about student participation clear to international students. As we know, this is an effective strategy for all students, but it is particularly useful for international students because research indicates that they are often not aware of what participation in class actually means in an Australian tertiary context. Making academic expectations clear can help to clarify this to students.
- Create a teaching atmosphere early in the semester in which students interact with each other. This allows the opportunity for international and domestic students to talk and get to know each other. [154]

7.4.6. Encouraging Contributions in Class

- We know that one way of increasing participation is to memorize students' names and invite them to speak. This can be a successful strategy if the lecturer has already established a 'safe environment' and if the international students feel that the group values their contributions.
- Ask international students how the issue would be considered from their experiences, keeping in mind that they do not represent the views of their culture or country.
- Briefly summarize the discussion from time to time, highlighting the key points, so that the students can follow the discussion.
- Pose questions or issues that students can discuss in pairs and then report back to the class.
- Remember to wait before moving on to another student, as it can take time for international students to understand the question, consider their response and communicate that in English.
- Structure group tasks so that international and domestic students are grouped together. Assign roles for each member of the small group, including discussion leader, timekeeper, note-taker, and person to report back. This allows everyone to have a role in the group.
- As is acknowledged in strategies for effective small group teaching, quizzes and pair work encourage interaction among students.
- Organizing group activities so that diversity of experience and knowledge are necessary for successfully completing the task.
- Where possible, develop tasks that increase opportunities for domestic and international students to interact. [154]

7.4.7. Adopting an Educative Approach to Plagiarism

Misunderstandings about plagiarism can occur for international students because of cultural and language issues. Students need to know what constitutes plagiarism. For international students, plagiarism can be an intercultural issue. They may come from cultures where writing involved repeating the collective wisdom and there is little need to acknowledge the source of information. Plagiarism can also be an English language ability issue. While international students may be aware of what plagiarism is, they may lack the English language skills required to read information, extract the relevant points and then put it into their own words, so that they can avoid plagiarizing.

- Highlight the reasons why referencing is used in your discipline and give students examples of correct referencing styles.
- Discuss issues concerning plagiarism with the students. Contact the Language and Learning Skills Unit or teaching and learning units within your faculty for expert support in this area.
- Model the use of referencing within your lectures and tutes.
- In the discussion of readings, highlight certain sections where the author has synthesized the main ideas and referenced them.
- Use examples of previous assignments to demonstrate how ideas can be presented and sources referenced.
- Develop tasks that ask students to evaluate and analyses ideas they have read, so that the focus is more on critiquing the readings rather than comprehension. [154]

7.4.8. Supporting Students in Developing Critical Thinking Skills

It is often suggested that students from Confucian heritage cultures find it difficult to think critically. However, like most stereotypes, this is unlikely to be true. Research has found that students from CHC are capable of high-level critical thinking. It is not the international students' cognitive skills that are in question but their English language ability that influences their reading, understanding, interpretation and evaluation of the material that is demonstrated in either written or oral expression. As we know, developing critical thinking skills is equally challenging for domestic students.

Teaching critical thinking skills can be useful in assisting students to develop learning strategies to avoid plagiarism. Classroom activities that model critical thinking skills in our discussions create learning opportunities for students to develop their skills and offer feedback can guide students' development of critical thinking skills. These may include:

- Explain and demonstrate what critical thinking skills are required in your disciplinary area. Different disciplines define it in slightly different ways.
- Clearly the reading process can be difficult for students who have English as a second language. It may be useful to highlight the importance of the reading material to the content of the course. This will assist students to access the main ideas presented in the text.
- When setting required reading, offer questions for students to guide their reading of the text. Stage the questions to include literal meaning (describe, define, explain), interpretive meaning (analyze, test, calculate, apply, demonstrate) and applied meaning (evaluate, compare assess).

This will help the students to think beyond the literal understanding and develop their skills as strategic and critical readers.

- Develop students' critical thinking skills through classroom discussions. Questions such as "In what situations would this work?" "Can you think of any situation in which this would not apply?" "How does this relate to other theories/concepts we have discussed?" can be used as prompts for students to present different points of view. [154]

7.4.9. Explaining Assessment Expectations

Assessment may be one of the most important areas in which international students need to be given guidance. As international students bring different educational experiences, we may need to highlight what we will be valuing in the assessment process. This requires explaining the assessment criteria and our expectations, as well as offering constructive feedback to students. Feedback is especially important to international students as it can offer them some direction on how they can improve their performance. [154]

7.4.9.1. Assessment criteria

- Explain in detail the purpose of the assessment and the subject content that will be assessed. Give students a copy of the assessment criteria and explain how marks will be allocated. This gives students a clearer understanding of what is required and clarifies expectations.
- If English language is being assessed, indicate in the criteria that aspects of English language will be assessed and the marks allocated for this.
- Outline the requirements of the exam and model the type of responses required. [154]

7.4.9.2. Assessment and learning

- Where possible try to vary the type of assessment tasks used, to cater for different learning styles. Assessment tasks early in the semester can help to identify students who may need extra support with their English writing.
- Involve the Language and Learning Skills Unit (LLSU) in your classes. Staff from the LLSU can assist in addressing the language learning issues for students in your classes.
- Plan learning activities that prepare the students for the assessment tasks. This is useful for all students and for increasing understanding of the requirements of the assessment for the subject. It also allows opportunities for group feedback. [154]

7.4.9.3. Feedback

- Try to avoid feedback such as "this is not logical" or "this is confusing", as these comments do not offer students advice on how they can improve. If the paper does not "flow logically" then offer a few brief suggestions to the students as to how they achieve this and direct them to the support services available at the university, such as the Language and Learning Skills Unit.

- Offer oral feedback to students in class after assignments have been returned, focusing on the main issues that arose from the assessment and identifying what students can do to improve their performance in the subsequent assessment for the subject. [154]

7.5. U.S. Department of Education: Teaching-Learning Powered by Technology

The U.S. Department of Education Learning has launched the National Educational Technology Plan (NETP) 2010 namely "Transforming American Education: Powered by Technology". Attracting global talent (Faculty and Students) is not sufficient for developing international teaching reputation. Like USA, we will have to adopt new technologies to enhance the teaching learning processes. [157]

More detailed information on "How technologies are involved for enhancing teaching learning processes" is covered in Chapters 1 to 9 (pages 1 to 198) in my book "Technology-Storms Redefining World Class Universities".

7.6. Conflicting Attributes

The quality of education, or of teaching and learning, is notoriously difficult to assess. While there has been discussion of the development of national and international measures of the 'value added' by educational institutions, the problem of assessing educational outputs has remained essentially unresolved. Let's see some of the conflicting attributes: [117]

- In some cases students' satisfaction with their education is used as a proxy for the quality of the education provided, but clearly this too is problematic.
- Class sizes can be measured, for example, and, Taylor and Braddock argue, they 'give at least some indication of teaching quality'.
- Both student/staff ratios and library holdings specifically become 'less useful with technological change'. Using library borrowings or holdings becomes problematic with increasing numbers of texts now being available electronically
- Student/staff ratios and class sizes are often used as one indicator of quality education – though this gives no indication of what actually goes on inside or outside the classroom. In comparing large classes with smaller classes it is the issue of interaction – between teachers and students, and between students and students – which is crucial and which is generally considered to be more likely to occur in a small class and less likely in a larger class. The chances for extensive student/staff interaction are greater in smaller classes but having smaller classes does not guarantee that quality teaching and learning will take place.
- The 'resources devoted to teaching and research training' would 'probably be the best input measure' but it would require 'some standardization of budgets to make it operational'.
- The output measures such as progression of undergraduates to postgraduate study and the placement of PhD graduates have merits as indicators of international academic standing, these are only useful if they satisfy statistical standards in design and responses. The quality of

graduates will be reflected in their development over several decades, but this reveals little about the current quality of teaching. [117]

7.7. Few Important References

A number of activities are being undertaken around the world attempting to produce reliable measures of educational and specifically teaching quality, including student evaluation of courses and graduate destinations, and measures of student engagement. These include the following:

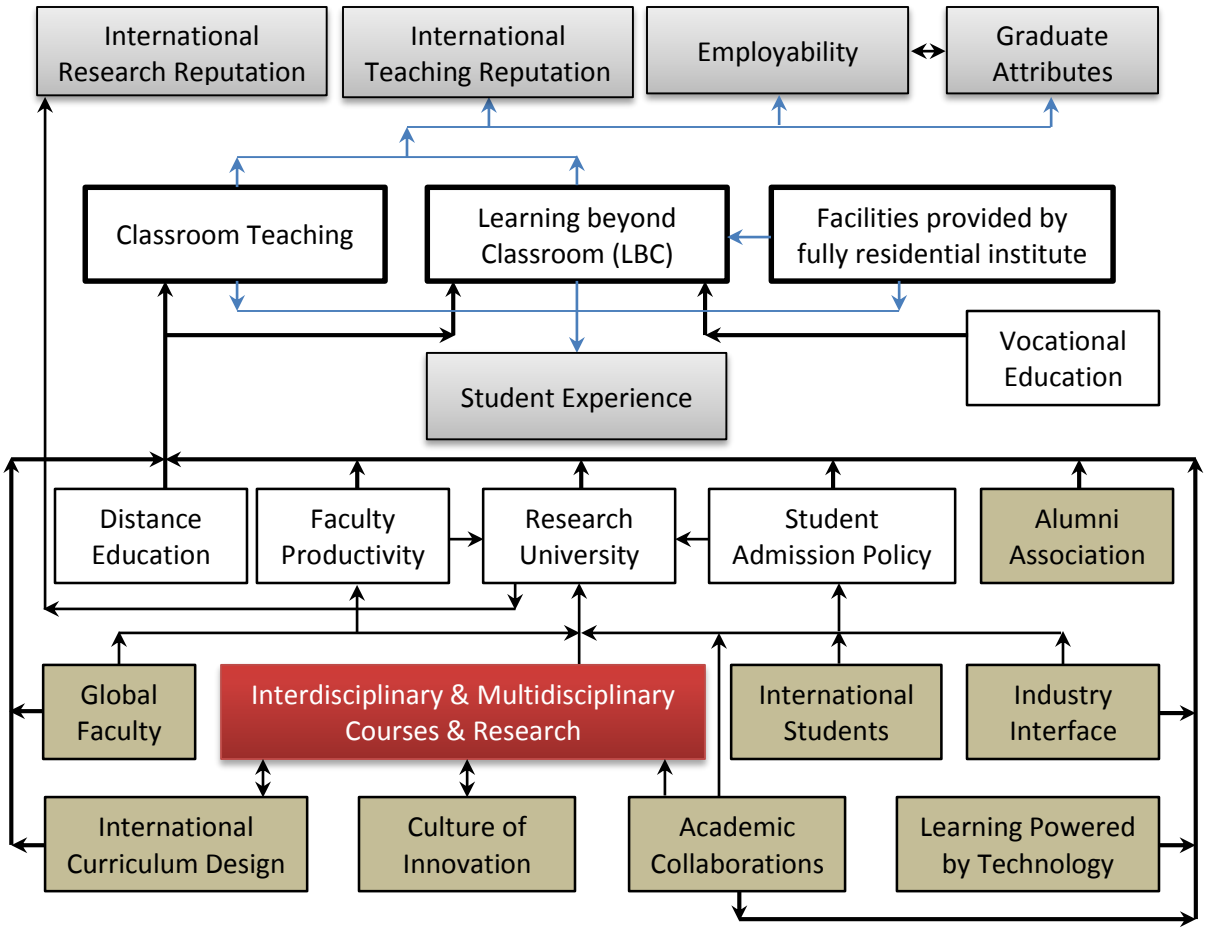
- The OECD Education Directorate's Assessment of Higher Education Learning Outcomes project (AHERO) (i.e. "PISA for universities")
- The Carrick Institute's Teaching Quality Indicators (TQI) project
- The Learning and Teaching Performance Fund (LTPF), which makes use of
    - The Course Experience Questionnaire (CEQ)
    - the Graduate Destination Survey (GDS)
- The Higher Education Funding Council for England's National Student Survey
- The US National Survey of Student Engagement (NSSE)
- The Australasian Survey of Student Engagement (AUSSE)
- University of California Undergraduate Experience Survey (UCUES) [117]

This topic is beyond the scope of this book and thus briefly covered.

Chapter 8: Interdisciplinary and Multidisciplinary Culture: Way to Develop Research University

Most of the Indian Universities and Institutes are having UG and PG courses in many disciplines (Disjoint Multiple Disciplines or Uni-Disciplines). It doesn't mean that they are having Multidisciplinary courses. Only very few Indian Universities are having Multidisciplinary Courses. Many Universities are following multidisciplinary approach in few research areas and for selected elective subjects in UG / PG courses (not multidisciplinary approach for entire course).

The head of the Scientific Advisory Council to the Prime Minister, C.N.R. Rao, who was recently conferred the Bharat Ratna, said that "First, you have to be able to think in an interdisciplinary way, approach a problem in an interdisciplinary way. I am an interdisciplinary scientist. I am for instance working now on a major paper that deals with physics. Yes, for years disciplines were kept apart. But fortunately today most subjects are themselves becoming interdisciplinary. The frontiers of biology now deal with physics and computational science. Some of the greatest works in medical science today borrow from chemical engineering and nanotechnology. If India has to make it to the cutting edge of science, it will have to embrace an interdisciplinary approach." [158]



8.1. World Class Higher Education System

The Interdisciplinary University is the intermediate step for developing Research University from Disjoint Multiple Disciplinary or Unidisciplinary University.

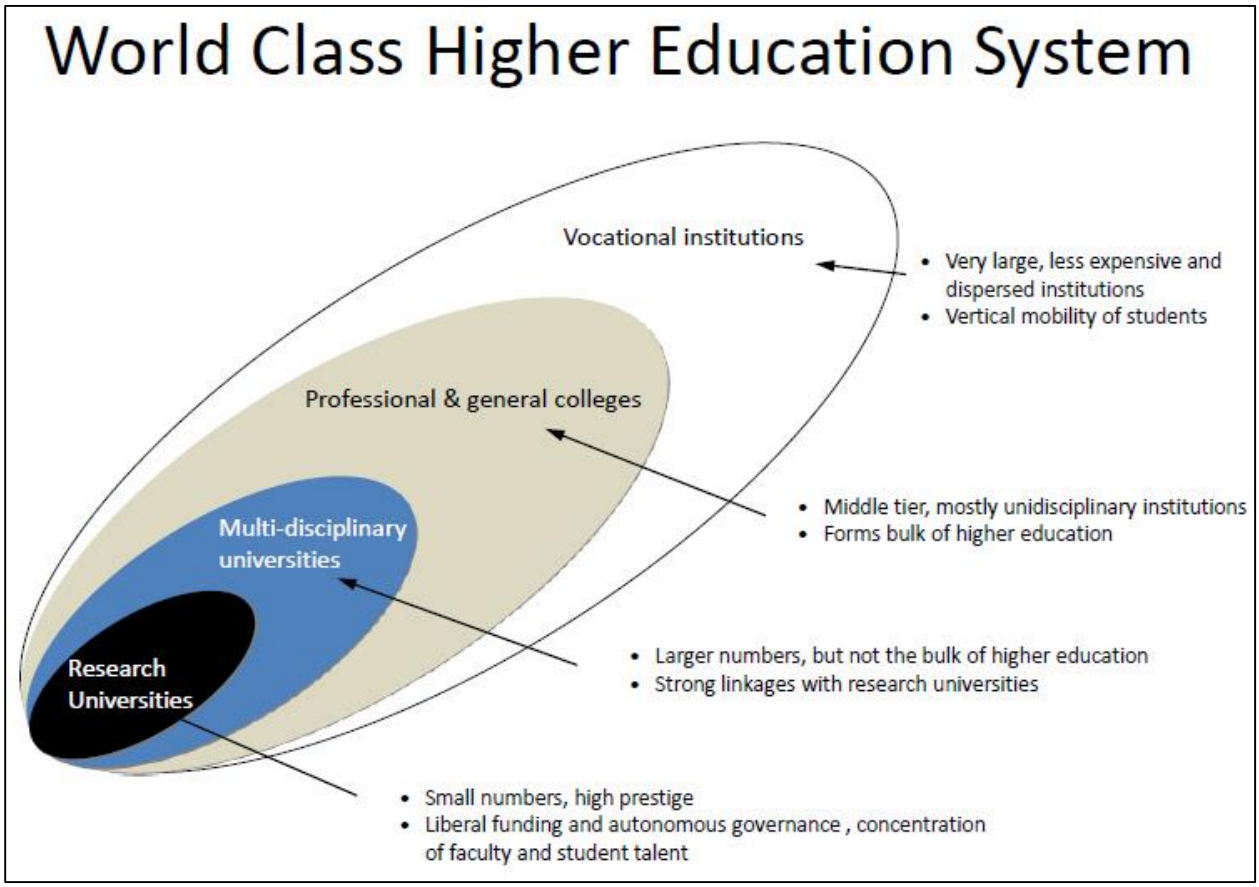


Fig. 8.1: World Class Higher Education System Presentation by Pawan Agrawal, Planning Commission [159]

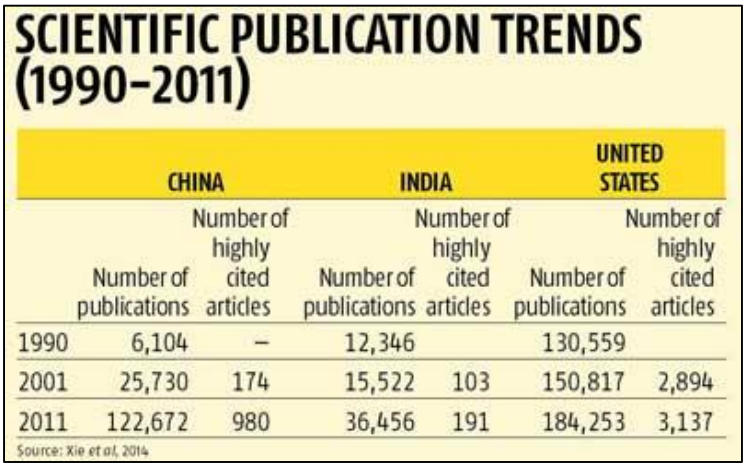
Report to the European Commission on "Improving the quality of teaching and learning in Europe's higher education institutions" (June 2013) stated that (Recommendation 10) "Higher education institutions should **introduce and promote cross-, trans- and interdisciplinary approaches to teaching, learning and assessment**, helping students develop their breadth of understanding and entrepreneurial and innovative mind-sets". [351]

8.2. Research Trends

In 21st century, the industry needs the manpower to identify and solve the highly interdisciplinary real world complex problems. To solve such problems they need a team of experts with diverse educational backgrounds across the globe. They expect that the student should have the experience

of working with such diverse teams (i.e. global employability) and the university should provide such training, teaching-learning mechanisms, pedagogy, educational atmosphere, academic culture etc.

The research trends of India, China and USA shown in following figure. It shows that **something terribly went wrong with our university system**. I had discussed many issues in my books "Strategy to Develop World Class University" and "113 Difficulties in Developing World Class Universities". I feel that, apart from all other major reasons, the multidisciplinary and interdisciplinary culture is one of the major issue, which needs to be addressed by university governing mechanism, if Indians are interested to develop research universities.



SCIENTIFIC PUBLICATION TRENDS (1990–2011)

	CHINA		INDIA		UNITED STATES	
	Number of publications	Number of highly cited articles	Number of publications	Number of highly cited articles	Number of publications	Number of highly cited articles
1990	6,104	–	12,346		130,559	
2001	25,730	174	15,522	103	150,817	2,894
2011	122,672	980	36,456	191	184,253	3,137

Source: Xie *et al*, 2014

Fig. 8.2: Scientific Publication trends from 1990 to 2011 of China, India and USA [160]

The way to "Research University" from "Multiple-Discipline University" pass through "Interdisciplinary and Multidisciplinary University".

8.3. Multidisciplinary, Interdisciplinary and Trans-disciplinary Culture

Most of the times **multidisciplinary** and **interdisciplinary** terms are used **interchangeably** but **they are different**. In many Indian Universities there are many of disciplines. Such Universities can be called "Multiple Discipline Universities".

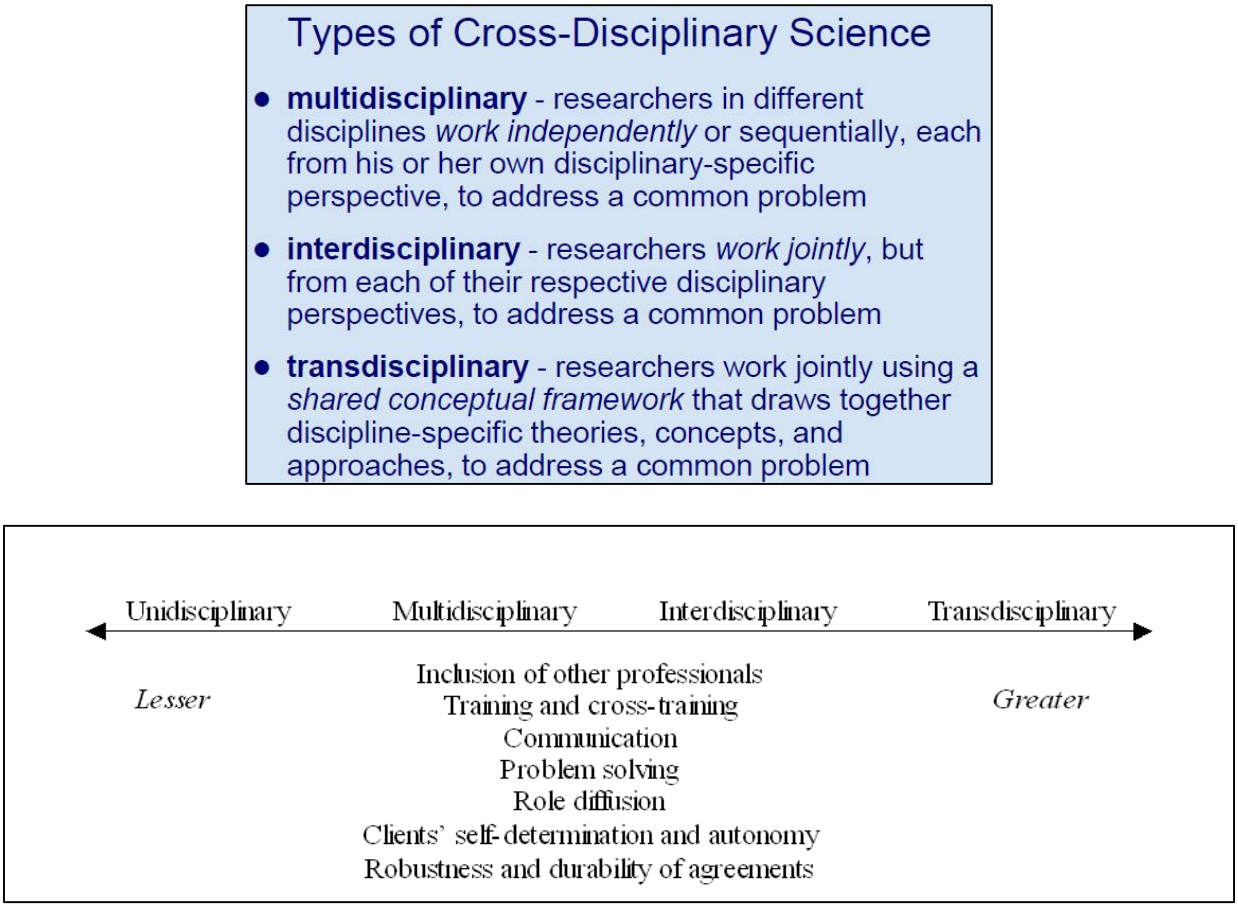
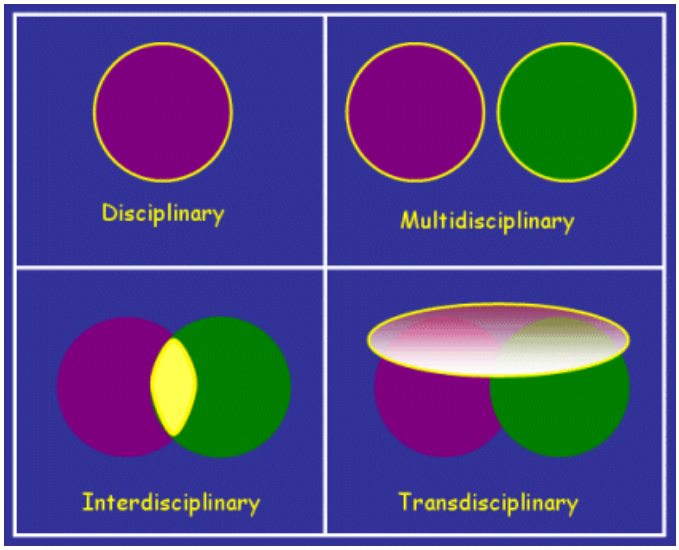


Fig. 8.3: Cross-Disciplinary Science [161] [162]



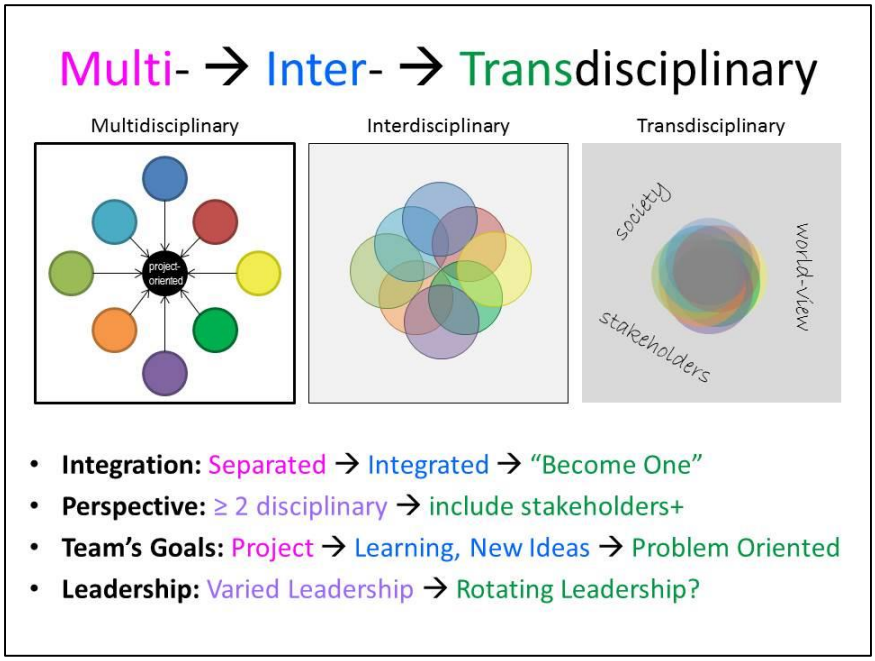


Fig. 8.4: Multidisciplinary, Interdisciplinary and Transdisciplinary [163] [164]

- **Disciplinary**: Epistemologies, assumptions, knowledge, skills, methods within the boundary of a discipline. e.g. Physics; History; Psychology
- **Multidisciplinary**: Using the knowledge/understanding of more than one discipline. The world has many different disciplines each of which attempts to explain "the same" phenomena from their respective disciplinary viewpoints. It is therefore important that students be made aware of this fact, so that they develop a rich, nuanced understanding of their own discipline in a broader context. e.g.
    - Physics and History;
    - Biology and Architecture
- **Interdisciplinary**: Using the epistemologies/methods of one discipline within another. Looking at "the same" issue/s from multiple disciplinary perspectives, in a way that tries to integrate or make holistic sense of the various explanations of "the same" phenomena that are generated from each of the disciplinary perspectives; an interdisciplinary perspective might be more than merely multi-disciplinary because of an attempt to think through the relations between the various disparate disciplines‟ explanations. e.g.
    - Biochemistry;
    - Ecophilosophy;
    - Astrophysics
- **Transdisciplinary**: Focus on an issue such as pollution or hunger both within and beyond discipline boundaries with the possibility of new perspectives. Drawing together the concepts, theories and approaches from different disciplines in a shared conceptual framework, a complete integration of the discipline perspectives e.g.
    - Molecular biology which combines chemistry / bio-chemistry with cellular biology to explain biological phenomena. [163] [165]

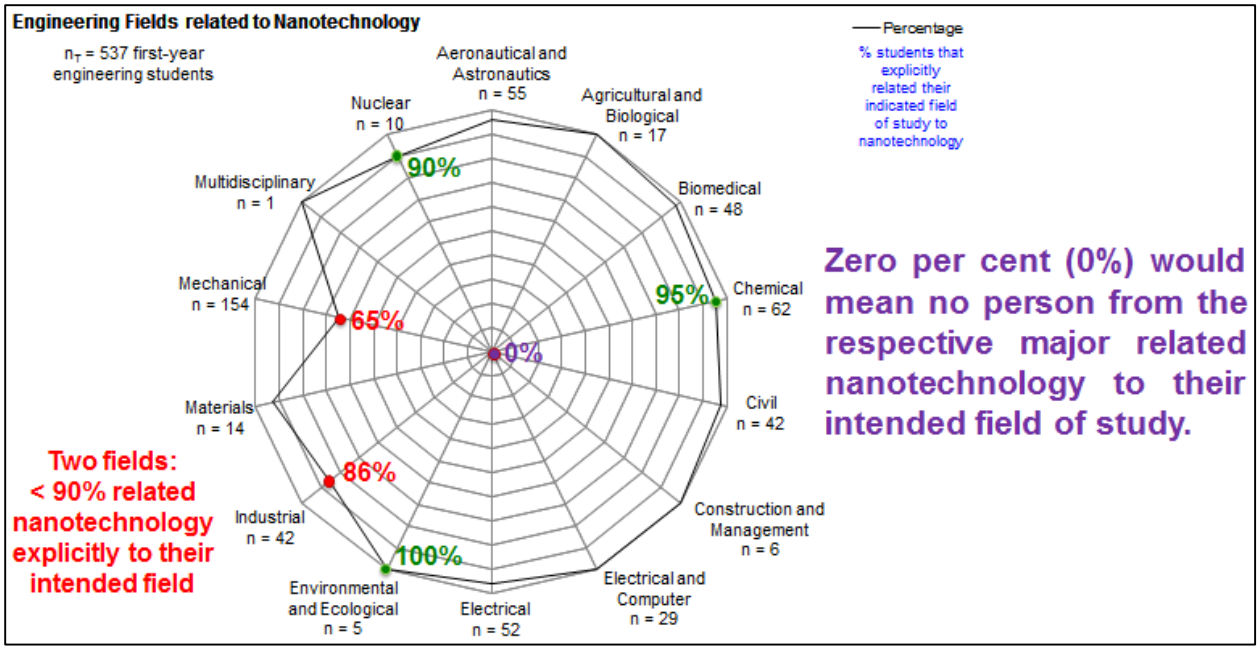


Fig. 8.5: Cross-disciplinary Nature of Nanotechnology: Engineering fields related to Nanotechnology [164]

Discovery increasingly requires the expertise of individuals with different perspectives – from different disciplines... working together to accommodate the extraordinary complexity of today's science and engineering challenges.

National Science Foundation Investing in America's Future. Strategic Plan FY 2006-2011 (NSF 06-48)

Interdisciplinary research can lead to major practical advances and most 'problem-oriented' research is interdisciplinary.

Research Working Group, Administrators

Many pressing problems requiring solution are interdisciplinary, so there is a mismatch between current disciplinary structure and the nature of inquiry.

Graduate Education Working Group, IGERT Principal Investigators

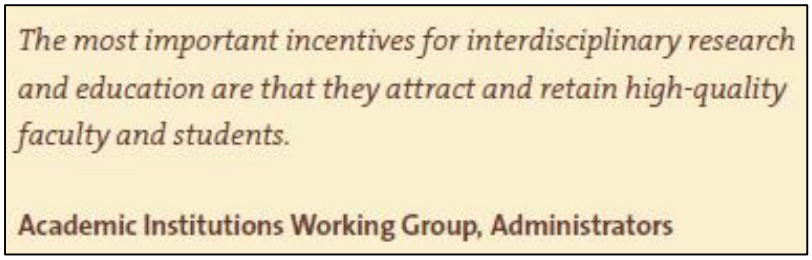


Fig 8.6: Recommendations for Advancing Interdisciplinary Research by NSF, USA [166]

The interdisciplinary and multidisciplinary **culture** can be developed through "interdisciplinary and multidisciplinary **Courses**" and "interdisciplinary and multidisciplinary **Research**".

Fig. 8.7: Interdisciplinary and Multidisciplinary Culture depend upon Research and Courses

8.3.1. Interdisciplinary and Multidisciplinary: Research

Interdisciplinary research was defined by the US National Academies, as "… a mode of research by teams or individuals that integrates information, data, techniques, tools, perspectives, concepts, and/or theories from two or more disciplines or bodies of specialized knowledge to advance fundamental understanding or to solve problems whose solutions are beyond the scope of a single discipline or area of research practice." [168]

Interdisciplinary research is an approach to advancing scientific knowledge, in which researchers from different disciplines work at the borders of those disciplines in order to address complex questions and problems. [167]

Interdisciplinary **research** is necessary to address problems whose solutions cannot be identified within a single discipline. However, while research projects often involve scientists from multiple disciplines, this does not necessarily mean that the research in the project is truly interdisciplinary. There is an important distinction between multidisciplinarity and interdisciplinarity. In interdisciplinary research, insights and methods from different scientific disciplines are integrated and used to investigate a jointly defined research problem through a joint research effort. By contrast, in multidisciplinary research, related research problems are investigated from different disciplines. The extent to which researchers from the different disciplines communicate with and draw inspiration from each other may differ, but there is no real integration of insights and methods from the participating disciplines. Another important difference between multidisciplinary and interdisciplinary research is their effect on the research fields they bring together. According to a report from the National Academies (2005), in multidisciplinary collaboration, researchers from different disciplines work on a common problem and split apart unchanged once their task has

been accomplished. Interdisciplinary collaboration, however, has the potential to forge new research fields or disciplines. [169]

Interdisciplinary **research** (IDR) is a mode of research by teams or individuals that combines information, techniques, tools, perspectives, concepts, or theories from two or more research traditions. Its purpose is to explore questions that are not confined to a single field of research. The increasing complexity of the relationship between nature and society has heightened the need for IDR. At the same time, the development of science and technology has resulted in new forms and practices of inquiry that continually change the disciplinary landscape of knowledge production. [170]

Although Interdisciplinary research is treated as a single entity, it comes in many different forms. Examples include

- A single researcher using ideas and methods from two or more disciplines
- A researcher and industry end-user partnering to invent a new commercial process
- A team of natural and social scientists collaborating with community groups and policy makers to tackle a complex social and environmental problem like sustainability. [168]

8.3.2. Interdisciplinary and Multidisciplinary: Courses

In an interdisciplinary **subject**, students explore and integrate multiple perspectives from different disciplines, sub-disciplines and areas of expertise. This is different from what might be called a multidisciplinary subject which juxtaposes multiple perspectives on the same topic without integration. Interdisciplinarity involves a synthesis or balance of multiple perspectives to produce such things as a deeper understanding or illumination, a balanced judgment, viable solution or a product that creatively accommodates the different perspectives. [171]

8.4. Need and Benefits of Interdisciplinary and Multidisciplinary Culture

8.4.1. Need

The wonderful article published by Times of India on 4th Aug 2013. I would like to highlight few points from this article: “For an India emerging from stagnation under the British; our per capita income grew by 0.1% per year between 1857 and 1947; the IITs created engineers who built power plants, dams, steel plants, roads, etc. and later became the supply chain for our IT industry and Corporate India (via the IIMs). But India's progress means that our challenge now is not only labor, capital or infrastructure. Further prosperity needs knowledge and intelligence to mate with imagination and innovation. Not more cooks in the kitchen but different recipes. New recipes are often at the intersection of disciplines, subjects and thought worlds; this means IITs must become multi-disciplinary universities with non-engineering schools…. Multi-disciplinary campuses are more vibrant, creative and effective at research and teaching…. No country can sustain greatness without great universities. No university can sustain greatness without research. And no research

is truly creative or impactful without being informed, influenced and shaped by multiple disciplines." [172]

The multidisciplinary and interdisciplinary universities is a complex issue, which paves the way towards vibrant research university.

8.4.2. Benefits

The Australian Council of Learned Academies (ACOLA) recognizes that there are considerable benefits in encouraging interdisciplinary research, particularly where the objective of the research is to achieve useful economic, social, environmental or cultural outcomes. The real world does not always present its problems and opportunities conveniently aligned with traditional academic disciplines so mechanisms are needed to facilitate interactions and collaborations between researchers working in widely different fields. [168]

It is now well-accepted that interdisciplinary research has three important, related roles. One is as a way to increase fundamental understanding. The second is as a source of innovation, which underpins productivity in the knowledge economy. The third is to help address complex real-world problems, such as how nations can achieve sustainability, contain health care spending or respond to organized crime. Of course, research in the disciplines also has these aims, but disciplines alone are more limited in what they can achieve. Interdisciplinary research builds on the strengths of the disciplines through diverse creative combinations of disciplinary knowledge. [168]

The Interdisciplinary research is "pluralistic in method and focus. It may be conducted by individuals or groups and may be driven by scientific curiosity or practical needs". The Interdisciplinary thinking is rapidly becoming an integral feature of research as a result of four powerful 'drivers':

- The inherent complexity of nature and society
- The desire to explore problems and questions that are not confined to a single discipline
- The need to solve societal problems
- The power of new technologies." [168]

More information can be found in the book "Meeting Standards through Integrated Curriculum" by Susan M. Drake and Rebecca C. Burns. [173]

For more details refer Chapter 6 (6.24) in my book "113 Difficulties in Developing World Class Universities" and "113 Difficulties in Developing World Class Universities".

8.5. Interdisciplinary Courses at World Renowned Universities

To get an idea, how multiple disciplines are involved to develop the Interdisciplinary Courses, I would like to quote few interesting case studies from World Renowned Universities.

8.5.1. Cardiff University, UK

Fig. 8.8: Cardiff University Interdisciplinary Masters courses [174]

- **Tissue Engineering (MSc):** This one year full-time course is mainly supported by the **Schools of Dentistry, Medicine and Biosciences through the Cardiff Institute of Tissue Engineering and Repair (CITER)**. Tissue engineering is an interdisciplinary field combining life and material sciences to progress the maintenance, repair and replacement of damaged / diseased tissue. The research area applies an understanding of normal tissue physiology to develop therapies including a cellular and cell-based treatment and novel biomaterials for clinical applications. Delivery of these advances requires research translation to patient products and services through commercial exploitation by the healthcare industry. [174]
- **Lean Operations (MSc):** This two year part-time course is supported by the **Cardiff Business School**. The MSc in Lean Operations at Cardiff is designed for practicing managers and consultants with aspirations to senior management level positions in leading operations-based organizations. Most students will come from operations functions, such as manufacturing management, industrial engineering, logistics or materials management. However, professionals from functions such as design, IT, HR, accounting or marketing would benefit greatly. [174]
- **Biophotonics (MSc):** This one year full-time course is supported by the **Schools of Physics and Biosciences**. The MSc in Biophotonics is the first course in the UK that has been designed to take biology and chemistry graduates to the forefront of field including optics, light spectroscopy and laser physics. The aim is to produce a generation of researchers that can develop and apply cutting edge optical techniques to fundamental questions in biosciences and medicine. [174]
- **Aging, Health and Disease (MSc / PgDip / PgCert):** This one year full-time course is supported by the **School of Medicine**. This course offers an opportunity for health and social care professionals to explore the complex health and social needs of older people living in today's society. The multidisciplinary programme is designed to meet some of the training requirements resulting from the recent changes in the NHS, including the Agenda for Change, the National Service Framework for Older People and the Higher Specialist Training Programme for Doctors. [174]

- **Sustainable Energy and Environment (MSc):** This one year full-time / two years part-time course is supported by the **Schools of Engineering and Architecture**. To ensure the sustainability of our planet, a cross-disciplinary, international, systems approach to developing solutions to these long-term problems is required. This will require graduates who are capable of thinking and working across traditional disciplines, and working effectively in multi-disciplinary project teams. Training such graduates is the primary aim of this new research-led and multi-disciplinary programme. The MSc provides a range of skills appropriate to these complex issues and allows graduates maximum flexibility in their future choice of professional employment. [174]
- **Bioinformatics / Genetic Epidemiology and Bioinformatics (MSc):** This one year full-time course is supported by the **School of Medicine**. Bioinformatics applies the principles of information sciences and technologies to make vast, diverse, and complex life sciences data more understandable and useful. It involves research, development or application of computational tools and approaches for expanding the use of biological, medical, behavioral or health data, including those to acquire, store, organize, archive, analyze, or visualize such data. Genetic epidemiology uses statistical methods to identify the locations of genes influencing risk of disease and quantifies the contribution of such genes to disease risk. [174]
- **Science, Media and Communication (MSc):** This is a one year full-time course based on an innovative collaboration between the **School of Social Sciences, the School of Journalism, Media and Cultural Studies and Techniquest**, an internationally renowned science discovery centre based in Cardiff. By drawing on teaching, research and practical expertise in Journalism and Media Studies, the Public Understanding of Science and Science Communication the course offers students a unique blend of the practical and theoretical skills needed to understand the relationships between science, society and the media. The course is particularly suitable for those interested in pursuing careers located at the interface of scientific knowledge and the public domain. This includes those working in political communication and parties, government agencies and bodies, statutory and voluntary organizations, museums, the mass media and other locations where skills in Science Communication are increasingly being recognized as important. [174]

8.5.2. Stanford University, USA

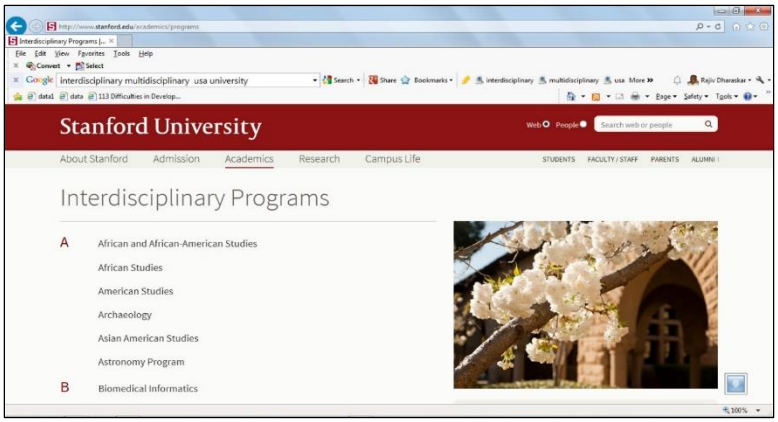


Fig. 8.9: Stanford University Interdisciplinary Programs

- **Archaeology Bachelor of Arts (B.A.):** Archaeology is the study of the past through its material remains that survive into the present. Archaeology is a discipline that offers direct access to the experiences of a wide range of people in numerous cultures across the globe. Increasingly, archaeology bridges past and present societies through the study of the human heritage and its role in contemporary societies. Stanford's Archaeology Program provides students with an interdisciplinary approach to the material remains of past societies, drawing in equal parts on the humanities, social sciences, and natural sciences. **The Archaeology curriculum draws on faculty from a wide range of University departments and schools.** To complete the requirements for the major, students must take courses from the offerings of the program and from the listings of other University departments. The program culminates in a Bachelor of Arts (B.A.) in Archaeology. [175]
- **Astronomy**: Research in Astronomy or Space Science is an ongoing activity in the Departments of **Physics, Aeronautics and Astronautics, Applied Physics, and Electrical Engineering, as well as at the W.W. Hansen Experimental Physics Laboratory (HEPL), Kavli Institute for Particle Astrophysics and Cosmology (KIPAC), and SLAC National Accelerator Laboratory (SLAC).** Degree programs are offered through the academic departments:
    - Physics (Ph.D., BS, or Minor in Astronomy)
    - Applied Physics (Ph.D. or MS)
    - Electrical Engineering (Ph.D., MS, Engr, or BS) [175]
- **Biomedical Informatics**
- **Biophysics**: The program centers on understanding biological function in terms of physical and chemical principles. The Program comprises faculty from 16 departments in the Schools of Humanities and Sciences, Medicine, Engineering, and the Stanford Synchrotron Radiation Laboratory. Research in the Program involves two overlapping branches of biophysics: the application of physical and chemical principles and methods to solving biological problems, and the development of new methods. Some of the departments involved in the Biophysics Program are
    - Applied Physics
    - Biochemistry
    - Biology
    - Radiology
    - Physics
    - Chemistry
    - Stanford Synchrotron Radiation Laboratory
    - Structural Biology [175]
- **Computational Mathematics**: Computational mathematics is at the heart of many engineering and science disciplines and has grown into a strong and very exciting interdisciplinary field of research. At Stanford, we've offered MS and PhD degrees in computational mathematics for over 30 years. For the last 10 years, ICME has been the central home of computational mathematics on campus. At ICME we conduct ground breaking research, train and advise our graduate students and provide over 40 courses in computational mathematics and scientific computing at both the undergraduate and graduate level to the Stanford community. We develop innovative computational and mathematical approaches for complex engineering and scientific problems. We attract talented PhD students from across the

globe. They are advised in research by over 45 faculty from **20 departments**, covering a wide variety of fields including

- Statistics and Data Science
- Control
- Optimization
- Numerical Analysis
- Applied Mathematics
- High-Performance Computing
- Earth Sciences
- Flow Physics
- Graphics
- Bioengineering
- Genomics
- Economics And Financial Mathematics
- Molecular Dynamics, and many more. [175]

- **Earth Systems**: The Earth Systems Program is an interdisciplinary environmental science major. Students learn about and independently investigate complex environmental problems caused by human activities in interaction with natural changes in the Earth system. Earth Systems majors become skilled in those areas of science, economics, and policy needed to tackle the globe's most pressing environmental problems, becoming part of a generation of scientists, professionals, and citizens who approach and solve problems in a new way: a systematic, interdisciplinary way. Earth Systems students take courses in the fundamentals of **biology, calculus, chemistry, geology, and physics, as well as economics and policy and statistics**. After completing breadth training, they concentrate on advanced work in one of five focus areas: biology, energy, environmental economics and policy, land systems, or oceanography. Tracks are designed to support focus and rigor but include flexibility for specialization. Examples of specialized focus have included (but are not limited to) the following: environment and human health, sustainable agriculture, energy economics, sustainable development, business and the environment, and marine policy. Along with formal course requirements, Earth Systems students complete a 9-unit (270-hour) internship. The internship provides a hands-on academic experience working on a supervised field, laboratory, government, or private sector project. [175]
- **Environment and Resources**: Stanford's Emmett Interdisciplinary Program in Environment and Resources (E-IPER) trains the next generation of interdisciplinary scholars and leaders to address the world's most challenging environmental and sustainability problems. E-IPER students combine academic disciplines, including **natural and earth sciences, engineering, economics, humanities, social sciences, law, health, policy, and business** to yield new insights and novel solutions to urgent global problems, such as energy use, climate change, food security, fresh water availability, depletion of ocean resources, land degradation, and biodiversity loss. E-IPER offers a PhD in Environment and Resources and, for students in Stanford's Graduate School of Business, Stanford Law School, and School of Medicine, a Joint MS in Environment and Resources in conjunction with their professional degree (MBA, JD, or MD). E-IPER's degrees are awarded by the School of Earth Sciences. [175]
- **Financial Mathematics**: This new track in the ICME M.S. Program will supersede, beginning in the fall quarter of 2014, the interdisciplinary M.S. Program (IDP) in Financial Mathematics in the School of Humanities & Sciences. The IDP has been offered by the Departments of

Mathematics and Statistics since 1999, in close cooperation with the Departments of Economics, Management Science & Engineering, and Finance in the Graduate School of Business. The Financial Math program provides a master's-level education in applied and computational mathematics, statistics, and financial applications. The program has been consistently ranked among the top tier of Financial Engineering/Mathematics programs in the U.S. Its interdisciplinary and collaborative nature has expanded from education to research, culminating in the establishment of the inter-school and inter-departmental Financial and Risk Modeling (FARM) Institute at Stanford in 2012. [175]

- **Human Biology**: The Program in Human Biology is an interschool, interdepartmental, undergraduate major. The program's mission is to provide an interdisciplinary approach to understanding the human being from **biological, behavioral, social, and cultural perspectives**. The curriculum provides a broad and rigorous introduction to the biological and behavioral sciences and their interrelationships, and explores how this knowledge, in conjunction with studies in other fields, can be applied to formulate and evaluate health, environmental, and other public policies that influence human welfare. Majors later pursue advanced training in professional or graduate programs, or work in diverse sectors. [175]
- **Human Computer Interaction Program**
- **Immunology**: Stanford Immunology is home to faculty, students, postdocs and staff who work together to produce internationally recognized research in many fields of immunology. The long tradition of collaboration among the immunology laboratories at Stanford fosters highly productive interdisciplinary research, with an emphasis on the application of molecular approaches to problems in cellular and clinical immunology. Faculty research interests include both bench-to-bedside approaches and basic science research. Graduate students and postdoctoral scholars receive outstanding training through their participation in research, teaching, seminars, journal clubs, and the annual Stanford Immunology Scientific Conference. Many members of our community are also affiliated with Stanford Institutes of Medicine. Stanford Immunology joined the Institute of Immunity, Transplantation and Infection in January 2011. [175]
- **Mathematical and Computational Science**: It is an interdepartmental undergraduate program designed for students interested in applying mathematical ideas and analysis to problems in the biological, computational, financial or management sciences. [175]

8.5.3. Purdue University, USA

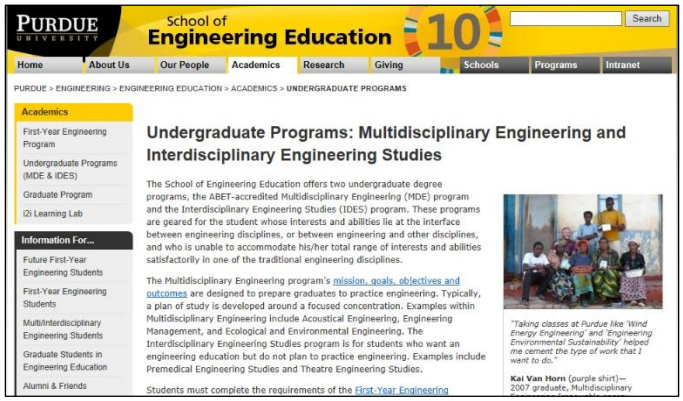


Fig. 8.10: Perdue University Interdisciplinary Engineering Education

8.5.4. Carnegie Mellon University

- **Arts Management**: The Master of Arts Management (MAM) program at Carnegie Mellon University is designed to create innovative leaders in the visual and performing arts. The program combines rigorous finance, marketing, technology and fundraising coursework with practical experience to prepare you to excel in a public, private or nonprofit arts environment. The MAM degree is offered through a joint partnership between the Heinz College's School of Public Policy & Management and the College of Fine Arts. Carnegie Mellon University's MAM program provides what other arts administration master's degrees cannot -- the solid foundation of quantitative management principles for which CMU is known globally. Students leave the University with the arts management and administration tools necessary to be innovative thought leaders and solve some of the most pressing economic and operational challenges currently facing arts organizations in the U.S. and internationally. [176]
- **The Master of Entertainment Industry Management (MEIM):** As traditional motion picture, television and video game businesses are merging into an integrated digital entertainment landscape, the MEIM program provides students with the most applicable skills to successfully learn development, production, marketing, distribution and exhibition practices across all entertainment platforms. The MEIM program is more than a film producing, TV producing or game development degree. It is a hands-on path to mastering the fundamentals of today's entertainment industry. At Carnegie Mellon's Pittsburgh campus, first-year students are provided a solid foundation through quantifiable business and financial management classes taught by Heinz College's world-renowned faculty. Moving to Los Angeles for the second year, students learn from top entertainment industry professionals at the MEIM Center, located within minutes of NBC/Universal, Warner Bros., Walt Disney Studios/ABC Television, CBS, and DreamWorks Animation. This second year is also a rigorous professional practicum, with students supplementing their full academic course load with 4 days per week in internships with top entertainment companies, including major studios, talent agencies, management firms, game publishers, marketing and distribution companies, broadcast and cable networks, and production companies. [176]

8.5.5. McGill University, Canada

- **Bioresource Engineering**: The Department offers M.Sc. and Ph.D. research programs in various areas of bioresource engineering including: plant and animal environments; ecological engineering (ecosystem modelling, design, management, and remediation); water resources management (hydrology, irrigation, drainage, water quality); agricultural machinery, mechatronics, and robotics; food engineering and bio-processing; post-harvest technology; waste management and protection of the environment; bio-energy; and artificial intelligence. The Department also offers a Graduate Certificate in Bioresource Engineering (Integrated Water Resources Management). The Department has well equipped laboratories for conducting research in all these areas. The interdisciplinary nature of bioresource engineering often requires candidates for higher degrees to work in association with, or attend courses given by, a number of other departments at both the McGill University Macdonald campus and the Downtown campus. [177]

- **Communication Sciences and Disorders**: The School provides both professional and research training in communication sciences and disorders at the graduate level through its M.Sc. (Applied), M.Sc., and Ph.D. degrees. We were the first department in Canada to provide both clinical and research degrees. Our M.Sc.A. program aims to educate the next generation of well-prepared and innovative speech-language pathology professionals by providing enriched classroom training, clinical laboratory activities that enhance the transition from theory to practice, and outstanding clinical practicum experiences. Our research degrees are designed to develop leading researchers and scholars, who will go on to train future investigators in the field of communication sciences and disorders and who, through their research, will advance our understanding of the processes of human communication and its breakdown. Interdisciplinary interactions are at the core of our research training approach, which includes preparation to conduct both fundamental and clinically applied investigations. Our professors have collaborative ties with many departments and institutes of McGill (**psychology, linguistics, neuroscience, otolaryngology, biomedical engineering, Montreal Neurological Institute and Hospital**) as well as other **Montreal universities**, and they maintain national and international collaborations. Students can access this rich collaborative network via the McGill Centre for Research on Brain, Language and Music, a world-class interdisciplinary research centre established and directed by the School. The multilingual context in which we reside provides a unique environment for language research. [177]
- **Neotropical Environment**: The McGill-STRI Neotropical Environment Option (NEO) is a research-based option for Masters or Ph.D. students in the departments of Biology, Geography, Natural Resource Sciences, Plant Science, Political Science, and Bioresource Engineering at McGill University. NEO is aimed at students who wish to focus their graduate research on environmental issues relevant to the Neotropics and Latin American countries. NEO favors interdisciplinary approaches to research and learning through the participation of researchers from McGill and from the STRI. Students will complete their research in Latin America and NEO's core and complementary courses will be taught in Panama. NEO's educational approach seeks to facilitate a broader understanding of tropical environmental issues and the development of skills relevant to working in the tropics. [177]

8.5.6. Boston University

- **Computational Neuroscience and Neural Technology**: The Center for Computational Neuroscience and Neural Technology (CompNet) is an interdisciplinary research center at Boston University that fosters collaborative research and education on mechanisms of neural computation and their applications. By providing administrative support, programs to stimulate scientific interaction, shared research and meeting space, and other infrastructure, CompNet brings together scientists from multiple fields in science and engineering and from all stages of training. [178]

8.5.7. University of Minnesota, USA

- **Health Informatics**: The Institute for Health Informatics (IHI) leads the inter-professional discovery, application, and teaching of health information science to improve the health of individuals and communities. The IHI, like the field of health informatics, is interdisciplinary.

As an integral component of the Academic Health Center (AHC), it includes informatics as it relates to the professions and practices of medicine, nursing, veterinary medicine, public health, dentistry, pharmacy, and the health sciences libraries, in addition to other University colleges, such as the Carlson School of Management and the College of Design. The IHI offers three graduate level degrees: Masters of Health Informatics, Masters of Science in Health Informatics, and the Doctor of Philosophy in Health Informatics. The graduate program maximize student's flexibility by offering courses online or in person. [179]

- **Microbiology, Immunology and Cancer Biology**: The Microbiology, Immunology and Cancer Biology (MICaB) Ph.D. Graduate Program provides training that emphasizes the interdisciplinary nature of biomedical and biological research, while providing opportunities for students to specialize in a specific research area of interest. [179]

8.5.8. Princeton University, USA

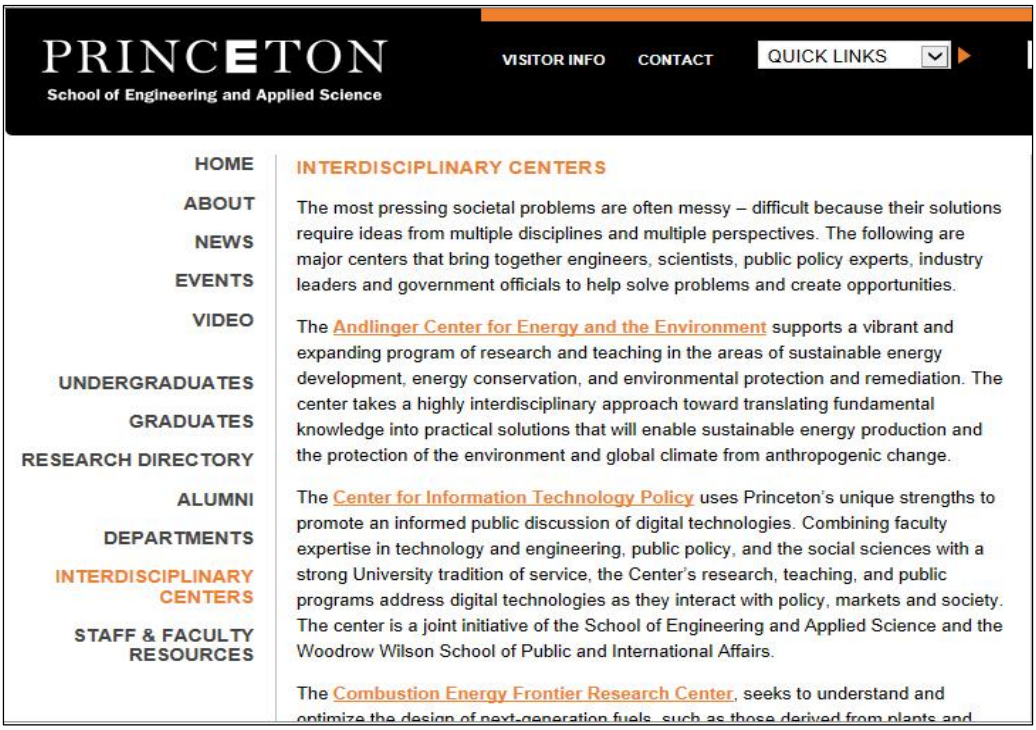


Fig. 8.11: Princeton University Interdisciplinary Centers

8.5.9. University of Nevada

- **Ecology, Evolution and Conservation Biology program**: It promotes doctoral education in theoretical, experimental and applied aspects of ecology, evolution and conservation biology. Research strengths include population biology, behavioral ecology, plant responses to climate change, conservation of endangered species and restoration of natural ecosystems, landscape ecology and biogeography and limnology. Two incoming EECB students (for Fall 2014) were recently awarded highly competitive NSF Graduate Research Fellowships. Of the nine NSF

Fellows that the University has had, seven of them have been in an interdisciplinary program, one in Social Psychology and six in EECB. [180]

8.6. Interdisciplinary Culture: Not Yet Fully Developed in India

Mostly, we have Universities with Multiple Disciplines. Very few Universities could take initiative to start multidisciplinary or interdisciplinary courses. After extensive search, I could find out very few examples.

8.6.1. Ashoka University, Haryana

The interdisciplinary programmes at Ashoka go beyond the traditional boundaries of disciplines and departments to give students an opportunity to combine multiple academic interests into a single degree programme. These are NOT double-degree programmes, but seek to combine closely related fields or explore new approaches to the study of particular fields to give students a single, interdisciplinary Bachelors' degree. Ashoka will begin by offering the following interdisciplinary programmes:

- Bachelor of Science in Economics and Finance
- Bachelor of Science in Computer Science and Entrepreneurship
- Bachelor of Arts in Politics, Philosophy and Economics
- Bachelor of Arts in Politics and Society
- Bachelor of Arts in English and Journalism
- Bachelor of Arts in History and International Relations [181]

8.6.2. Visvesvaraya Technological University, Bangalore

M.Tech. Nanotechnology: Nanotechnology is the engineering of functional systems at atomic or molecular level. It is rapidly progressing multidisciplinary subject, which is the result of interdisciplinary cooperation between **physics, chemistry, biotechnology, material sciences and engineering** towards studying assemblies of atoms and molecules. More than in other domains, the nanotechnology requires the integration of many scientific, engineering and technical disciplines and competences. Applications of nanotechnology will penetrate nearly all sectors and spheres of life (communication, health, labor, mobility, housing, relaxation, energy, food) and will be accompanied by changes in the social, economic, ethical and ecological spheres. The size dependent properties of Nano-materials and the ability to measure manipulate and organize material on the nanoscale may have significant implications on existing disciplines.

8.6.3. Manipal University

Mechatronics Engineering: The Department of Mechatronics Engineering started in 2012. The department offers a 4-year B.Tech course in Mechatronics Engineering with an integrated curriculum to provide a broad-based education in the basic principles of electrical, electronics,

mechanical, control, instrumentation and computer engineering. The course aims to produce students who can design and develop smart machines and use their multidisciplinary skills to meet growing demands of an industry. [182]

8.7. How to Develop Multidisciplinary and Interdisciplinary Culture

8.7.1. Steps and Problems Involved in Interdisciplinary and Multidisciplinary Research

The steps involved in Interdisciplinary and Multidisciplinary research are:

1. Pick a good problem
    a. Keep your eye on the big picture: read, listen and share ideas
    b. Know your own strengths and interests
    c. Identify a piece where you can make progress
2. Line up the resources you need
    a. People, expertise
    b. Background knowledge, through prerequisite courses
    c. Your thesis committee
    d. Equipment
    e. Data
    f. Funding
3. **Team Building and Learn how to work with a team**
    a. Identify your role in the project; expect to have both "secondary" and "primary" role
    b. Learn the jargon
    c. Help your team and document your contributions (e.g., organize the journal club; maintain a webpage)
    d. Have a back-up plan in case the team falls apart
4. Know where to publish
    a. Focus on quality
    b. Assess journal quality (journal impact factors)
    c. Learn practices around listing authors
    d. Learn how to craft your writing for the audience
    e. Be aware of differences in publication strategies: highly refereed CS conferences vs journals in other disciplines
5. Measure the impact
    a. Quality of collaborations and team work
    b. High quality publications
    c. Third party evaluation
    d. Evidence that others are using your work
    e. Citation counts
    f. Posters and talks [183]

In these steps the most challenging tasks are:

- Selection of team members (step: 2 (a))

- Interdisciplinary Funding (step: 2 (f))
- Team Building and Learn how to work with a team (step: 3)
- Evaluation of Interdisciplinary research
- Research Publication (step: 5 (b))

The **assumption** is sometimes made that **anyone can engage in interdisciplinary research** should they choose to do so, but it is clear from a considerable body of literature that successful interdisciplinary efforts **require mastery of specific competencies**. [167]

The **assumption** that simply bringing together a group of talented and skilled researchers who are enthusiastic about a given project is sufficient to deliver innovative research is **somewhat naive** and can often result in an experience which is **disappointing** for both the members of the team and the project's stakeholders. [184]

There are at least seven major barriers for interdisciplinary collaboration and integration, which are major hurdle for interdisciplinary team selection and management.

1. **Structural barriers** concern the organizational structure of science, including the mechanisms of pressure and incentives that are built into the organizations.
2. **Knowledge barriers** are constituted by the lack of familiarity that scientists often have with other disciplinary fields. Such lack is often a cause of misunderstanding and failed communication, and also contributes to an absence of visions of connections between the disciplines.
3. **Cultural barriers** are formed by differences in the cultural characteristics of different fields of enquiry, particularly the language that is used and the style of argumentation. The cultural category of barriers also includes differences in values.
4. **Epistemological barriers** or problems are caused by differences between fields in how they see the world and what they find to be interesting in it.
5. **Methodological barriers** arise when different styles of inquiry confront each other. These barriers are particularly difficult to overcome, because both assessment of competence and disciplinary identity is strongly tied to excellence in some particular way of doing a study.
6. **Psychological barriers** occur as a result of the intellectual and emotional investments that researchers have made in their own field and disciplinary community. Interdisciplinary work may require researchers to change both attitudes and identity, often without having the social support that is needed for such change. Also, the alertness to interdisciplinary opportunities varies among researchers. Such alertness can partly be learnt, but also results from individual experiences and personality.
7. **Reception barriers**, finally, emerge when the interdisciplinary research is communicated to an audience – e.g., evaluators, financiers and the general public – that does not understand, or want to see, the value of the interdisciplinary integration. [185]

8.7.2. Integration of Curriculum and Designing Interdisciplinary Tasks

Griffith University Australia has developed wonderful Toolkit namely "Graduate Attributes Interdisciplinary Perspective Toolkit" for developing Interdisciplinary culture. [165]

Following Table shows four possible levels of integration of multiple disciplines into curricular. These show varying degrees of explicit and formal commitment to Interdisciplinarity from incidental or accidental through to the intentional trans-disciplinary perspective.

Level	Description
Level 1	Students enroll in courses from different discipline areas. At this level there is no formal requirement for the student to connect what they learned in one context to what was learned in another.
Level 2	Students are able to share their insights from the different disciplines in a formal setting such as a capstone seminar course. At this level the student is responsible for integration of this learning.
Level 3	Students are exposed to the different disciplines through multi-disciplinary team teaching. At this level students synthesize knowledge from the different disciplines but interpret the problems and issues through their own discipline.
Level 4	Students and staff make a conscious effort to integrate the discipline perspectives into a coherent framework requiring an understanding of methodologies etc. and building a shared language. An example is biophysics which integrates physics with chemistry and biology

Table 8.1: Levels of Interdisciplinarity [165]

8.7.3. Preparing Students for Interdisciplinary Experience

Students can be prepared for an interdisciplinary experience by encouraging them to link and integrate all of their learning experiences (e.g. other course content, their experiences in the workplace or at home or general life experiences) into their approach to gaining an understanding about a problem or an issue. The students should:

- Be encouraged to utilize tools and methodologies from disciplines other than their own
- Be engaged in seeking, obtaining, and utilizing "knowledge in an organic - not an artificial way" i.e. in the context of authentic problems, interests, issues, and concerns by using "disciplines of knowledge" in an integrated way
- Recognize that the interdisciplinary experience requires a reference point of discipline knowledge as discipline knowledge includes "much (but not all) of what we know about ourselves and our world and about ways of making and communicating meaning" but must go beyond that perspective to achieve a holistic view of a problem, phenomena or issue. [165]

In encouraging an interdisciplinary perspective you might try to discuss with students:

- What constitutes an interdisciplinary approach (using appropriate examples of issues approached from the multiple perspectives of your own and other disciplines)
- The skills, traits and characteristics of interdisciplinarians (e.g. critical thinking, problem-solving, flexibility, approaching problems from different perspectives)
- Role of the disciplines in interdisciplinary work (i.e. a reference point which students can use to understand the theme or problem before exploring it through other disciplinary perspectives; something that makes a unique yet equally valuable contribution to our understanding of an issue along with other disciplines)
- How different disciplines interpret and influence understanding of a problem (e.g. choosing a site for a building, an accountant may look at cost, an environmental scientist may look at environmental impact and an architect may look at the space for the design)
- Defining elements of disciplines and their relevance to interdiscplinarians (e.g. as an interdisciplinarian not only considering the costs from an accounting perspective but also

considering the environmental impact of a decision i.e. recognizing the defining aspects of more than one discipline in the exploration of an issue). [165]

8.7.4. Assessing Student's Interdisciplinary Perspective

In assessing the development of an interdisciplinary perspective the focus is on "Assessing their ability to integrate and assimilate knowledge from multiple disciplines rather than simply concentrating on content-specific knowledge from a single discipline." [165]

The four cognitive abilities cultivated by interdisciplinary learning are ability to:

- Develop and apply perspective-taking techniques
- Develop structural knowledge of problems appropriate to interdisciplinary inquiry
- Integrate conflicting insights (i.e., three expert views) from two or more disciplines
- Produce a cognitive advancement or interdisciplinary understanding of the problem. [165]

Examples of the types of learning outcomes/ objectives you could use within your course to capture the interdisciplinary learning outcomes for students include:

- Viewing the course theme, issue, problem, or question from the perspective of two disciplines (i.e., use disciplinary-based [and conflicting] perspectives to better understand a problem)
- Perceiving connections between the two knowledge (i.e., disciplinary) domains that pertain to the course problem or theme; integrating conflicting disciplinary insights and viewpoints
- Producing a more comprehensive understanding of the course problem or theme and test it by proposing a holistic solution. [165]

The Examples of interdisciplinary activities and artefacts that could be used for assessment.

Discipline examples	**Assessing for an interdisciplinary perspective**
Public Health students work in teams to prepare reports outlining implementation strategies for tackling obesity in their local community. Each team member gathers and summarizes information from a different disciplinary perspective: behavioral science; biology; nutrition; and psychology. The team then synthesizes information from the different perspectives in the report.	In their report assess students' ability to accurately and effectively integrate the different disciplinary perspectives to provide a more holistic solution to the problem.
Urban planning students research planning issues surrounding the proposed Marina at the Southport Spit and present these in class as if they are making a submission to a Gold Coast City Council Planning Committee. The issues are drawn from sociology, ecology, law, financial planning and environmental studies.	Assess the students' ability to recognize and incorporate in their presentation issues from different disciplines pertaining to the proposed development of the Marina at Southport.
Criminology students examine contributing factors to violence against women with reference to biology, psychology, criminology and sociology. They draw on statistics to defend or refute theories they consider. The students' research provides content for a class debate on appropriate strategies for working with domestic violence offenders.	Assess the debate for the students' ability to provide a comprehensive argument that recognizes and integrates more than one disciplinary perspective.

Environmental studies students explore the sustainability of the Murray-Darling Basin with reference to interdisciplinary research from the social sciences, humanities, business studies, environmental and health sciences. They present their findings in an assignment written in the style of an article for The Australian Weekend Magazine.	Assess the students' ability to demonstrate an understanding of the interdisciplinary nature of the research drawn on for their articles.
Cross-disciplinary teams of animators, filmmakers, composers and digital media creators work together in teams, to produce video and digital media programs for community clients such as Riding for the Disabled or the Royal Brisbane Children's Hospital in-house TV.	Assess the students' ability to effectively integrate the different disciplinary elements in their final production.
Midwifery students participate in a debate in which they prepare arguments on home birth from both the medical and midwifery perspectives. They are randomly allocated to either 'side' of the debate by a lottery system.	Assess the debate for the students' ability to identify connections and disparities between the different disciplinary perspectives.

Table 8.2: Examples of interdisciplinary activities that could be used for assessment [165]

8.7.5. NSF USA: Recommendations for Interdisciplinary Research

In May 2008, the National Science Foundation (NSF), USA, has organized the workshop and published very interesting report namely "Impact of Transformative Interdisciplinary Research and Graduate Education on Academic Institutions". I would like to quote the recommendation of this report. [166]

Recommendations for Advancing Interdisciplinary Research

Universities

- Organize discussions about research around achieving open-ended scientific discovery and addressing social challenges rather than framing them in terms of disciplinary versus interdisciplinary science.
- Consult with and learn from industry on how best to achieve teamwork on interdisciplinary research problems and how to prepare people for it in the future.
- Develop short-term, intermediate-term, and long-term measures of success of interdisciplinary research, encompassing internal effects on pedagogy, the structure of academia, and development of a diverse workforce in science and engineering, as well as external effects on industry, society (societal problems), and policymakers.
- Form research teams driven by problem-oriented research challenges that serve to defocus emphasis on whether a given research challenge is disciplinary or interdisciplinary.
- Remove disincentives and create incentives for faculty to engage in interdisciplinary research.

Recommendations for Advancing Interdisciplinary Research – Continued

- Develop new models of university organizational structures and funding to facilitate interdisciplinary research.

Funding Agencies

- Reduce the boundaries between disciplines at each of the funding agencies to facilitate cooperation on review and funding.
- Maintain a balance of funding between disciplinary and interdisciplinary research, emphasizing scientific problems as the major determinant in the types of funding programs in the portfolio.
- Increase the numbers of grants supporting interdisciplinary research and training clusters and centers in order to enhance the total investment for interdisciplinary research.
- Because the impact of discoveries is often unforeseen, maintain a portfolio approach to research funding including both research with expected shorter term practical and economic impact, and research with less defined but potentially longer term impact.
- Foster interdisciplinary research at the individual research grant level in addition to the larger interdisciplinary grants. Include more reviewers who are receptive to and conversant with interdisciplinary research. Multiple disciplinary reviews are not the same as reviews by colleagues who are experienced in interdisciplinary collaborations.
- Effectively collaborate with other funding agencies and other constituency groups, such as industry or states, and learn from each other's experience regarding interdisciplinary research and education.
- Be aggressive in staying knowledgeable about current and emerging research areas. One mechanism to achieve this goal would be to expand support for workshops in which scientists and constituencies convene to brainstorm responses to critical interdisciplinary research issues.
- Include interdisciplinary skills training as a part of grant-writing workshops.

Recommendations for Future Interdisciplinary Graduate Education

- Ensure that undergraduates are prepared to do research and have sufficient depth and breadth in a discipline to undertake interdisciplinary research when they are graduate students.
- Develop mechanisms to support, recognize, and reward teamwork in graduate education and in thesis topic research.
- Develop specific outcome goals for skill development in the broad topic of professional skills and match training to these goals.
- Recognize the unique stresses on graduate students in interdisciplinary programs and provide support and mentoring.
- Make funding mechanisms that are typically tied to departments more portable and guarantee multi-year support, but also ensure a mix of experiences, including teaching experience, for those aiming for careers in academia.
- Provide credentialing through dual degree programs, certificates, minors, concentrations, designated emphases, or other means so as to recognize a graduate student's interdisciplinary training and potentially aid in communicating both disciplinary depth and interdisciplinary breadth to potential employers.
- Utilize and build on successful collaborations from the past and use these as models for transformative interdisciplinary graduate training.

Recommendations for Advancing Interdisciplinarity and Engaging Faculty

University Policies and Procedures

- Develop mechanisms for faculty with traditional disciplinary expertise to learn and embrace new interdisciplinary approaches and collaborations.
  - Establish incentives and remove disincentives for faculty to perform interdisciplinary research and teaching.
  - Address the incompatibility between traditional hierarchical administrative structures and new interdisciplinary cross-cutting programs.
  - Develop paths to reduce the potential tension between disciplinary and interdisciplinary interests when hiring faculty.
  - Reward successful interdisciplinary initiatives.
  - Provide mentoring and training of both junior and senior faculty in the skills needed to succeed in interdisciplinary research, including effective communication and teamwork.
- Develop new and agreed-upon models for evaluating faculty contributions to interdisciplinary work.
  - Establish policies regarding distribution of interdisciplinary grant overhead funds and credit for multi-authored publications, patents, and grants.
  - Define a mechanism for faculty to explicitly identify, communicate, and obtain credit for their individual contributions within multi-investigator interdisciplinary projects and publications.
- In order to facilitate the development of a broader more interdisciplinary view by faculty research collaborators, consider separating the research/graduate teaching functions from the academic unit-driven undergraduate teaching mission.
- Collect data and evaluate successful models of institutions that have demonstrated success with interdisciplinary initiatives.
- Develop ways to ensure benefit for multiple academic departments by using each other's courses, avoiding duplication of effort, and at the same time acknowledging the value of what their cognate colleagues bring to the table.

Recommendations for Supporting Interdisciplinarity in Academic Institutions

- Be strategic in planning for investment in interdisciplinary research and education based on institutional strengths, size, and type.
- Move away from rigid hierarchical structures to more dynamic and flexible structures in which faculty have some fluidity of movement between or across disciplinary homes.
  - Provide physical space and shared facilities that bring people together to support collaborative work.
  - Take advantage of new interdisciplinary funding opportunities offered by federal funding agencies.
- Clarify expectations for new and current faculty doing interdisciplinary research and education, and include all parties in the contract.
- Add new elements in promotion and tenure guidelines to include recognition and reward for contributions to interdisciplinary research and education.
- Continue to base interdisciplinary graduate education solidly in disciplinary programs while allowing mechanisms for new programs to evolve.
- Extend support for interdisciplinary research and education into undergraduate education.
- Forge links between majority and minority institutions in order to take advantage of the attraction of interdisciplinary research to broaden participation in science and engineering.
- Examine international models for interdisciplinary research and education and consider adapting/adopting successful models.

Fig 8.12: Recommendations for Advancing Interdisciplinary Research by NSF, USA [166]

8.8. Remove Regulatory Obstacles and Need Special Efforts at All Fronts

To develop the Interdisciplinary and Multidisciplinary Research culture and courses, there is a need of special efforts at all fronts like

- Policy makers
- Central Regulatory Authorities
- State Government Authorities
- Research Funding Agencies
- Board of Managements and Authorities of Universities and Institutes

I found that, in many cases, the degrees in interdisciplinary courses couldn't satisfy the eligibility criteria of

- Higher degree
- Number of entrance examinations
- Various competitive examinations
- Government Jobs
- Industry Jobs etc.

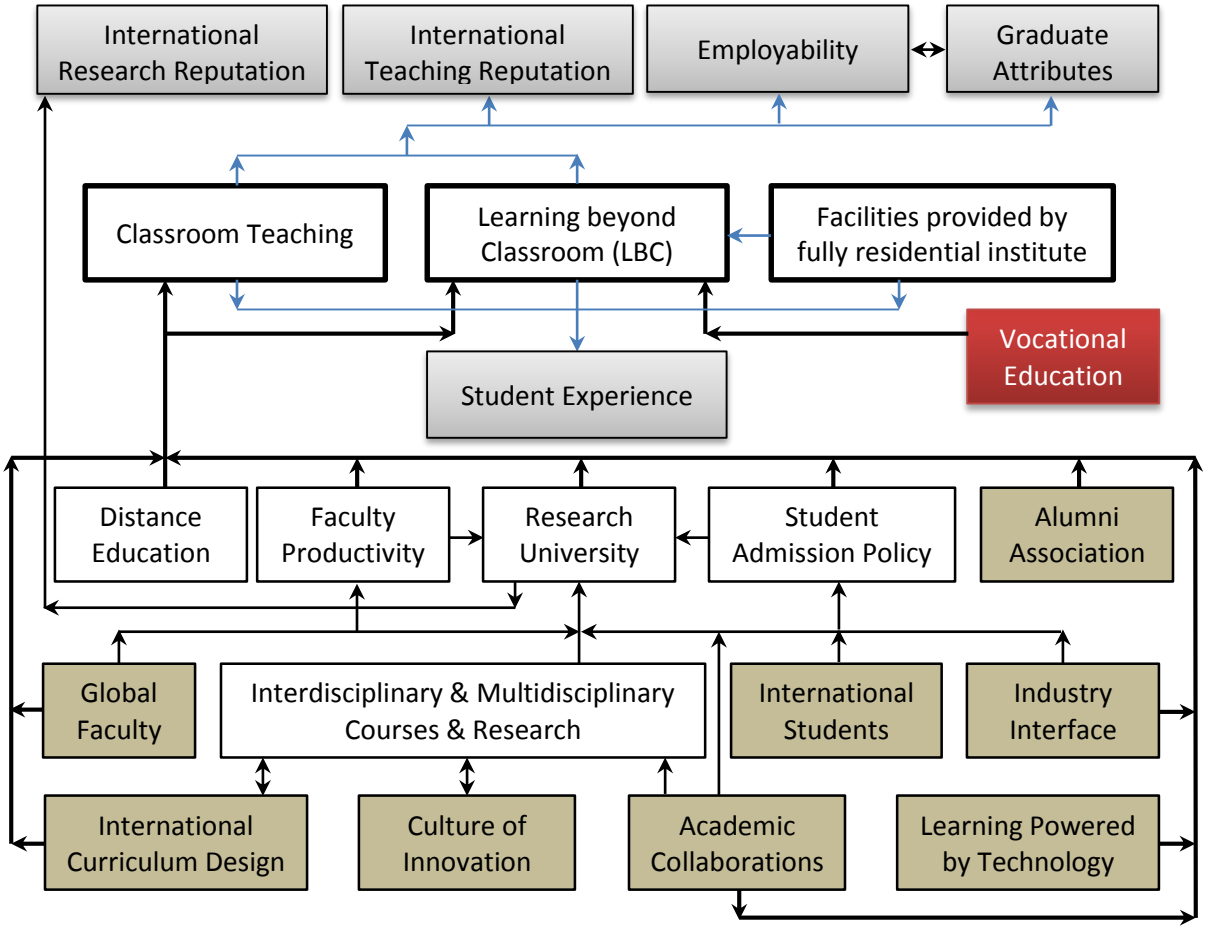
Thus the students and institutes are discouraged to choose and start the Interdisciplinary and Multidisciplinary courses. There should be efficient mechanism to remove these regulatory obstacles to encourage these courses and students in India.

Chapter 9: Vocational Component Boost the Student's Employability of University

There are two types of higher education in the U.K.: higher academic education, and higher vocational education. They provide "Applied" degrees with VET and HE components. UK: Vocational + higher education = success [186] [187] [188]

Australia's tertiary education system includes universities and vocational education. The Universities Australia initiative seems to focus on "vocational training to improve graduate employability". This needs to be interpreted quite broadly. All higher education is vocational in the sense that it can help shape a graduate's capacity to succeed in the workplace. [189] [190]

Dr. Pawan Agarwal, Adviser (Education), Planning Commission, Government of India stated that "India has a binary system where vocational training is done in institutes and centers that do not fall within the purview of the universities, and thus vocational education is separated from general higher education. It is necessary to ***merge general higher education with skill-based and professional education*** *in order to bring in greater curricular diversity and to ensure the mobility of students, scholars, and academics between these sectors." [191]*



9.1. Need of Vocational Education as a Part of University Education

In University system to enhance Employability, Education and Training both are essential.

↓

Technology and skill sets are changing quickly and you cannot readjust the university curriculum every time that happens.

↓

Normally for teaching and practical training, any institute gets 8 hours per day. That is 4 hours each for Education and Training. The 4 hours training is not sufficient for enhancing employability.

↓

Extra training is required for personality development, skillset development, providing shadow industrial experience etc. Which can be provided through Learning beyond Classroom (LBC). For LBC the residential campus is must.

↓

To conduct hundreds of different specialized training activities require huge finance.

↓

If Vocational Education is part of the University then it is feasible. Many joint or overlapping activities of Higher Education and Vocational Education are possible. The joint training of vocational education will be more scientific and specialized. Whereas Higher Education can have more training opportunities. It can be a Win-Win situation.

Fig. 9.1: Need of Vocational Education as a part of University Education

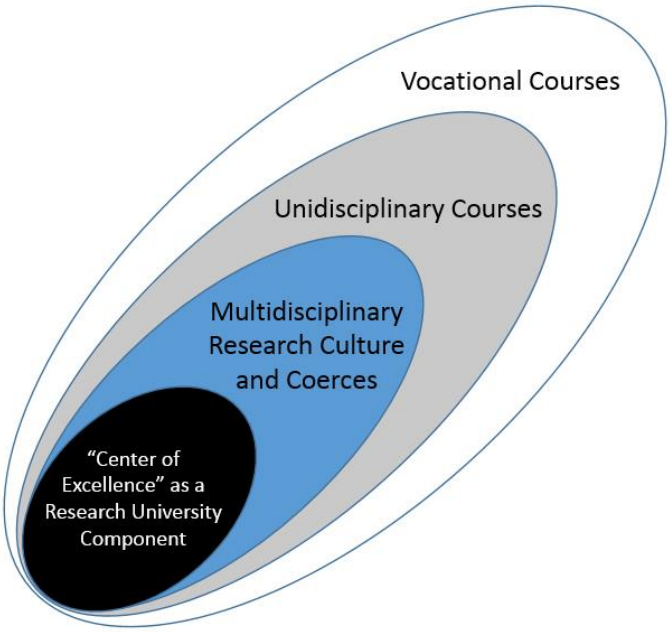


Fig. 9.2: Components of University Higher Education

The Figure 9.1 shows the need of vocational education as a part of university education system. The Figure 9.2 (see Figure 8.1) shows the Components of University Higher Education. The Vocational education must be part of higher education system.

9.2. Need to Understand the Difference between Education & Training

Training and education are both different facets of learning. Their purpose and methodology are altogether different. For example,

- The Dog can be trained but not educated
- We say "Military Training" and not "Military Education"

9.2.1. Training

Training is undertaken with the hopes of gaining a specific skill. Generally this skill will make you more employable. These skills can be manual:

- Plumbing
- Carpentry
- Weaving
- Computer Programming
- Accounting
- Marketing

Training is usually done through specialized courses and textbooks. The learning (through training) can often be done by rote and textbooks are very prescriptive. While independent thinking at a micro level is encouraged, revolutionary innovation is often looked down on. Training generally comes in a course; when the course is completed, the training is done.

Training brings the learner up to the level of others in the industry and will tend to make them the same as the experts they seek to emulate. For example, to get a better job as a network administrator learn how to install routers and become certified in internetworking technology. **Training helps the learner solve known problems with a high degree of expertise.** [192]

Training is a part of education, which can close the competency's gap.

Training is concerned with acquiring a skill or the psychomotor domain of learning. This objective can be accomplished through apprenticeships, seminars, workshops, classes, or self-study (e.g. reading, observing videotapes, etc.). With training, a task analysis will yield a complete "step-by-step" list of what needs to be done to accomplish the skill being learned. One knows if the training was accomplished when the trainee can reiterate the right answers and/or demonstrate the "approved way" of doing something. Training is specific, has a definite goal and a time, and requires a show of proficiency. In summary, the desired outcome of training is a skill and training has predefined content and is a closed system. [193]

9.2.2. Education

Education is undertaken in the hopes of **furthering your individual knowledge** and **developing your intellect**. While a highly educated person is often more employable, **education is not about getting a job**. Education is a **lifelong process**. Most educational learning is done **through real books, rather than textbooks**. The learner is **encouraged to think** and write about what he is reading. Any point is open to discussion and the only right answers are those that can be found in the text.

In today's universities highly specialized areas of training are being passed off as education.

Education should be used **to acquire a mindset not currently owned** or **to deepen a mindset already possessed**. An electrical engineer may wish to become a businessperson and will undertake an MBA education to acquire a business and management mindset, for example. A biochemist will go on engage in a Master's in chemistry to deepen the mindset of a professional chemist learned as an undergraduate. **Education broadens the learner**, makes him **different from everyone else** and helps him **think in his own way to solve problems that have not been solved before**. Of course educational programs include **training in the skills and knowledge of the discipline**, but they go further to develop **thinking abilities, attitudes and behavior patterns** that might be classified as a **mindset**. In this sense, **training programs do not include education** but **education programs often include training**. [192]

Education has a much **broader aim** to develop an individual, while training has a **narrow aim** to increase knowledge and skill in specific areas.

Education gives basic knowledge and skill to a person to become employable. Training gives a perfect knowledge on some activity, to become a person professional in that.

The **aim of education is broader than training**. It strives to prepare learners to be **analytical thinkers** and **problem solvers** by facilitating the learning of **principles, concepts, rules, facts, and associated skills and values/attitudes**. Its aim is to **develop residents' understanding, abilities to synthesize information, and work skills within and beyond the workplace**. Therefore, it often includes what might be considered generic or general topics without a specific, immediate application. [193]

9.2.3. Examples

Situation	Training or Education	Why?
A company needs to train all employees on the new version of Microsoft Office®.	Training	Employees need to learn how to use new versions of various software programs (Word, Excel, etc.) that makes up the Microsoft Office suite – the company needs to teach them a new skill – how to use the software to perform their job.
A company needs to improve the negotiation capabilities of their procurement group.	Education	Employees need to learn how to build their skills in effective negotiations – this is not simply learning steps to negotiating but rather understanding how to analyze

		complex situations and read people/understand their motivations to ensure win-win situations.
A company is developing a year-long program for developing high potential employees	Education	Employees need to develop a variety of competencies in order to eventually be able to take on leadership roles within the organization – this includes: strategic planning, critical thinking, problem solving, etc.
A company wants their employees working on projects to use earned value management (EVM) systems on all projects that are valued at $2 million plus.	Training	Project managers need to learn the EVM formulas to measure the progress of the projects for which they are responsible.

Table 9.1: Example of Training and Education [194]

9.3. University: Training Difficulties

Professor NV Varghese, director of the Centre for Policy Research in Higher Education in New Delhi, said: "Industry is expecting a finished product who can be employed and universities cannot provide that. You cannot degenerate universities to training institutions. "**Technology and skill sets are changing quickly** and you cannot readjust the university curriculum every time that happens." India needed to focus on expanding the non-university sector, added Varghese. "Expecting one system to provide everything is unrealistic." [195]

9.4. Vocational Education

Vocational education (education based on occupation or employment), also known as career and technical education (CTE) or technical and vocational education and training (TVET) is education that prepares people for specific trades, crafts and careers at various levels from a trade, a craft, technician, or a professional position in engineering, accountancy, nursing, medicine, architecture, pharmacy, law etc. Craft vocations are usually based on manual or practical activities, traditionally non-academic, related to a specific trade, occupation, or vocation. It is sometimes referred to as technical education as the trainee directly develops expertise in a particular group of techniques. It is not, however, further education. [196]

Vocational education may be classified as teaching procedural knowledge. This can be contrasted with declarative knowledge, as used in education in a usually broader scientific field, which might concentrate on theory and abstract conceptual knowledge, characteristic of tertiary education. Vocational education can be at the secondary, post-secondary level, further education level and can interact with the apprenticeship system. Increasingly, vocational education can be recognized in terms of recognition of prior learning and partial academic credit towards tertiary education (e.g., at a university) as credit; **however, it is rarely considered in its own form to fall under the traditional definition of higher education**. [196]

Vocational education is related to the age-old **apprenticeship system of learning**. Apprenticeships are designed for many levels of work from manual trades to high knowledge work. However, as the labor market becomes more specialized and economies demand higher levels of skill, governments and businesses are increasingly investing in the future of vocational education through publicly funded training organizations and subsidized apprenticeship or traineeship initiatives for businesses. At the post-secondary level vocational education is typically provided by an institute of technology, university, or by a local community college. Vocational education has diversified over the 20th century and now exists in industries such as retail, tourism, information technology, funeral services and cosmetics, as well as in the traditional crafts and cottage industries. [196]

The article in University World News stated that "In the study funded by the Economic and Social Research Council, Oxford University's Dr. Geoff Hayward found that students that combine vocational education with academic studies are nearly as successful at gaining entry to and completing the first year of higher education as those with general academic qualifications." [197]

European universities were originally regarded as vocational schools, providing training in law, theology and medicine. These three vocations developed into what has been called the first generation of professions, and the education and training of these professionals is firmly institutionalized in universities. [198]

Relationships between higher education and VET are **significant and complex**, and of increasing interest in many countries. In **Ireland and Norway**, the difference between the university sector and the professional tertiary Education / VET sector is **blurring**. [198] [199]

In recent years there seems to have been a shift in Australian workplaces. The Daily Telegraph indicates that in 2012, the average **bachelor-degree graduate earns $50,000 a year**, compared to **$53,200 for a Certificate III or IV graduate**. Workers with a Diploma or higher qualification earn even more on average – $60,800 a year. [200]

A spokeswoman for Universities UK, the umbrella body for UK universities, said: "**UK universities should offer more practical and vocational learning**, a survey for a think tank suggests…. A key strength of the UK's higher education system is the diversity of courses offered across many different types of institution. It is vital that this remains the case in order to ensure student choice. **In practice it is difficult to distinguish between vocational and academic subjects**. Some subjects thought of as 'traditional' or 'academic', such as **law, medicine, architecture and engineering, are in fact largely vocational**." [201]

9.5. Vocational University: Institution of Higher Education & Research

A **Vocational University**, sometimes called **Professional University** or **Applied Technological University** or college of higher vocational studies, is an **institution of higher education and sometimes research**, which provides both tertiary and sometimes quaternary education and grants academic degrees at **all levels** (bachelor, master, and sometimes doctorate) in a variety of subjects. In some countries, a vocational university more precisely grants **Professional degrees** like

Professional Bachelor's degree, Professional Master's degree and Professional doctorates. The term is not officially used in many countries and an assignment to a certain type of university in a certain country's educational system is therefore difficult. The **UK** once had a very extensive **vocational university sector** with its polytechnic system. Vocational universities are often regulated and funded differently (for example, by the local government rather than the state) from research-focused universities, and the degrees granted are not necessarily interchangeable. [202]

The education which takes place at vocational universities combines teaching of both practical skills and theoretical expertise. There exist vocational universities of applied sciences, vocational universities of liberal arts, etc. [202]

University of applied sciences is a common English-language name for the institutions of higher education in several European countries which are designed with a focus on vocational degrees, especially in engineering, business, and health professions. Similarly to the universities, they provide both undergraduate and postgraduate education as well as grant academic degrees, but do not award doctoral degrees. [203]

Few of the well-known Vocational Universities across the globe are:

- Zurich University of Applied Sciences, Switzerland: The ZHAW is one of the largest and most productive universities of applied sciences in Switzerland, with a strong presence both nationally and internationally. Among the ZHAW's distinguishing features are Interdisciplinarity and a close connection to everyday working practice. The university also offers a broad range of continuing education courses, including over 30 Masters of Advanced Studies programmes, over 150 Diploma and Certificate programmes thus serves as a partner for life-long learning. 30 institutes at the ZHAW network their resources to provide business and industry with customized services. The ZHAW is one of the leading universities of applied sciences in Switzerland. Teaching, research, continuing education, consulting and other services are both scientifically based and practice-oriented. Graduates of the ZHAW hold their own on national and international markets and in the intercultural working world. Students benefit from an internationally oriented university that places a special focus not only on conveying **practical and specialist competencies**, but also on **developing social and personal skills**. About 11,100 students are enrolled at ZHAW. The ZHAW is one of the largest universities of applied sciences in Switzerland and thus offers a wide range of specialist knowledge. All of its Schools carry out disciplinary and interdisciplinary research. The results of ZHAW research projects are both scientifically sound and practice-relevant. The eight Schools of the ZHAW cover a broad range of subjects:
    - Architecture, Design and Civil Engineering,
    - Health Professions,
    - Applied Linguistics,
    - Life Sciences and
    - Facility Management,
    - Applied Psychology, Social Work, Engineering, and
    - Management and
    - Law. [204]
- University of Music and Performing Arts, Vienna, Austria
- Örebro University, Sweden (formerly Örebro Högskola).

- Royal Institute of Technology in Stockholm, Sweden.
- In Germany, Fachhochschule (translated University of Applied Sciences) has a more practical profile. Universities of Applied Sciences grant Bachelor degrees and Master degrees.
- A Dutch hogeschool (hbo) is called a university of applied sciences in English. Universities of Applied Sciences offer Bachelor degrees, Master degrees (but neither "of Arts" nor "of Science") and no doctorates.
- Liming Vocational University (Guanzhou), China
- In 2009, the first University of Vocational Technology was established under the purview of the Ministry of Vocational and Technical Training of Sri Lanka.
- There are five public vocational universities in Malaysia:
    - University Malaysia Pahang (UMP)
    - University Malaysia Perlis (UniMAP)
    - University Teknikal Malaysia Melaka (UTeM)
    - University Tun Hussein Onn Malaysia (UTHM)
    - University Malaysia Kelantan (UMK) [202]

9.6. Vocational Education and Higher Education at University

University education provides students with broad knowledge and basic skills to serve as the foundation for further learning and on-the-job training. Specific **vocational skills become obsolete too quickly**, and it is necessary to give people the ability to adapt to new technologies through a more general university education. [205]

The curriculum for higher education courses is based on notions of knowledge and understanding, while VET courses are based on the concept of competency. The interpretation of competencies is relatively narrow, being based on the tasks and skills required. The competencies are specified in training packages, which are developed by industry skills councils. This arrangement results in the characterization of VET as being industry-led, quite different from higher education, in which the teaching institution determines what is taught. [206]

The relevance of higher education to later working life for many graduates will lie in the realm of generic and transferable skills rather than specific competencies needed for a first job after graduation. The latter competences are not unimportant but the graduate's employer is generally much better equipped than a university to ensure that the graduate acquires them. Work experience alongside or as part of study can also help a lot. The emergence of graduates from higher education without any employment experiences is neither in their own nor in their employers' interests. [189]

Stronger recognition of the links between research and skills, which is **critical to innovation** and essential to the important concept of a more 'joined-up' approach between different elements of the education system, as well as to facilitate individual career progression

European universities were originally regarded as vocational schools, providing training in law, theology and medicine. These three vocations developed into what has been called the first

generation of professions, and the education and training of these professionals is firmly **institutionalized in universities**. [198]

9.6.1 The Argument for University Education

- With new technologies changing practices and procedures for vocational careers, a student's training can become outdated quickly. Professionals who can't or don't update their skills to stay competitive see a decrease in their market value and will see career instability later in life. [205]
- While lacking training in a specific skill set may prolong the job hunt, research has shown that university graduate in general see higher wages. [205]
- Higher demand for university graduates.
- Higher education is about preparation for working life, not for a specific job in the first couple of years after graduation. Graduates who have studied the more academic subjects will require a longer transition period into employment than those who have studied more vocational degrees. The transition may well entail further training in a professional field, which either the employer or an educational institution may provide. All types of graduates are likely to change their jobs several times over their working lives. Higher education is for the long term. Universities, employers and students should realize that. [189]

9.6.2 The Argument for Technical & Vocational Education & Training (TVET) Education

- Students trained in technical-vocational education develop specialized and practical job-related skills in order to prepare for work in specific occupations. They are often more in-line with the job market needs leading to increased employment.
- Higher rates of employment for students in vocational training programs
- Equal or higher earnings for vocational students [205]
- Degree courses in subjects such as history and sociology are preparations for employment as much as vocational degrees such as business and engineering. But the job details will not be known at the time of study. Indeed, they may not be known until several years later. [189]
- Vocational education trains you in practical, job-specific skills rather than giving you an academic education as a university typically does. A university education is a long term investment in your future. Choose vocational education and training if you want to fast-track a well-paying skill, change career or go back to study as an adult learner. [190]

9.7. Case Studies for Hybridization of Vocational Training & Higher Education at University

The "Global Employability Survey and University Ranking 2013" shows the ranking of most employable graduates of the world. The ranking of India shows that, we need to adopt the best practices of developed countries for enhancing our education standards and employability of the students. [207]

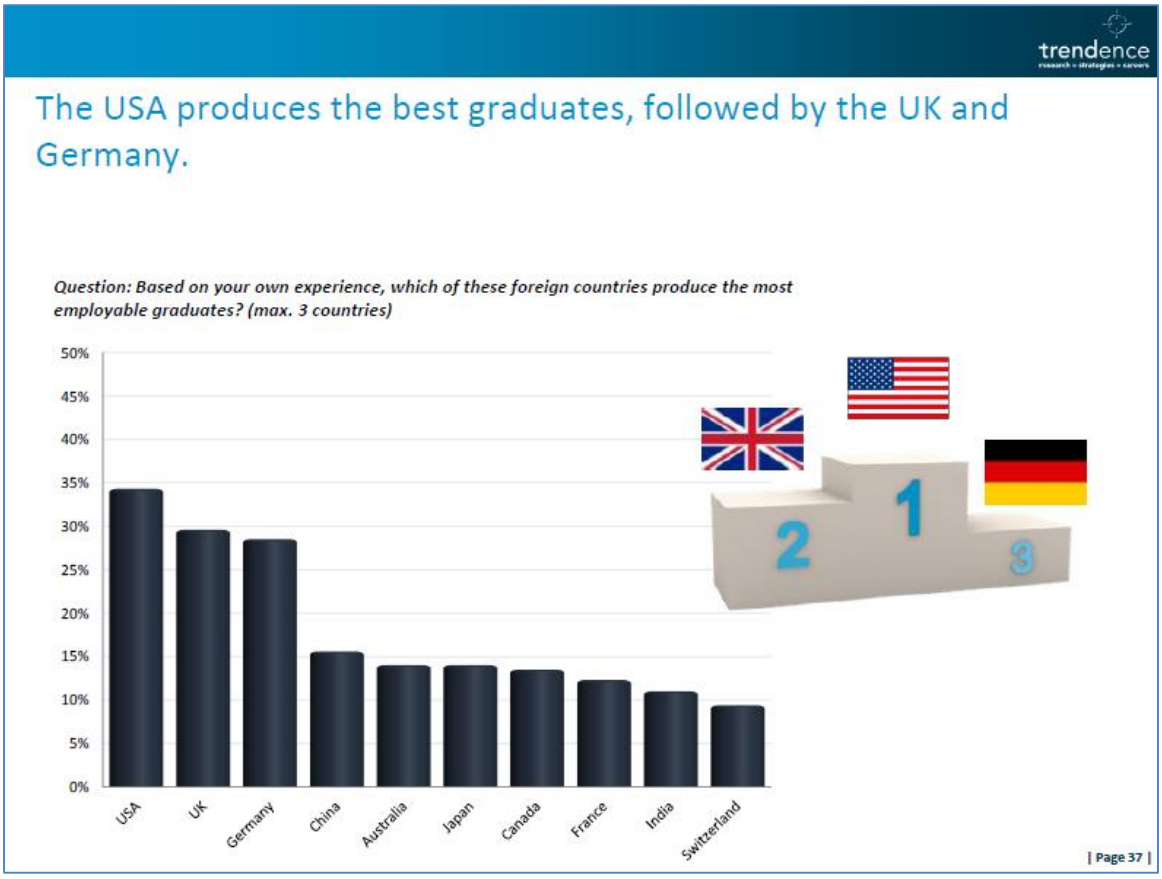


Fig. 9.3: Which country produces best graduates? [207]

9.7.1. Austria, Germany, and Switzerland

However, based on document analysis and, most importantly, several dozen expert interviews carried out with key stakeholders in all three countries between 2010 and 2011, the key finding from my fieldwork in Austria, Germany, and Switzerland is that all three countries are increasingly relying on hybridization – a specific combination of organizational and institutional elements from the two organizational fields of VET and HE – to introduce gradual institutional reforms within their long-established skill formation systems. [208]

The Swiss universities of applied sciences were deliberately designed for vocationally trained people and are legally obliged to be practice oriented. Crucially, their governance entails elements of traditional processes in VET. Swiss universities of applied sciences are directly linked to dual apprenticeship training via the vocational baccalaureate. The Swiss vocational baccalaureate, which is regarded as the ideal path ("Königsweg") into a Swiss university of applied sciences, builds a bridge between dual apprenticeship training and universities of applied sciences. In sum, the Swiss hybrid organizational configuration of university of applied sciences, dual apprenticeship and vocational baccalaureate combines learning processes from both VET and HE and links upper-secondary VET with post-secondary HE. [208]

Baethge argues that the separate institutionalization of and the resulting divide between VET and HE stem from the pre-industrial era and are rooted so deeply in the social structure of society, as well as the mode of diversified quality production, that all efforts at reform over the 20th century have failed to transform it. From this perspective, there seems to be little prospect for transformative change in the divided relationship between VET and HE. [208]

9.7.2. France and Germany

The research paper "The Shifting Relationship between Vocational and Higher Education in France and Germany: towards convergence?" highlight this issue nicely. [209]

9.7.3. Australia

Universities Australia recently announced a joint initiative with business groups to get graduates **"work ready" through vocational workplace training**. This is to be welcomed but it is also to be questioned – about what it should mean in practice, how it should be applied, and what the respective roles of universities and employers should be in providing it. [189]

In Australia, the **majority of universities are registered training providers and deliver VET** certificates, not to mention the dual-sector universities such as RMIT University and Victoria University. [206]

Swinburne University Australia's 2020 vision is to be Australia's leading university for science, technology and innovation. **With a combination of strengths that spans VET, higher education and research**, Swinburne is the only dual-sector institution consistently ranked as one of the world's premier universities. [210]

The Universities Australia initiative seems to focus on "**vocational training to improve graduate employability**". This needs to be interpreted quite broadly. All higher education is vocational in the sense that it can help shape a graduate's capacity to succeed in the workplace. [189]

9.7.4. United Kingdom

Manchester Metropolitan University UK is the largest campus-based undergraduate university in the UK with a total student population of more than 37,000. Our claim is to be the University for World Class professionals with an **emphasis on vocational education and employability**. [187]

9.7.5. Europe

The Lisbon Strategy can be seen as a turning point in European education policy. The Lisbon Agenda set the (economic) policy scene for the EU in the year 2000 with its aim of making Europe the most competitive and dynamic knowledge-based economic area in the world by 2010. Implementation of this aim is based on the Sorbonne (1998) and Bologna (1999) Declarations and their follow-up conferences – known as the **Bologna process** – and, in vocational education and

training (VET), on the Copenhagen Declaration (2002), Maastricht Communiqué (2004) and Helsinki Communiqué (2006) – known as the **Copenhagen process**. The merging of the **Bologna** and the **Copenhagen** processes into a single European education area appears appropriate, especially as **general, vocational, adult and academic education** are to be integrated in a future **European Qualifications Framework (EQF)**. [209] [211] [212]

9.7.6. Netherland

Higher education in the Netherlands is offered at two types of institutions:

- Research universities and
- Universities of applied sciences.

Research universities include general universities, universities specializing in engineering and agriculture, and the Open University. Universities of applied sciences include general institutions as well as institutions specializing in a specific field such as agriculture, fine and performing arts or teacher training. Whereas research universities are primarily responsible for offering research-oriented programmes, universities of applied sciences are primarily responsible for offering programmes of higher professional education, which prepare students for specific professions. These tend to be more practice oriented than programmes offered by research universities. [213]

World knows about the great performance of US Universities. But population wise the performance of **Netherland is more impressive**. The Netherland like very small countries can have 12 top ranking universities then India must have at least few WCU. The Population wise distribution of the top 100 universities of the world as follows.

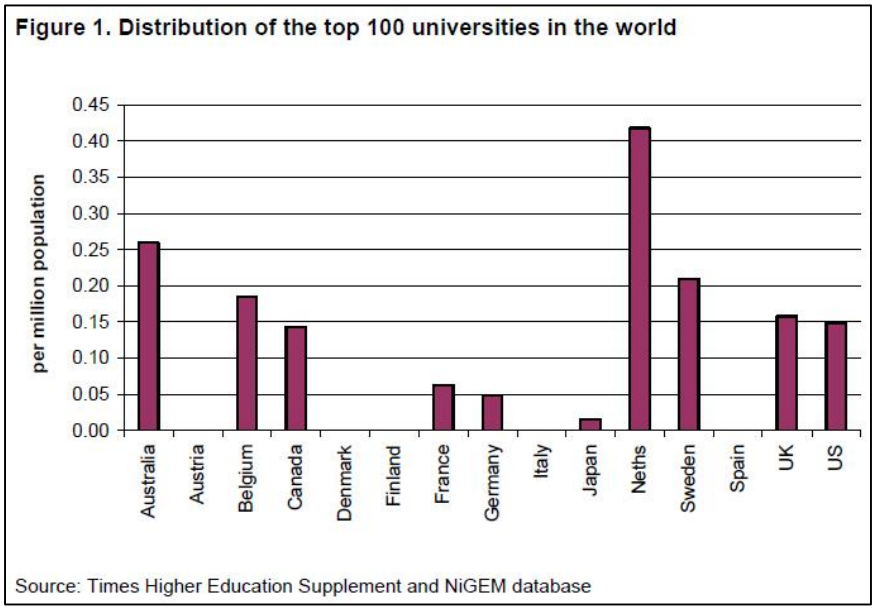


Fig. 9.4: Population wise distribution of the top 100 universities of the world [214]

9.7.7. Japan and Korea

For various reasons, however, **higher education institutions have been regarded as largely irrelevant to the so called 'economic miracles' of Japan and Korea**. Western observers appear to have been less focused on the question of skills formation in Korea beyond applauding its general emphasis on human resource development. This is interesting particularly because the **Korean government had taken a very proactive role in strengthening vocational education systems**, certainly in comparison with Japan, and possibly also compared with other international peers. In Japan, the Imperial University Ordinance of 1886 that defined the purpose of the modern university system was clearly based on the German and other western models of higher education, which was transferred to Korea during the colonial period (1910-1945), and the education system in both Japan and Korea was reorganized under US influence following the second world war and political independence in 1945. One critical change made under the occupation government, which was since been much criticized by the Japanese, was for **vocational colleges to become integrated into universities**. [186]

9.8. Indian Context

In India, to provide low cost education for developing the specialized labor forces was the basic reason behind keeping the vocational education separate from higher education sector.

Dr. Pawan Agarwal, Adviser (Education), Planning Commission, Government of India stated that "India has a binary system where vocational training is done in institutes and centers that do not fall within the purview of the universities, and thus vocational education is separated from general higher education. It is **necessary to merge general higher education with skill-based and professional education in order to bring in greater curricular diversity and to ensure the mobility of students, scholars, and academics between these sectors**." [191]

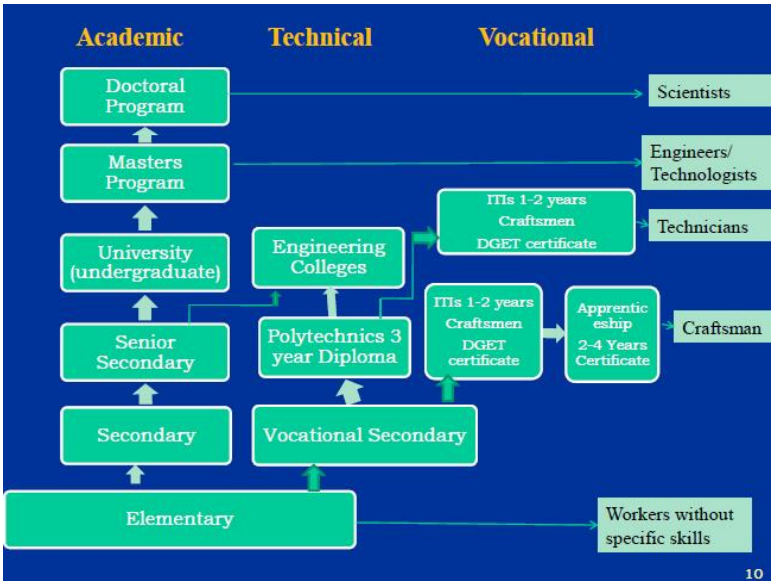


Fig. 9.5: Technical and Vocational Education System in India

9.8.1. Goals Achieved

- The Pathways are created from VET to Higher Education like
  - Recently the AICTE has permitted the ITI certificate holders to take admission to the 2nd year Engineering Diploma courses.
  - Similarly the Engineering Diploma holders can take admission to the 2nd year of engineering degree courses
- Till today, Vocational Education is not part of University System.
  - Recently the UGC is planning to introduce vocational courses at graduation level.
  - TeamLease University (TLU), Gujarat will be India's first University focused on vocational education. [215]
  - ITM Vocational University has been approved in March 2014 as a Private University by the Govt. of Gujarat. [216]
- Vocational courses covered in different areas under Apprentices Act 1961
  - **Agriculture**: Poultry Production, Fisheries/Fish Processing, Dairying, Sericulture, Apiculture, Floriculture, Plant Protection, Agricultural Chemicals, Inland Fisheries, Plantation Crops and Management, Seed Production Technology, Swine Production, Vegetable Seed production, Medicinal and Aromatic Plant Industry, Sheep and Goat Husbandry, Repair and Maintenance of Power Driven Farm Machinery, Veterinary Pharmacist-cum-Artificial Insemination Assistant, Agro Based Food Industry (Animal based), Agro Based Food Industry (Crop based), Agro Based Food Industry (Feed based), Post-Harvest Technology, Fish Seed Production, Fishing Technology, Horticulture, Soil Conservation, Crop Cultivation/ Production.
  - **Business and Commerce**: Banking, Marketing and Salesmanship, Office Secretaryship / Stenography, Co-operation, Export-Import Practices and Documentation, Insurance, Purchasing and Storekeeping, Taxation Practices/ Taxation laws/ Tax Assistant, Industrial Management, Receptionist, Basic Financial Services, Office Management, Tourism and Travel, Accountancy and Auditing.
  - **Engineering and Technology**: Civil Construction/Maintenance, Mechanical Servicing, Audio Visual Technician, Maintenance and Repair of Electrical Domestic Appliances, Building and Road Construction, Building Maintenance, Ceramic Technology, Computer Technique, Rural Engineering Technology, Materials Management Technology, Rubber Technology, Structure and Fabrication Technology, Sugar Technology, Tanaries.
  - **Health and Paramedical**: Medical Laboratory/ Technology Assistant, Health Worker, Nursing, Health Sanitary Inspector Hospital Documentation, Hospital Housekeeping, Ophthalmic Technology, X-ray Technician, Physiotherapy and Occupational Therapy, Multi-rehabilitation Worker, Bio Medical Equipment and Technician, Dental Hygienist, Dental Technician, Multipurpose Health Worker, Pharmacist, ECG and Audiometric Technician, Nutrition and Dietetics, Auxiliary Nurse and Mid Wives, Primary Health Worker.
  - **Home Science**: Food Preservation, Child Care and Nutrition, Catering and Restaurant Management, Pre-school and Crèche Management, Textile Designing, Interior Design, Commercial Garment Designing and Making, Clothing for the Family, Health Care and Beauty Culture, Bleaching Dyeing and Fabric Painting, Knitting Technology, Institutional House Keeping .

- **Humanities Science and Education**: Library and Information Science, Instrumental Music (Percussion Tabla), Classical Dance (Kathak), Indian Music (Hindustani Vocal Music), Photography, Commercial Art, Physical Education, Bharat Natyam, Cotton Classifier. [217]

9.8.2. Goals Need to Achieve

- There is a need to match the "Vocational education's Perspective" as per the needs of 21st century. The Vocational education should be introduced in multidisciplinary environment and should not be separated out from higher education. In future the role of VET in WCU can't be neglected.
- Master level Vocational courses are missing
- Hybridization of Higher Education with VET is not yet started. The initiative from premier institute is required.
- Share of labor force receiving vocational training is extremely low in India.

Fig. 9.6: Vocational Training: extremely low in India [218]

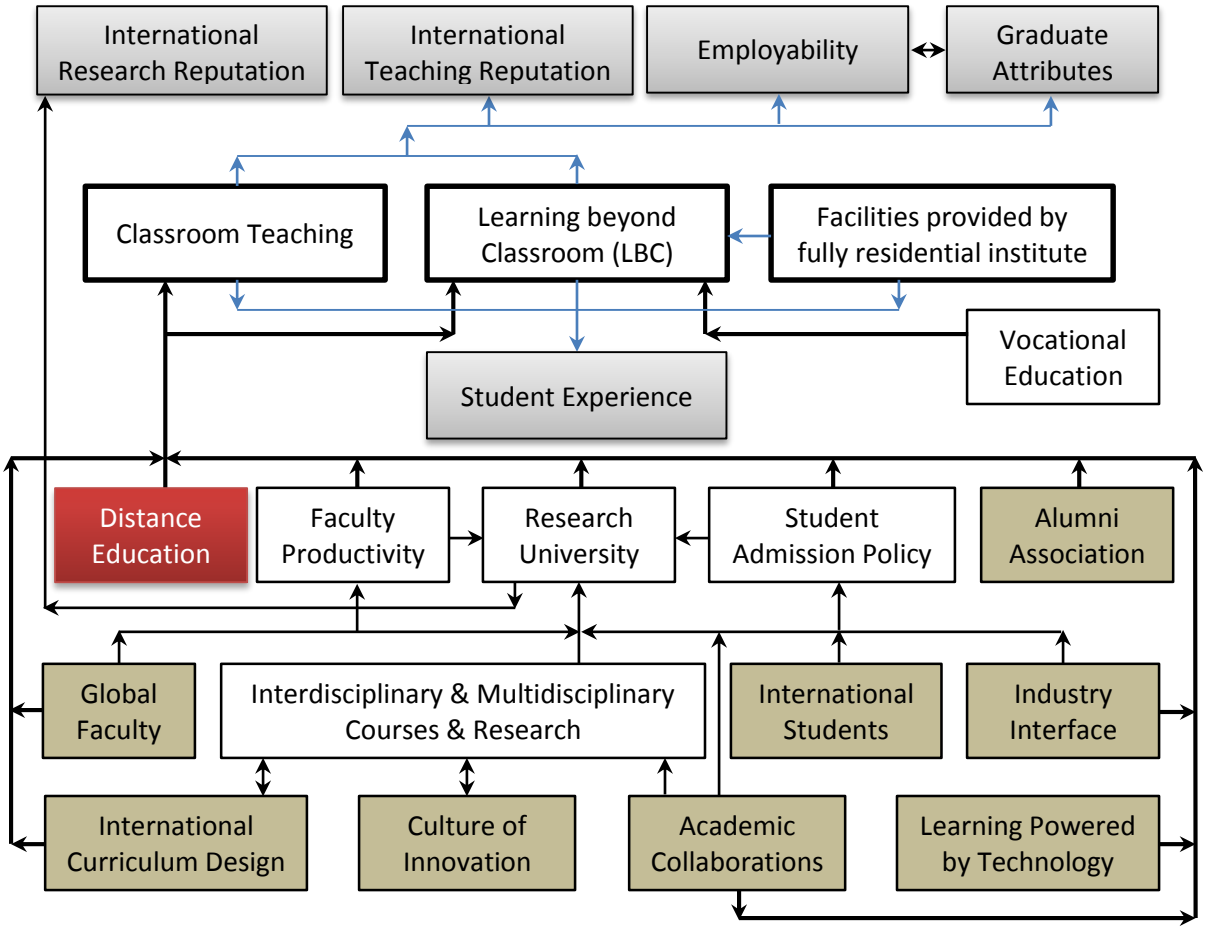
But the fierce competition for jobs between highly qualified graduates frequently makes the headlines as more and more people struggle to find employment, despite obtaining degrees. A new report from the Institute of Public Policy Research (IPPR) released today, to coincide with VQ Day 2014, reveals that many of the jobs expected to drive economic growth and mobility in the future will not necessarily require this traditional academic education pathway. Instead, the vocational path, which includes apprenticeships and on-the-job training, can open doors to an endless array of careers. [219]

With youth unemployment at record levels, the possibility of qualifications which facilitate young people's access to both the labor market and higher education could be seen as an attractive idea. [220]

Chapter 10: Distance Education Must be Tightly Coupled with Academic Programs

In most of the WCU, to enhance the teaching learning processes, the Distance Education, Digital Learning and E-learning are tightly coupled with academic programs. In India, we are keeping them as a separate components.

"Our distance-learning institute "Symbiosis Centre for Distance Learning (SCDL)", which conducts all its affairs—admissions, assignments, assessments and results - online, has grown to 200,000 students from 40 different countries. It has enabled us to introduce innovations like exam-on-demand," says S B Mujumdar, Founder and Chancellor, Symbiosis International University. [221] [222]



10.1. Importance of Distance Education for Developing WCU

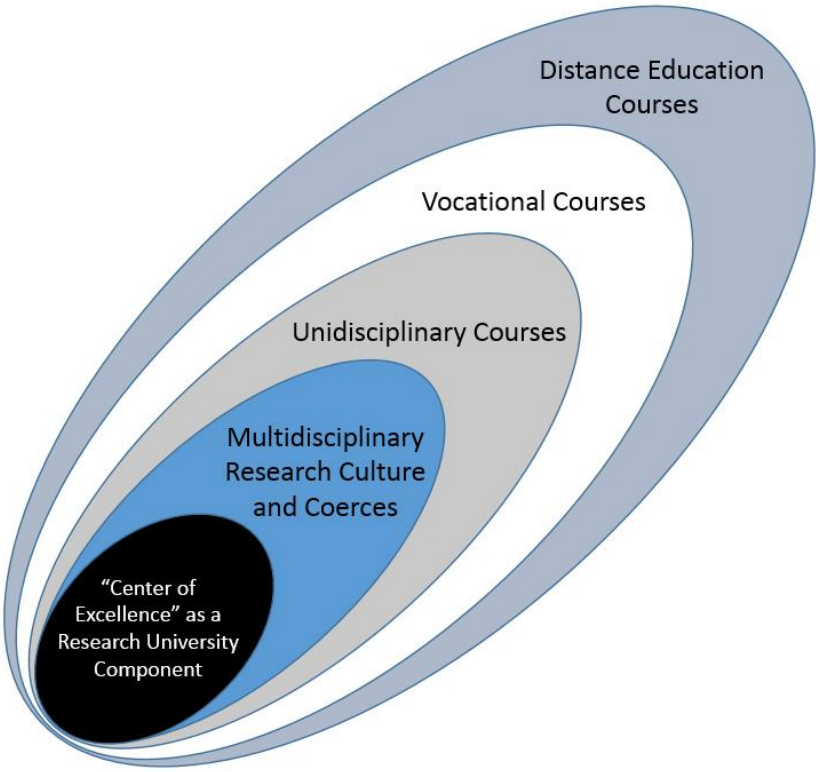


Fig. 10.1: Components of University Higher Education

- The Distance Education (digital education and e-learning) is one of the vital component of "**Learning beyond the classroom (LBC)**" activities and in turn the major requirement of WCU.
- The Distance Learning has tremendous scope in India and it can be **major source of revenue** for the university. Unfortunately majority of universities in India couldn't focus on this issue.
- In fact in most of the WCU, the distance education (e-learning) is **tightly coupled with academic programs**. Even part of vocational training can be provided through distance mode. The following diagram shows the details. Most of the technical details are available in my book "Technology-Storms Redefining World Class Universities".

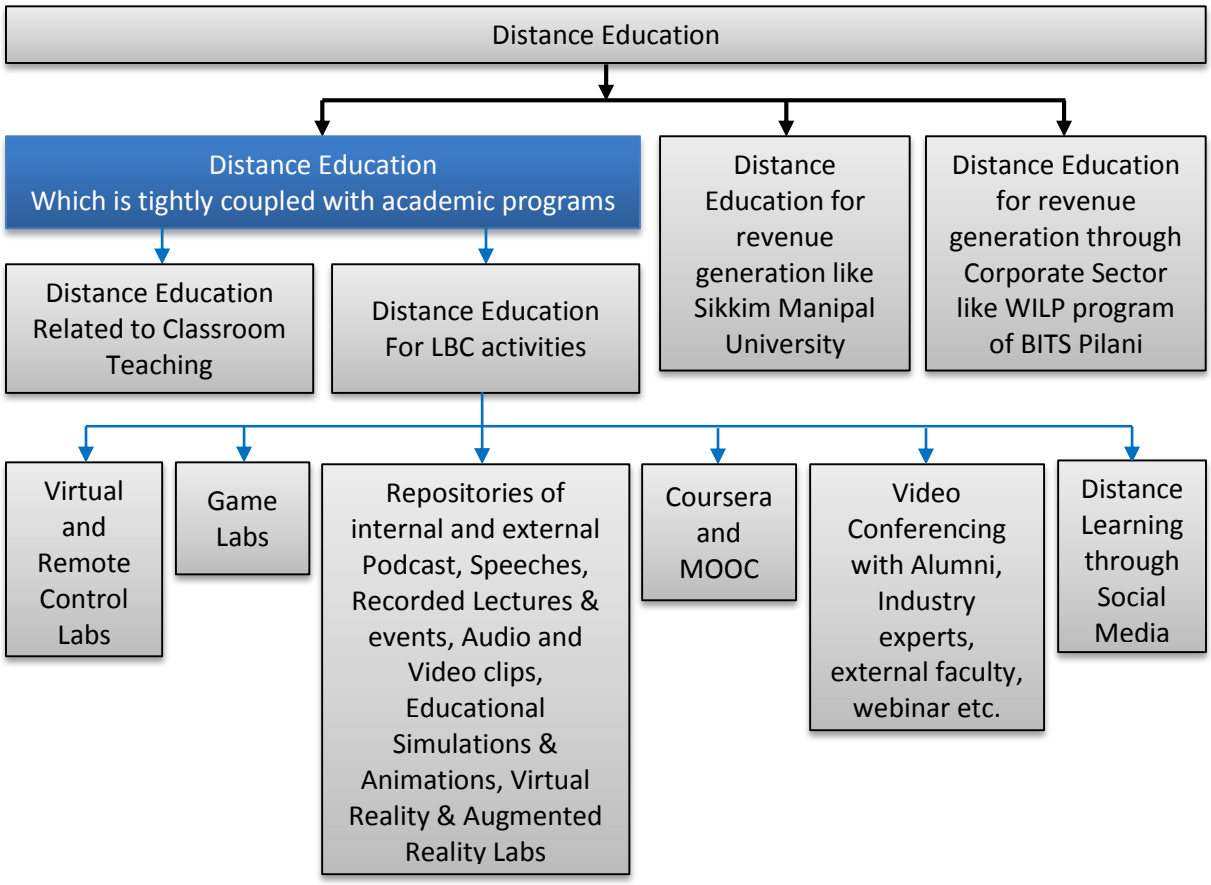


Fig. 10.2: Classification of Distance Education

10.2. Distance Education Programs of World Renowned Universities

10.2.1. Boston University, USA

Boston University's website stated that "**A world-class education is within reach, wherever you are**". For more than 140 years, Boston University has changed the world with pioneering research, academic innovation, and internationally renowned faculty. Today, BU's digital learning programs bring that unique experience to students around the globe through a process of online learning unequaled anywhere. [223]

10.2.2. North Carolina (NC) State University, USA

NC State's University "Learning beyond the classroom" or Distance Education. Program provides **learning opportunities to students wherever they are located**. More than 300 DE courses and 50 DE graduate degrees, undergraduate degrees, certificates, teacher licensure, and subject specializations are offered in a variety of disciplines.

Distance Education and Learning Technology Applications (DELTA) integrates and supports learning technologies in NC State's academic programs, both on the campus and at a distance. With academic programs more accessible to the state — and world — DELTA applies expertise in technology and pedagogy in an efficient, effective, and service-oriented environment to provide instructional support for faculty and optimum learning outcomes for students. [224]

10.2.3. University of Pretoria, South Africa

For a number of years, the University of Pretoria has been offering a variety of distance education programmes. **The Faculty of Education has established itself as a national leader in teaching innovation and education research**. Its programmes enjoy international recognition, and are aimed at training world-class leaders to develop a generation of innovative thinkers. [225]

10.2.4. Manchester University, UK

You don't need to be in Manchester to make the most of our teaching**. Our distance learning and online courses bring our University to you, so you can expand your horizons no matter where you are in the world**. Whether you're a professional looking for a formal qualification, a graduate aiming to boost your career prospects or an enquiring mind eager for greater knowledge, you'll be able to find a course at Manchester to suit your needs. Delivered via self-study and web-based resources, our distance learning and online courses allow you to enjoy a Manchester education without ever having to visit our campus. This makes them an ideal method of study if you cannot move to Manchester or if you need to study alongside other commitments. [226]

10.2.5. University of Cincinnati, USA

It has been stated at the website of University of Cincinnati that "Welcome to online learning at the University of Cincinnati, where our world-class faculty employs current technologies to provide innovative curriculum and excellent instruction! Whether you are a current or prospective student facing time demands or restrictions on your travel, online learning at UC means access to an abundance of **high-quality educational opportunities** - degrees, certificates, and courses online and through other media. We are committed to meeting your needs for **alternative delivery options** that are **affordable and convenient** as you pursue the knowledge and credentials you need to achieve your goals." [227]

10.3. India: Distance Education Case Studies

Let's see successful distance education programs by Self-financed Indian Universities.

10.3.1. Symbiosis International University: Symbiosis Centre for Distance Learning (SCDL)

- In 2001, a small group of educational visionaries started a small private educational institute called the Symbiosis Centre for Distance Learning (SCDL). The vision was simple; provide quality education through distant learning in a broad spectrum of programs and disciplines that could provide postgraduate working students with an opportunity to further increase their knowledge in a subject area leading to new opportunities for personal growth and job enhancement.
- Yes we began with 8000 students in 2001. By 2003 we had 15,000 students & by 2006 we had 100,000 students.
- Today SCDL has over 200,000 students from all corners of India and 42 countries.
- Prior to the e-learning initiative at SCDL in 2004, SCDL only provided its distant adult learners with hard copy, self-directed learning materials, which were supplemented with occasional faculty-led classroom-based programs.
- Beginning in 2004, SCDL has strategically focused on implementing technology solutions that would increase student access to education,
    - To Improve program quality and delivery
    - To provide a quicker response time to student questions and
    - To improve student support services.
- Today, adult learners at SCDL have access to
    - e-learning
    - virtual classrooms
    - podcasts
    - faculty chat sessions
    - exam booking, and
    - academic test results all delivered through a sophisticated Web portal,
- Created a large virtual campus.
- E-learning: Since its beginnings, SCDL offered only traditional printed learning material to its adult students. In 2006 the Institute active student enrollment attendance was approaching 100,000 students. The major challenge that existed at the time was that the students were spread across long distances in remote areas and across many countries (as many as 30 different countries). Understandably, it was difficult and challenging to organize face-to-face, faculty-led classes that added tremendous value to the students' learning experiences. The dynamics of geography, time zones, and diverse student population was an immense challenge towards implementing a universal, one-for-all solution in the learning pedagogy. At the same time, it was important to enhance learning experiences of students by providing technology based solutions that would ease the operational difficulties that existed at SCDL. Therefore, e-learning emerged as a suitable and lucrative possible solution. Implementing this kind of a solution was far more cost effective than arranging multi-location, faculty-led classroom lectures. Faculty was considered a very expensive operational expense, so the Institute decided to use faculty only when and as needed. The e-learning initiative goes well with the Institute's vision and mission of providing self-paced, self-styled learning. After further investigation, the SCDL Institute took the initiative of introducing e-learning course modules to supplement the self-guided, paper-based, learning materials. The customized e-learning course modules covered key concepts, used case studies, and real-life situational examples to explain various

concepts. However, when designing any e-learning course, a great deal of effort was made in not reiterating information already available through existing faculty lectures or the paper-based learning materials, therefore ensuring that the e-learning was an effective supplement to the existing self-guided learning materials. Utilizing e-learning for teaching was selected as an appropriate learning strategy because it would enable the Institute to address key concepts of the curriculum in an interactive, interesting manner via custom built e-learning modules. Furthermore, the Institute decided to use real-life examples, case studies, and scenarios in the treatment of e-learning, thereby making the e-learning courses more application-based. This was only possible through customized e-learning modules, which would be based on the self-paced learning material that the Institute already had. The Institute's leadership considered that e-learning could also provide a cost-effective learning model to support the Institute's tremendous growth. In order to accommodate new, larger numbers of students enrolled in the Institute, the cost related to hiring more faculty members and building more schools was not necessarily the right approach to growing the school. E-learning was scalable. More students take courses without increasing the faculty size and it allowed students to learn at their own pace and in their homes. So considering these factors, SCDL could increase student numbers, expand its reach, and maintain costs. The Institute wanted to improve the richness of the learning experience it was delivering to its students. Through the integration of technology, teaching, and e-learning SCDL could mix these important ingredients together to create a far more personalized learning experience to the end user. The Institute leveraged its highly recognized faculty in providing real-time learning with insight into the e-learning experience that other traditional schools in India could not match.

- **The first step** taken by management at the Institute was to create a team from existing internal departments, where one team was organized to provide the course content, subject matter expertise, and design and development expertise. The different academic departments, the media department, and e-learning department were all primarily involved in the planning and implementation of the eLearning initiative. The academic departments provided content and subject matter expertise. The media department did the scheduling and logistics management. The e-learning department coordinated with all involved departments, vendors, and faculty in actual design and development of the e-learning courses and services. All e-learning courses were created in the English language only as it is the language of business used in India and most other world countries.
- Another aspect of the school's approach was the use of external vendors to develop the e-learning courses as the school had limited resources to do this. The internal e-learning team then created guidelines and standards that external vendors would use in meeting SCDL's development requirements. The design approach was to keep each e-learning course to one hour of student seat time and keep the development cost to approximately US$3,500 to US$4,000 per e-learning course. History has shown that on average, it takes the internal e-learning team about two months to design and develop each course using both the Macromedia™ Flash and Dreamweaver course development application tools. All the courses were in English as the medium of instruction is English for all educational programs offered by SCDL.
- **The second step** that followed in the plan was to create e-learning courses for a limited number of classes. These courses were created to be delivered through the Internet and remote students without the Internet would receive the course on a disk in the form of a DVD. Instructor-led

courses delivered in a classroom by faculty members were videotaped and again offered via the Internet or by DVD.

- **This third important step** now provided students with even greater flexibility of not having to be physically present in a class and still have access to what the faculty member was teaching. Following step three, the SCDL team designed and built a robust learning portal so students could have on-line access to courses, grades, videotapes lectures, career paths, and support services.
- Media and Tools
    - Content and subject matter expertise provided from the faculty to support their existing courses
    - Macromedia Flash and Dreamweaver
    - External e-learning vendors to supplement development
    - Internet student portal developed as the primary access point for students to get to e-learning courses, class lectures that were videotaped, career paths, grades, and support
    - Virtual classrooms used so foreign students could take classes without having to be on-site
- Deployment I: The deployment of the e-learning initiative began with the development and launching of several e-learning course modules to support the most difficult courses that were being offered at the Institute. The SCDL's management and academics department decided that the e-learning modules should be integrated into existing faculty-led and distance learning courses, which in turn would provide the participating students with deeper learning opportunities, particularly with difficult concepts and therefore improve the intrinsic value of the course. Future releases of e-learning modules and on-line learning was deployed in a phased rollout with the annual goal of releasing between 10 to 15 new e-learning courses in future years. The actual deployment number could vary on the higher side depending upon program requirements. A variety of e-learning is presently used by over 200,000 students from all states of India and 42 countries.
- Deployment II: One of the most challenging early decisions that needed to be made by the SCDL's executive management team was what to do regarding the purchase/lease of a learning management system (LMS). The E-Learning Department thoroughly investigated different learning management systems, but their findings indicated that the systems were either too large, difficult to implement and manage, and/or very costly to purchase. The decision was made not to have an LMS, but rather they would sacrifice some of the benefits of an LMS, such as tracking students, and simply allow students to launch courses, videos, and recordings from the school's website portal. SCDL has recently decided to introduce virtual classrooms. At present SCDL is exploring various virtual classroom software, such as Wimba. This model will be used on an experimental basis for 1–2 courses, especially to judge student response considering SCDL has a very large student population. This model will help SCDL students to get flexibility of attending classes from the convenience of their home or office without coming to our campus. We can also offer many more courses through the virtual classrooms as physical infrastructure requirement is minimal in this model. This will help further our vision of creating a 'virtual campus' to provide self-based learning environment to our students.
- Marketing Approach
    - Both the Institute and faculty internally promoted e-learning as part of the improved curriculum to existing students through course catalogs and their website.

  - Advertisements were placed in large newspapers such as the "Times of India" promoting the expanded learning opportunities.
  - Sample demo e-learning courses were uploaded to the Institute's website to promote and train students on the approach and use of e-learning courses in their learning.
- **Business Impact**: The use of e-learning began to take shape in 2004 when it was deployed to approximately 60,000 students. Today there are more than 200,000 students using the e-learning courses for various programs in their studies. The Institute presently offers 16 programs in 134 courses of study in 6 disciplines, primarily in Management, Information Technology, Education, Humanities, and Law. From this, sixty four e-learning courses are in use today at the Institute with the goal of adding 10 more courses per year. This equates to over 60% of the curriculum for all programs being offered with supporting e-learning modes. The e-learning initiative has yielded excellent responses for the student population. This supplementary learning approach has helped students to understand key course concepts better. Due to this response, in-class, face-to-face, faculty-based learning has been reduced in terms of a "learning need" and the Institute has been able to manage costs associated with requirements of additional faculty to meet growing student's enrollment numbers. The faculty was initially reluctant and hesitant. There was a feeling of insecurity as to whether e-learning would take away jobs! However, SCDL trained faculty on the entire process of e-learning content development and then the important role as subject matter experts. These training programs and workshops for faculty created interest and cleared doubts. It also helped to set their buy-in.
- **Revenue**: 2008 Revenues: US$37 million (Rs. 222 Crore)
- SCDL is an autonomous institute and is not part of any University [228]

10.3.2. BITS: Work Integrated Learning Programmes (WILP)

The internal faculty, who is not ready to disclose his name, told that "The BITS is generating more than **50% income** from Work Integrated Learning Programmes (WILP) i.e. ICT based Distance Learning or e-learning technology, which is unique case in India". They have registered more than 20,000 students all over India for the degree like B.S, M.S., M.Sc. (Tech), M.Phil. etc. There are providing corporate training to many industries [229] [230]

BITS Pilani offers degree programmes through Work Integrated Learning Programmes (WILP) for employed professionals to **enhance their academic qualification while gaining significant professional experience at their respective employing organizations**. The programmes are specifically designed to **integrate the learning with their working environment**. We also offer specific programmes under Corporate Partnerships to leading organizations from several industries **customized to suit their Learning & Development requirements**. [231]

Over the past three decades, the educational activities of the Institute have extended beyond the campus. **This has been principally due to institutionalized linkages established by the Institute with various industries, R&D organizations, developmental agencies, etc.** This activity for all the on-campus programmes is through the Practice School which as an integral component of the academic curriculum takes the classroom for a specified period to a professional

location where the students and the faculty along with the industry experts get involved in real-life problems. [232]

Since 1979, the Institute has been participating in the human resources development activities of the industries by evolving several degree programmes by integrating the working environment of the employees with the learning environment required by the Institute. [232]

These programmes were first started as M.E. (Collaborative) programmes in 1979. Later, from 1988, the work integrated learning philosophy has been extended to programmes like First Level Diploma in Computer Applications, Instrument Servicing & Maintenance, Workshop Technology, Nautical Sciences; M.V.S in Computer Operations & Applications, Information Management, Physician Assistant, Footwear Technology; B.S. in Technological Operations, Pharmacy Operations, Industrial Management, Process Engineering, Engineering & Industrial Technology, Optometry, Physician Assistant, Power Engineering, Manufacturing Engineering, Marine Engineering, Nautical Technology, Engineering Technology, Information Systems, Ophthalmic Assistant, Industrial Engineering & Technology, Nautical Sciences; M.Sc. (Tech.) Pharmaceutical Chemistry; M.S. in Systems & Information, Computer Science, Electronics & Control, Pharmacy Operations, Technological Operations, Life Sciences, Biomedical Sciences, Design Engineering, Habitat Technology, Chemical Technology, Consciousness Studies, Consultancy Management, Engineering Management, Industrial Production & Management, Management Systems, Medical Laboratory Technology, Microelectronics, Quality Management, Software Engineering, Software Systems, Manufacturing Management, e-Business, Pharmaceutical Operations and Management, Telecommunication & Software Engineering; Mechanical Systems Design, Embedded Systems, M.Phil. in Mathematics, Physics, Science Communication & Journalism, Astronomy & Planetarium Sciences, Cardiac Sciences, Hospital & Health Systems Management, Optometry, Physician Assistant and Off-campus Ph.D. [232]

BITS Pilani has also institutionalized collaborations with several leading institutions to offer degree programmes in selected professional areas like Marine Engineering, Nautical Technology, Optometry and Physician Assistant. [231]

10.3.3. Manipal University: Sikkim Manipal University for Distance Learning

Established in 1995, Sikkim Manipal University is a public-private partnership or Joint Venture between the Government of Sikkim and Manipal Education" for distance learning (EduNxt)

Mr. V. Sivaramakrishnan, President of education services, Manipal Education said that "We aim to cover 50% of India's districts in five years; with distance education, we are nearly there. Today, Manipal has **180,000 students** in distance education programmes. It's true that the highest number of students comes from the top 22 towns, but that's because of internet availability". [233]

The Facts and Figure of Manipal University

- Courses across 9 disciplines through 69 different programmes
- More than 4 lakh students on roll
- 800+ authorized centres across 205 districts in 310 towns

- Overseas presence across 25 countries with 25 authorized centres
- Support of 6,800 committed and qualified mentors with 65 core faculties
- Alumni base of more than 1,50,000
- Academic counselling
- Comprehensive course content with assignments
- Regular industry interaction and acceptance
- EduNxt- Technology enabled Internet based learning platform
- Winner of the e-India award for "ICT enabled university of the year, 2009"
- Winner of the e-Rajasthan award for "ICT enabled university of the year, 2009" [234]

The disciplines include Information Technology, Management, Hospitality Management, Journalism and Mass Communication, Biotechnology, Bioinformatics, Apparel & Fashion Designing, Allied Health Sciences, Telecom, Commerce and Fire & Safety. [234]

10.3.4. OP Jindal Global University

C Raj Kumar VC, OP Jindal Global University said that “We have used IT tools to conduct classes between us and all those universities that we collaborate with. Take University of Michigan, Ann Arbor, for instance. With the help of technology we have conducted classes with both Indian and Ann Arbor professors. We are not talking of standalone, sporadic seminars. We have completed a full semester, 15-week course with Ann Arbor and Jindal professors teaching both our students and theirs. These classes involve 25 Indian and 25 US students and begin from 6.30 am (Indian time). Our teachers regularly engage with Ann Arbor professors to collectively plan out schedules and curriculum. Technology has also helped us to conduct common examinations at the end of the course. The examiner may be in the US or here”. [235]

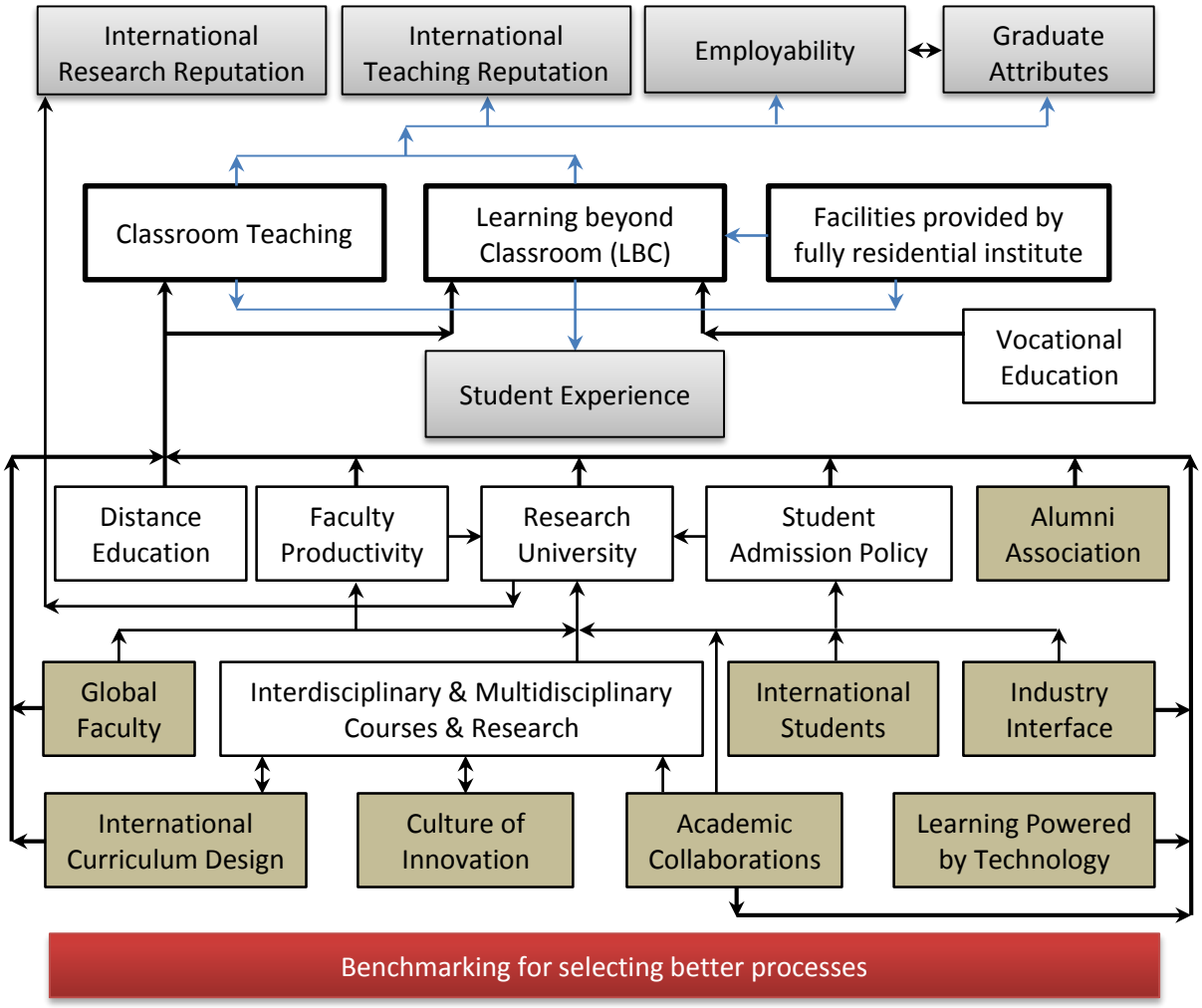
More detailed information is available in my book "Technology-Storms Redefining World Class Universities".

The Indian University must tap the source of Distance Education for revenue generation, establishing brand name and an opportunity for developing strong industrial interface.

The distance mode education should be tightly coupled with academic programs of the university. It should not be treated as separate component. It should be part of academic delivery mechanism to enhance the teaching learning process as well as to increase the International Teaching Reputation.

Chapter 11: Benchmarking: Optimizing Financial Investments for Enhancing Educational Outcomes or Graduate Attributes through Better Processes

Initially the Tier-1 institutes may try to invest more to enhance the educational outcomes (graduate attributes). Gradually they will understand, the importance of processes and will try to improve the process, sometimes through Benchmarking, for better educational outcomes with optimized investment. Unfortunately the Benchmarking Techniques are rarely used in India by Universities and Institutes for improving their performance.



11.1. What is Benchmarking?

Benchmarking means finding out who is the best in an area, studying how they work, and adopting the best practices that are suitable to your own organization. [236]

The term benchmarking was originally used by early land surveyors, who used the term to identify a fixed point from which all other measurements are made. In the late 1970's however, it took a broader meaning. Applied to an organization, benchmarking is a process to determine who else does a particular activity the best and emulating what they do to improve performance. A more formal definition is "Simply the systematic process of searching for best practices, innovative ideas and highly effective operating procedures that lead to superior performance". University benchmarking is a concept adopted from industry, where it has been used in manufacturing and services with great success for over two decades. [236] [237]

Benchmarking is a means of comparing the University's performance or standards, or both, with those of its peers. It is a means by which the University

- Can monitor its relative performance,
- Identify gaps,
- Seek fresh approaches to bring about improvements,
- Set goals,
- Establish priorities for change and resource allocation, and
- Follow through with change processes based on empirical evidence [236]

It can be about

- Broad University-wide issues or
- Specific matters affecting only one area;
- It can be strategic (addressing priority issues) or
- Cyclical (addressing a number of areas on a regular basis) or
- Adhoc (taking advantage of an opportunity) [236]

Benchmarking projects can be as simple as doing a desktop survey of relevant websites or may involve a formal request for information and/or an agreement with another institution. Whatever its scope or subject matter, benchmarking is an important element of the University's quality assurance cycle. [236]

Benchmarking (comparing against the best) is the process of comparing ones business processes and performance metrics with industry bests or best practices from other industries. Traditionally the areas measured are quality, time and cost. Improvements from learning mean doing things better, faster, and cheaper. It requires an emphasis on systematic means of making comparisons to identify areas that need improvement. It involves questioning how processes are performed, seeking out best practices, and implementing new models of operation. [236]

Essentially, benchmarking attempts to answer the following questions:

- How do the standards we have set ourselves compare to our peers?

- How does our performance measure against the outcomes of national and comparator institutions?
- How can we adapt good practice examples from other institutions to our own organization? [236]

Benchmarking allows the University to:

- Identify and monitor standards and performance in order to improve University outcomes, processes and practices
- Discover new ideas for achieving the University's 'core objectives' as outlined in its Strategic Plan
- Provide an evidence-based framework for change and improvement.
- Inform planning and goal setting
- Improve decision-making through referencing comparative data
- Bring an external focus to internal activities [236]

11.2. Benchmarking Global Trends

There are different Benchmarking Processes available.

11.2.1. Process Benchmarking

Initiating institution focuses its observation and investigation of processes with the goal of identifying and observing the best practices from one or more benchmark institutions.

11.2.2. Financial Benchmarking

Performing a financial analysis and comparing results in an effort to assess the overall competitiveness and productivity.

11.2.3. Benchmarking from an Investor's Perspective

Extending the benchmarking universe to also compare to peer institutions that can be considered alternative investment opportunities from the perspective of an investor.

11.2.4. Performance Benchmarking

Allows the initiator academic institute to assess their competitive position by comparing products and services with those of competition

11.2.5. Strategic Benchmarking

Involves observing how others compete and work. This type is usually not industry-specific, meaning it is best to look at other industries.

11.2.6. Functional Benchmarking

An institute can focus its benchmarking on a single function or faculty and department to improve the operation of that particular function.

11.2.7. Best-In-Class Benchmarking

Involves studying the leading competitor that best carries out a specific function

11.2.8. Internal Benchmarking

Involves comparing practices and processes with other units in the University. The advantage of internal benchmarking is that access to sensitive data and information is easier; standardized data is often readily available; and usually less time and resources are needed. There may be relatively few barriers to implementation as practices may be relatively easy to transfer across the same organization.

11.2.9. International Benchmarking

Involves strategic, performance, functional and process benchmarking with comparator institutions overseas. International benchmarking widens the University's focus and helps to ensure international competitiveness.

11.2.10. Quantitative Benchmarking

Looks at quantifiable outputs of an operation. The benchmarks are hard measures. Measurement is critical to help the University monitor its current performance relative to that of best practice institutions.

11.2.11. Qualitative Benchmarking

Looks at the systems and processes that deliver the results. The qualitative benchmarks are generally attributes of best practices in a functional area and these benchmarks could be simply a checklist of essential attributes constituting best practice.

The true benchmarking is always the Returns on Investments (ROI). Are our students getting jobs that justify the fee? In USA the Accreditation Board for Engineering and Technology has earned

a remarkable reputation. In the UK, it is the Quality Assurance Agency for higher education—which does an excellent job. However, our aim should be to become like Harvard or Oxford, which have become benchmarks by themselves. [236] [238]

11.3. Benchmarking Process Details

11.3.1. Selecting Benchmarking Partners

Selecting appropriate benchmarking partners is essential for successful strategic and performance benchmarking. The University usually undertakes this type of benchmarking with other universities. A benchmarking partner should:

- Have a compatible mission, values and objectives
- Be of comparable size
- Be a research intensive university
- Have a similar discipline mix
- Have superior performance in the areas to be benchmarked, and
- Have a commitment to quality management and a 'willingness to share'.

In addition to the above, international benchmarking partners should:

- have a Memorandum of Understanding (MOU) with the University or other agreement, which includes reference to benchmarking, and
- Have common primary language.

For functional and process benchmarking, choose partners with best practice in the areas or processes to be compared.

Membership of benchmarking consortia is another avenue for comparing performance and outcomes with other institutions. [236]

11.3.2. Benchmarking Resources

The area that initiates and manages the project will be responsible for providing the resources for the project. The following resources are normally needed for a benchmarking project:

- Staff time: An investment of staff time is required in collecting, analyzing and reporting benchmarking data.
- Logistical Costs: Some benchmarking projects may require site visits or participation in benchmarking partners' forums.
- Implementation Costs: The implementation of recommendations arising in the final stage of the benchmarking project may incur costs. [236]

11.3.3. Benchmarking Reports

Benchmarking reports will vary depending on the size and complexity of the exercise. They may include:

- A gap analysis
- A discussion of best practice examples
- Recommendations for the adaptation of initiatives to the University of Adelaide context
- A cost/benefit analysis [236]

11.3.4. Benchmarking Checklist

The Checklist covers the key activities of benchmarking:

- Project Selection (Identify what is to be benchmarked)
- Form an Internal Benchmarking Team
- Select the Benchmarking Partners (Consider the necessary protocols required such as confidentiality arrangement, agreements, code of practice, etc.)
- Finalize Benchmarks (Measures & indicators)
- Collect Data
- Analyze Data (Determine performance gaps, reasons for gaps, cost/adaptation benefit analysis)
- Communicate Findings (Gain acceptance from management and area staff)
- Set Functional Targets (Implement specific improvement actions)
- Prepare a Monitor Progress Plan (Include responsibilities and deadlines) [236]

11.3.5. Benchmark: Don't

- Don't initially benchmark areas where the organization already performs well.
- Don't benchmark topics or processes that aren't important.
- Don't benchmark processes that are so broad in scope, so poorly defined, or so poorly circumscribed, that the team cannot agree on its mission and cannot focus its efforts
- Don't undertake benchmarking projects with a team that is too large to be effective (10 or more) or too small to be credible (1 to 2).
- Don't undertake complex process benchmarking efforts with team members that don't understand the benchmarking process and don't have access to and experienced benchmarking facilitator.
- Don't benchmark unless all those affected by likely changes are represented on the benchmarking team or are given opportunity to contribute their ideas and interests to the benchmarking process.
- You aren't targeting a process or it isn't critical to the business
- You don't know what your customers require from your process
- Key stakeholders aren't involved in the benchmarking project
- Inadequate resources have been committed
- You have an unreasonable fear of sharing information with benchmarking partners

- There are no up-front plans for implementing your findings
- You haven't done your "homework" before contacting benchmarking partners
- You're benchmarking an organization rather than a process • There is a strong resistance to change (NIH syndrome)
- When you are expecting results instantaneously [237] [239] [240] [241] [242]

11.4. TQM, Re-Engineering, Performance Measurement & Benchmarking

Total Quality Management (TQM) uses internal methods and the ideas of people within an organization to improve itself from the inside out. This does not include comparing one's organization to that of another, which is critical in benchmarking.

Reengineering has been defined as "the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in contemporary measures of performance, such as cost, quality, service, and speed. While reengineering is cutting-edge and dramatic, and encourages employees to think big, it is still an **internal process**. It does not involve the practices of one organization to compare itself to those of another. While benchmarking may result in the use of completely new ideas similar to reengineering, it often is simply improving on existing ones.

Performance Measurement is a way of determining whether it is providing a quality product at a reasonable cost. What benchmarking does is to use data collected as performance measures and compare it to other organizations that perform those duties or processes. By comparing to other organizations through benchmarking, performance measurement becomes something other than "bean counting". However, since **performance measurement is a prerequisite to benchmarking**, the two have become intertwined, but they are not the same. [237]

11.5. Examples

Almost any activity can be benchmarked. Even the most complex activities can be broken down into component steps or parts for comparison with those in organizations demonstrating good practice. Even processes that are not directly comparable with those in other organizations can be benchmarked using Functional Benchmarking.

In the University environment, the various areas, where you can apply benchmarking are:

- Internationalization
- Financial management
- Human resource management
- Regional engagement and innovation
- University-enterprise cooperation
- Quality management
- Student recruitment
- Student progression and performance

- Curriculum delivery
- Learning, teaching and assessment
- E-learning and Distance Education Services
- Regional Contribution of Universities [243] [244]

11.5.1. University of Otago, New Zealand

The School of Physiotherapy has benchmarked its clinical teaching against the University of Sydney and the University of Queensland, in order to review both the format and the cost effectiveness of clinical education at Otago. This study proved useful not only in providing alternative approaches to clinical education, but also as an impetus towards change. [245]

The University of Otago has also been part of a wide-ranging comparative study, covering four Australian and the seven New Zealand universities and focusing on research outputs across a range of departments and divisions. Data were collected on research published, graduate and postgraduate numbers and research expenditure for the years of 1993 and 1994. These data were weighted by dividing research output by the number of equivalent academic staff in each department. A points system was also used in which different types of publication were given different weightings. The final report was circulated amongst heads of department at Otago, who were seen to be in the best position to act on its findings. As one would expect, the generality of the report prevented the formulation of specific recommendations for change. However, as a guide in identifying underperformance in departments or divisions, the report proved very useful for targeting areas requiring further attention. [245]

11.5.2. University of Bristol, UK

The University of Bristol will often compare itself against the Russell Group (a group of 24 research-intensive universities) or even a sub-set of the Russell Group agreed by the Vice-Chancellor's Advisory Group as a comparator group. [246]

11.5.3. University of Wollongong, Australia

As a self-accrediting institution, the University has an obligation to ensure that it continues to demonstrate high standards of performance in **learning and teaching**, **research** and associated activities. This commitment to excellence is underpinned by a robust and efficient system to support continuous improvement of its processes and outcomes. Benchmarking with appropriate partners, at a national or international level, enables the University to compare and evaluate its performance and, in so doing, monitor standards, compare good practice and make quality improvements. [247]

11.5.4. Griffith University and University of Western Sydney, Australia

During 2007 and 2008, Griffith University and University of Western Sydney (UWS) are working together in a benchmarking exercise to make comparisons in a number of key strategic areas, and

to develop a combination of practical and conceptual outcomes. The Griffith-UWS benchmarking exercise has given priority to projects addressing the following issues:

- Effectively providing student services to a dispersed student body across multiple campuses, and particularly the challenge of coordinating service delivery at any given campus by cross-campus administrative elements
- Effectively leading and managing an academic or administrative element across multiple campuses
- Providing effective systems and IT support for cross-campus academic operations
- Identifying the strategic, policy, quality assurance and pedagogical implications of cross-campus delivery
- Providing effective support across campuses for research activity, including for RHD students
- Improving performance management, support and rewards for senior staff [248]
- Enterprise wide learning management systems (LMS) are integral to university learning and teaching environments. Griffith University and the University of Western Sydney (UWS) are predominantly face-to-face, multi-campus teaching institutions with similar size student bodies and academic communities. Both Griffith and UWS utilize a single enterprise wide e-learning system, although the systems are different. To determine the level and quality of the uptake of the e-learning system a benchmarking activity between the two universities has been carried out. A framework was developed as a product of the partnership and applied to a representative sample of e-learning sites. The results of the benchmarking exercise showed that there are parallel trends between the two institutions in how the LMS is being used, however with distinct differences in specific areas. [249]

11.5.5. James Cook University Australia

Benchmarking is an important principle in the University's Quality Enhancement Framework. It is a means of comparing JCU's performance with those of its peers, either at University wide or discipline specific levels. JCU can make use of benchmarking at various parts of the quality cycle:

- To inform planning and goal setting through referencing comparative data (approach)
- To identify and implement good practice to help achieve the University's goals (deployment)
- To provide evidence based framework for change and improvement (results)
- To identify and monitor standards and performance in order to improve outcomes (improvement). [250]

The Universities benchmarking activities currently include the following:

- Teaching and Learning
- Student satisfaction and engagement
- Student profile and outcomes
- Research & Innovation
- Aspects of international operations
- Library
- Aspects of IT services
- Aspects of marketing services
- Workplace health and safety

- Facilities
- Student Counselling and Careers Services
- Human Resources
- Financial and Business Services [250]

11.5.6. University of Virginia, USA

For the 1998/2000 biennium, the University of Virginia Library chose as one of its goals (6f) to institute benchmarking as a tool for the analysis of internal processes and to establish benchmarks against which the Library can measure those processes. The Library's first Benchmarking Team was created in January 1999. The Team was charged with two challenges: to create a benchmarking process for the Library; and to carry out a short-term benchmarking project as a pilot. [251]

11.5.7. College and the Council, UK

In October 2012 the College and the Council approved the creation of a Project Board to oversee and direct work to evaluate the effectiveness of the Council and to consider what revisions might be necessary to College Statutes and Ordinances. The Board decided that to conduct a deep review of the effectiveness of the College's governance arrangements it was wise to supplement a survey of Council members and members of the senior management team with a study of alternative models in operation in the HE sector, with a view to identifying examples of best practice. Members of the Secretariat have been in discussion with 16 other universities regarding the governance arrangements operating in their governing bodies. 13 pre-1992 universities were identified by the Strategic Development Unit as being the most likely to serve as appropriate comparators, given their similarity to Royal Holloway in size, their degree of research focus, and their status as direct competitors for students in many cases. The Project Board identified 3 post-1992 universities that might provide very different sets of governance arrangements which could serve to broaden our thinking about what is required for effective governance. The universities surveyed were Bath, De Montfort, Durham, the University of East Anglia, the University of East London, Exeter, Goldsmiths, Kings, Kingston, Lancaster, Queen Mary, Sheffield, Southampton, Surrey, Sussex, and York. The Project Board identified a number of questions to ask of each university.

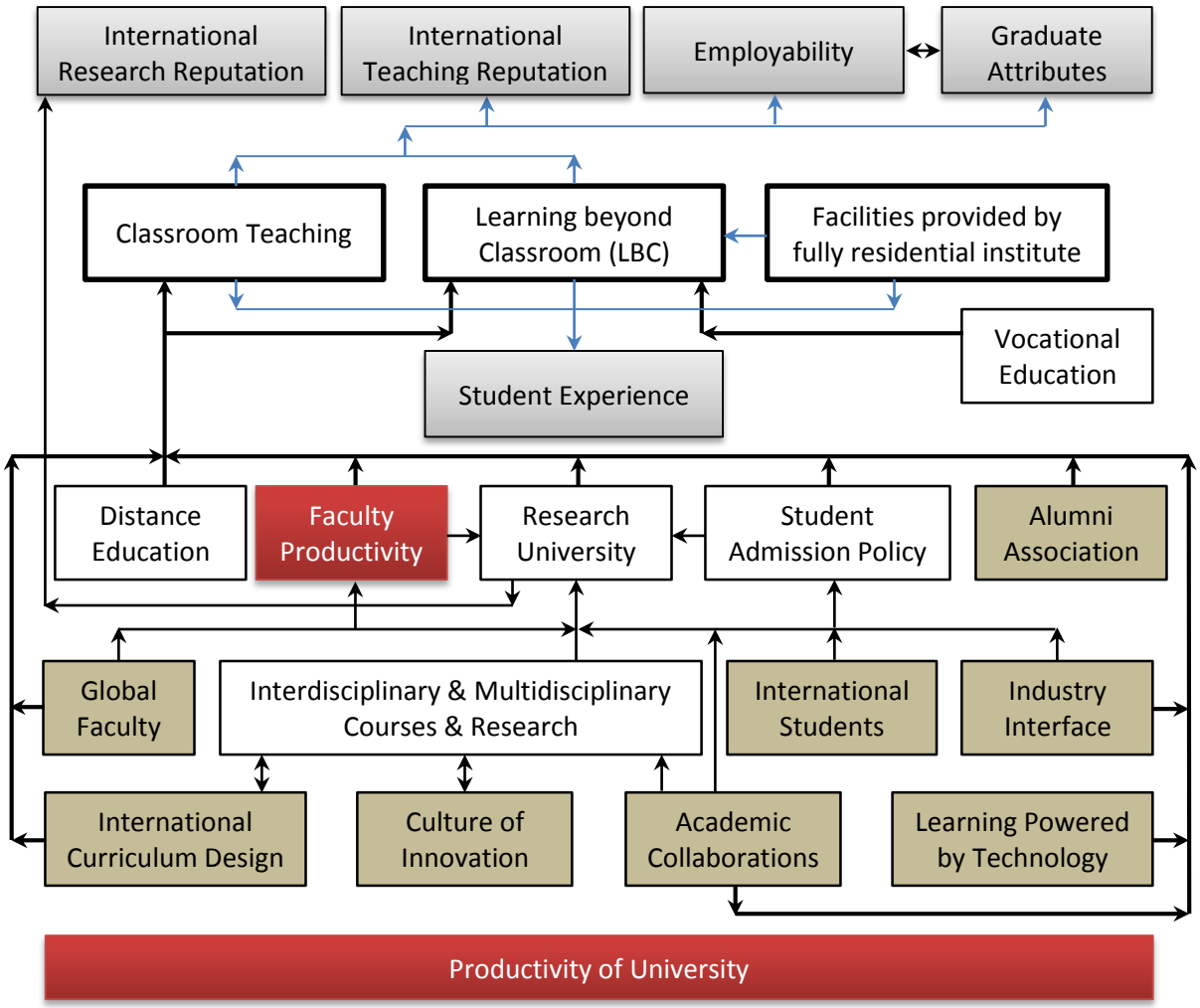
- How effective is the governing body at maintaining a focus on key priorities?
- How does the governing body handle the sharing of information?
- How does the governing body maintain oversight of key risks?
- What is the size of the governing body and how many are staff members?
- How is responsibility divided between members of the governing body?
- What are the formal arrangements for members of the governing body to visit the university?
- How are meetings organized?
- What administrative support is in place to support the work of the governing body?
- When the Statutes or Articles of Government were last reviewed?
- How is succession planning managed?
- What are the induction arrangements? [252]

Chapter 12: Enhance Faculty and University Productivity for Better Educational Outcomes

The Washington Accord (Outcome based Accreditation System) will change the current "qualification and experience based faculty selection approach" and will force to adopt "productivity based faculty selection approach". The old techniques of faculty searching and selection wouldn't work. The Human Resource Management (HRM) Division will have to take care of Searching, Selecting, Managing, Developing and Retaining faculty and staff.

Residential Campus, Amenities, Salary Structure, Teaching & Research Facilities and Culture can help to attract better productive faculty. Unless you have better productive faculty the world class outcomes are impossible.

Every University need to enhance its' productivity continuously to optimize its investments plans. Every WCU is equivalent to Medium size Global Corporation. One must keep close watch on Investment and Productivity for better outcomes.



12.1. HR Selection & Management Strategies

In most of the Universities in India, the faculty selection is done as per guidelines of the UGC, University ordinances and Pay Fixation Committee, which is based on qualification, teaching and research experience. The Washington Accord and the New NBA Outcome based Accreditation System demand more **productive faculty**. The productive faculty must have **additional skill sets** apart from qualification and teaching skills.

To search and select such productive faculty needs very effective **Human Resource Management (HRM) Division**. The simple technique like "**Newspaper advertisement for faculty selection**" **wouldn't work**.

The HRM Division doesn't Exist or **Neglected Activity** in most of the Indian Universities or Institutes. They think that the appointment of faculty should be as per UGC or University ordinance and it doesn't require any special department to handle these issues.

In India, once the faculty is appointed, normally institutes as well as faculty **never bother about their accountability**. The outcome based evaluation process will drastically change this phenomenon. **To produce better outcomes and to enhance the productivity** of the faculty the Institutes or Universities will have to adopt **incentive based mechanism like USA**.

In most of the Institutes or Universities the **faculty retention policies** are missing. It is **difficult to search and attract productive faculty**. Once employed, the institutes can't afford to lose these productive faculty. Thus role of HRM department and Faculty Grievances Cell will be very crucial. They must constantly watch, understand and timely solve the genuine problems of faculty and staff of the institute.

To maintain the efficiency and productivity, the HRM division is responsible for providing the healthy and conducive environment as well as uninterrupted support services for faculty and staff.

The continuous faculty skill development is one of the most neglected process in India. The institutes like "National Institute of Technical Teachers' Training and Research" are available but not in sufficient numbers and unable to support the faculty development of huge number of technical institutes spreaded throughout India. The HRM division need to address this issue of "Teachers development and training" at each institutes. But it requires substantial financial investments.

The Washington Accord may force to reform the human resource selection and management strategies of the institutes and universities. To become Tier-1 institutes or WCU, the institutes will have to adopt the new innovative faculty and staff searching and selection strategies, which are more productive to enhance the graduate attributes.

I have discussed the global faculty searching techniques adopted by WCU in my book "Strategy to Develop World Class University" (Chapter 8, pages 186-203). In this chapter, I would like to discuss the faculty, department and University productivity in detail.

12.2. Productivity: Faculty, Department and University

At the most basic level, productivity is defined as the quantity of outputs delivered per unit of input utilized (labor, capital services, and purchased inputs). [253]

Productivity is a function of inputs, processes, and outcomes, and any attempts at measuring or assessing faculty productivity should include all three components, even if the focus is shifting to outcomes. [254]

Economists define productivity, in the simplest terms, as a **measure of output per unit of input**. Productivity in education can be measured in terms of units, such as average class size, or it can be measured in terms of dollars, such as the quality or value to students relative to the cost of educating students. These definitions allow for an evaluation of how a change in costs, quality or quantities influences productivity in higher education.

- Productivity will increase if student quality increases more than the cost of educating students.
- Similarly, a reduction in costs while student quality remains the same or rises will also increase productivity.

How can institutions of higher learning reduce costs and increase student quality in an effort to increase productivity? [255]

Measuring and managing faculty productivity has become one of the **most significant and controversial policy issues** in higher education, not only within universities but also within state governments. [256]

One of the interesting article at New Yorker stated that "Sectors, like education, have a harder time increasing productivity. Ford, after all, can make more cars with fewer workers and in less time than it did in 1980…Some sectors of the economy, like manufacturing, have rising productivity … which leads to higher wages and rising living standards. But other sectors, like education, have a harder time increasing productivity … the average student-teacher ratio in college is sixteen to one, just about what it was thirty years ago. In other words, **teachers today aren't any more productive than they were in 1980** … colleges can't pay 1980 salaries, and the only way they can pay 2011 salaries is by raising prices". [257] [258] [259]

There is increasing evidence that productivity in the university has also come to mean the productivity of larger units, **departments, divisions, and colleges**. Most commonly, productivity in this sense refers to the "**production of students**" (i.e., to student/teacher ratios, numbers of student credit hours produced, numbers of graduates, etc.), but, particularly in research-oriented universities, it can refer to "**scholarly" productivity**, as, for example, when overall departmental publication records are compiled (to compare departmental "quality") or when departments are asked to demonstrate success in attracting external funding. [260]

While the economist's general definition of productivity, namely **outputs relative to inputs**, is straightforward, the definition is too simple to guide management strategies aimed at increasing productivity. A more thorough definition of productivity recognizes that **productivity can be divided into two parts: efficiency and effectiveness**. **Efficiency refers to the level and quality of service that can be obtained given an organization's fixed resources**. Thus, an organization

is considered more efficient if it can increase the level or quality of service without increasing the amount of inputs used. **Effectiveness, on the other hand, refers to how well an organization meets the demands of its customers**. The customers in higher education are students, parents, employers and state legislatures. Customer demands may include such outcomes as a specialization of knowledge in a specific area, career assistance and job placement and, probably most important, the graduation of well-educated and productive students. Thus, **improving productivity in higher education requires undertaking measures that increase efficiency and effectiveness**. [255]

Universities and their faculty **believe they have high "productivity"** when students learn what's intended and research receives positive peer reviews – in other words, when they are effective in **producing outputs desired by stakeholders**. Economists and those responsible for allocating public resources, on the other hand, use a different definition: the "ratio of outputs to inputs." **Institutions that waste resources may be very effective** (though not as effective as they could be) **but they are not productive by the economist's definition**. [261]

12.3. Faculty Productivity: Recommendations of CEPRI USA

Remember that

- Every department must develop their own faculty productivity measurement strategy. A "one-size-fits-all" strategy should not be used.
- The faculty productivity is a double edged sword. Thus must be used very carefully in decision making process

In this regard, the recommendations of "The Council for Education Policy Research and Improvement (CEPRI), USA are important. It stated that the Faculty Productivity is a crucial element of the **review process for individual faculty members**. Measures of productivity are used to **rationally allocate institutional resources**. Few of the important recommendations are:

- Productivity measurement should always encompass both qualitative and quantitative aspects of faculty work, and should include the three major faculty assignments – **teaching**, **research**, and **service**.
- Any productivity improvement strategies deemed necessary by the institutions should be developed collaboratively among all institutional stakeholders – **faculty**, **administrators**, and **students** – and have clear expectations.
- Measurement and focus of faculty productivity, to be meaningful, must be at the **individual departmental level** within each institution.
- Productivity improvement strategies should be linked directly to the role and **mission** of the institution as well as to the institutional incentive structure.
- Each university should be encouraged to select peer institutions against which to compare themselves for the establishment of productivity **benchmarks**. [254]

12.4. Parameters for Faculty Productivity

There are many parameters for measuring the faculty productivity. It can differ from institute to institute. The important parameters are:

- Direct Instructional Activities
  - Total student credit hours
  - Total students taught, by level
  - Formal courses taught, by type of course section
  - Student evaluations
- Research
  - M.S. students directed
  - Ph.D. students directed
  - Graduate committees
  - Publications: Number of research papers in high impact refereed journal
  - Books: Number of Books, Textbooks, and Reports published
  - Number of Patents
  - Performances
  - Citations
  - Reviews
  - Proposals submitted
  - Number of PhD scholars guided
- Revenue Generation
  - Income from Patents
  - Research grants awarded per year
  - Industrial funding per year
  - Income from consultancy projects
  - Total revenue generated
- Service Activities
  - Departmental and university committees
  - State service
  - National service [254]

EXHIBIT 2-2
QUANTITATIVE AND QUALITATIVE MEASURES OF PRODUCTIVITY INCLUDED IN THE DELAWARE STUDY

QUANTITATIVE MEASURES
-- Proportion of lower-division student credit hours taught by tenured and tenure track faculty;
-- Proportion of lower-division organized class sections taught by tenured and tenure track faculty;
-- Proportion of undergraduate student credit hours taught by tenured and tenure track faculty;
-- Proportion of undergraduate class sections taught by tenured and tenure track faculty;
-- Undergraduate student credit hours per FTE tenured and tenure track faculty;
-- Undergraduate organized class sections per FTE tenured and tenure track faculty;
-- Total student credit hours per FTE tenured and tenure track faculty;
-- Total organized class section per FTE tenured and tenure track faculty;
-- Direct instructional expense per student credit hour taught; and
-- Direct separately budgeted research and service expenditures combined, per FTE tenured and tenure track faculty.
QUALITATIVE MEASURES
-- Number of refereed publications within past 36 months;
-- Number of textbooks, reference books, novels, or volumes of collected works within past 36 months;
-- Number of edited volumes within past 36 months;
-- Number of editorial positions held within past 36 months;
-- Number of externally funded contracts and grants received within past 36 months;
-- Number of professional conference papers and presentations within past 36 months;
-- Number of nonrefereed publications within past 36 months;
-- Number of active memberships in professional associations and/or honor societies within past 36 months;
-- Number of faculty engaged in faculty development or curriculum development activities as part of their assigned workload;
-- Five-year undergraduate persistence and graduation rates for most recent cohort;
-- Most recent average student satisfaction scores for -quality of academic advisement -out of class availability of faculty -overall quality of interaction with faculty;
-- Proportion of most recent graduating class finding curriculum-related employment within 12 months of commencement;
-- Proportion of students passing licensing, certification, or accreditation examinations related to academic major;
-- Proportion of most recent graduating class continuing to pursue further graduate or professional education;
-- Number of students engaged in undergraduate research with faculty mentor within past 12 months;
-- Number of students engaged in internship or practica under direct supervision of faculty over past 12 months;
-- Number of students who author or co-author with a faculty mentor an article or chapter over past 36 months; and
-- Number of students presenting or co-presenting with a faculty mentor a paper at a professional meeting.

Table 12.1: Quantitative & Qualitative Measures of Productivity included in "Delaware Study" [254]

12.5. Advantages of Measuring Faculty Productivity

12.5.1. Rating the Department

The department productivity can be rated either above or below average and then can be rewarded. If "National Benchmark for Productivity" is available then the standing of the department and performance can be judge. This measurement can help to categorize the departments in to either "efficient" or "expensive. Category.

12.5.2. Resource Allocation to Departments

When institutions routinely collect data on faculty activities, it also opens up the question of whether to measure departmental productivity (and not just individual productivity). It is obviously possible to aggregate the data on individual faculty members and create a picture of a department's overall productivity. These data can become the basis for comparisons, either within institutions or across them. For example, chairs know that Deans and other administrators sometimes gather data on departmental "productivity" and use them to help guide resource allocation decisions. [260]

12.5.3. Process Improvement

Department wise or Institute wise comparisons or Benchmarking of Faculty Productivity can help to enhance the processes of research, teaching and services offer by departments.

12.5.4. Deciding Salary Structure, Promotions and Motivation Policy

The faculty productivity measurement can help to take decisions about faculty promotions, increments, reward and or punish policy. It also help to take decision about motivation policy.

12.6. Factors Affecting the Faculty Productivity

12.6.1. Organizational Culture

The culture of Innovation can boost the faculty productivity. Strong culture leads to creating better feeling for employees and do better things. Also, a strong organizational culture increases commitment of employees to the organization and creating align between employee goals and objectives, and this factor is an important factor for increasing productivity. [262]

12.6.2. Environmental conditions

A good environment can influence the development of personal values, increasing of their ability and their productivity. Environmental factors affecting the productivity of human resources can include observe workplace health and safety principles, precise in placement and arrangement of equipment, providing minimum physical standards for the design of the environment and different sectors, use of appropriate technology and facilities to do things better, accuracy and effort to sequence the parts related to each other in terms of working. [262]

12.6.3. Empowerment

Empowerment of human resources is the psychological concept that is related to emotions and beliefs to their job and organization and is defined as the process of increasing intrinsic motivation that 5 dimensions including

- Sense of competence (self-efficacy),
- Sense of autonomy (having choice right),
- Feel the effectiveness (impact),
- The sense of being meaningful (useful) and
- Trust (security) [262]

12.6.4. Motivational Factors & Encouragement Policy

Motivational factors are effective on productivity of faculty members. In India, the public university salaries are paid as per criteria of Pay Commission. The Private Universities generally offer higher salaries to the very few faculty members. But there is no motivational or encouragement component.

Pankaj Jalote, director, IIIT Delhi & M Balakrishnan deputy director, IIT Delhi stated that "Perhaps the single biggest factor that motivates faculty in the US to compete vigorously for research grants is the provision of a 'summer salary' in these grants. **The yearly compensation of faculty in the US is for nine months, allowing faculty to earn up to three months' salary from research projects**. In other words, a faculty member can earn up to one-third more in a year through research grants. This is a brilliant policy which creates a huge incentive for faculty to get grants, and then to deliver the research output promised in order to secure grants in future as well. And it keeps the incentive limited, preventing it from being entirely money oriented, since a faculty member can only earn some fraction of his salary even if he has a multimillion-dollar grant. In India, research grants do not allow any such incentive for the researchers. Just allowing for the faculty member to get some percentage of his salary from a project can dramatically change the sponsored project scenario. The drive to get grants will bring about better proposals and the faculty will strive harder for more and higher quality research". [263]

In Self-Financed University the salary of renowned faculty is above the prescribed pay scales. The pay component which is above regular salary can be a **"conditional salary", which can be related to performance indicator**. That is, the salaries of highly paid staff should have fixed component and variable component. The variable component should be proportioned to performance indicator. This technique can increase the productivity of faculty.

The Indian Universities must design motivation and encouragement strategy while framing the salary policies and must create competitive environment to develop the Tier-1 Institutes and WCU.

12.6.5. Leadership Style

Research conducted by Chuang Fong has shown that leadership style of managers is related to effectiveness, efficiency and productivity of organizations and use of most important relationship

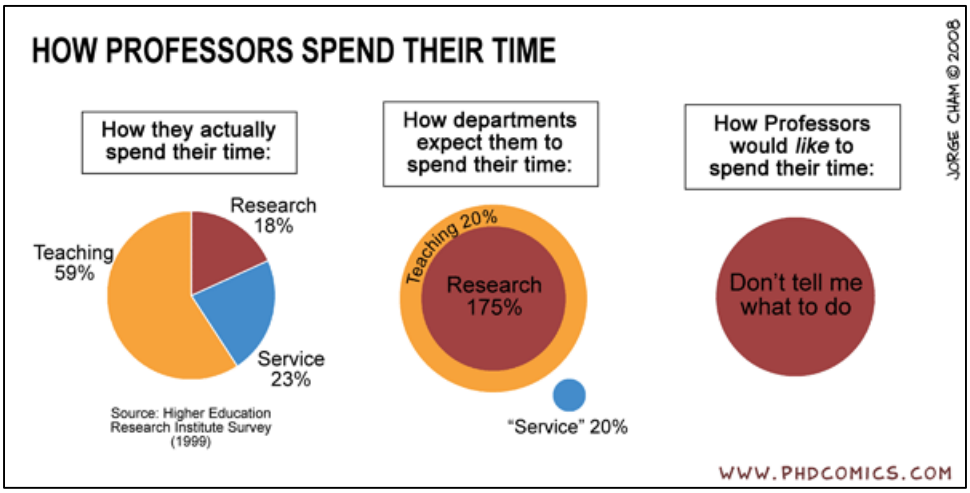
style lead to increasing effectiveness and efficiency and ultimately will improve labor productivity. [262]

12.6.6. Use of Technology and Campus Workforce Management Software

The use of Information and Communication Technology can drastically increase the faculty productivity. There are number of software tools are available for Campus Workforce Management. If properly used these software can boost the faculty and department productivity. I have discussed this issue in detailed in my book "Technology-Storms Redefining World Class Universities".

12.6.7. Organizational Survey and Research

The Higher Education Research Institute had done a nice survey for "How Professor spend their time" and "with whom they are working". These kind of analysis can help to improve the faculty productivity. [264]



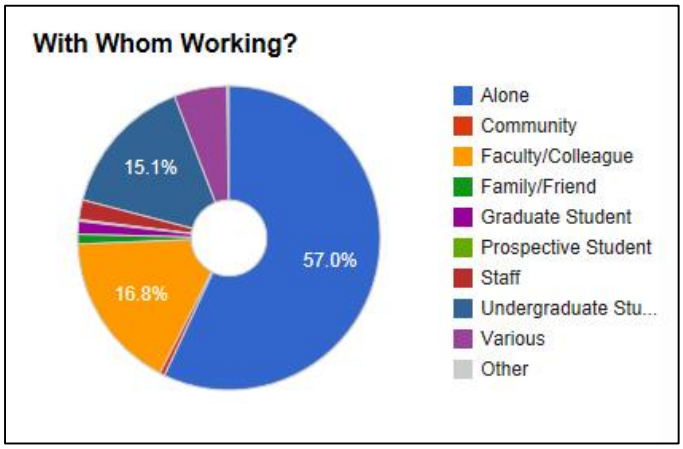


Fig. 12.1: Higher Education Research Institute Survey: How Professor spend their time and with whom they are working [264]

This data illustrates that the work of faculty members was more complex than represented in workload policy and annual reporting activities. These results suggest that Boise State faculty work substantially more than the 40 hours per week. Our study participants spent the largest portion of their time during the week on teaching-related activities and a much smaller proportion of our workweek time on research. [264]

12.7. Complexities of Faculty Productivity

"But measuring the productivity of **people who don't produce tangible** goods will never be straightforward, **because the outputs are so varied in form and manifestation, and even in timeframe**: the full impact of what faculty "produce" **may not be felt for years** as their students, projects and contributions mature and evolve in the cumulative world of knowledge. The temptation is always to measure what can most easily be counted; we must supplement the obvious numbers with assessments of what really matters." [265]

There have always been disputes about this type of measurement of faculty productivity. Generally, these focus on

- Are citation rates meaningful?
- Should books count more or less than articles?
- How should journal prestige be measured?
- What weight should be given to journal prestige?
- How to weigh the relative significance of grants and publications?
- How should submissions with multiple authors be judged?
- How should articles in specialty journals be judged in comparison to articles in "mainline" journals?
- How should articles outside the field of sociology be judged in comparison to articles in sociology journals?
- What weight should be given to external reviewers? What weight should be given to grants (i.e., external funding)?
- What weight should be given to textbooks?
- What weight should be given to trade texts rather than to those published through academic or university presses?
- How should publications in international journals be judged?
- Questions are also raised about the appropriate period of time over which to measure productivity (One year? Three years? Five years?)
- And there are always disputes about how the data should be used. [260]

The major problem for measuring faculty productivity is off campus work. Faculty spent a substantial amount of time working off campus – work that may be less visible to their colleagues and administrators. Weekends were times to prepare and catch up on courses, as well as conduct research. [264]

12.7.1. Complexities of Faculty Research Productivity

In research, publications are easy to count and so are research dollars. All other things being equal, more publications and more funding are suggestive indications of greater impact, accomplishment and "productivity." But all other things are never equal: publications vary in quality and impact, funding varies in availability and competitiveness by discipline, or across the theoretical/applied spectrum. Moreover, measuring an input like funding ignores what the funding led to – what did it produce? Constructs like the H-index can help fine-tune assessment of research impact, but in some fields research outputs take other forms, less amenable to pure citation analysis: from patents, disclosures and partnerships to paintings, plays and poems. We must also account for the significant productive effort that goes into supervision and training of graduate students. [265]

12.7.2. Complexities of Faculty Teaching Productivity

Teaching has several simple-but-incomplete metrics: student-faculty ratios assume that each instructor has only a fixed amount of "teaching" to divide among learners; higher graduation rates can reflect lowered standards or increased student success; student course evaluations can devolve into a thinly veiled popularity contest. There are nuggets of utility in numbers like this, but to characterize (and incentivize) truly productive teaching we ought to recognize outputs like student engagement, learning outcomes assessments and curriculum innovations (which, like foundational research, have effects that grow in time). We also should capture the impact of efforts outside the classroom, like thesis and project supervisions, experiential and service-learning activities, and the informal but productive interaction that makes up unassigned teaching. [265]

The measurement of teaching effectiveness is complex and problematic. The most commonly used technique for assessing teaching quality is a quantitative instrument completed by students near the end of a course. These instruments are used on most university campuses, but have been the subject of much criticism. Some see such instruments as measuring little more than faculty popularity with students. Others contend that a variety of factors (class size, gender of instructor, rank of instructor, expected grade, difficulty of course, etc.) affect student responses, making the results of these evaluations difficult to interpret and/or misleading... There has also been extensive research on the reliability and validity of the many existing quantitative measures of teaching effectiveness... Qualitative analyses of teaching effectiveness are much less common. Peer reviews of teaching are time-consuming and some have questioned their reliability. [260]

12.7.3. Complexities of Faculty Services Productivity

The measurement of service is best described as crude and commonly consists of little more than a listing of committee assignments in the department, college, or university and/or of activity in professional associations at the national or regional level. [260]

Service doesn't mean only internal committee work. Faculty engage in community service, both local and global. As specialists in their field, they advise governments, industry, non-profits and other institutions; and they serve their disciplines by reviewing or editing the "productions" of their colleagues. [265]

12.8. Faculty Scholarly Productivity Index (FSPI), USA

The Faculty Scholarly Productivity Index (FSPI), a product of Academic Analytics, is a metric designed to create benchmark standards for the measurement of academic and scholarly quality within and among United States research universities. The index is based on a set of statistical mean algorithms developed by Lawrence B. Martin and Anthony Olejniczak. It measures the annual amount and impact of faculty scholarly work in several areas, including:

- Publications (how many books and peer-reviewed journal articles have been published and what proportion of the faculty is involved in publication activity?)
- Citations of journal publications (who is referring to those journal articles in subsequent work?)
- Federal research funding (what and how many projects have been deemed of sufficient value to merit federal dollars, and at what level of funding?)
- Awards and honors (a key indicator of innovative thinking and/or scholarly excellence that has impacted the discipline over a period)

The FSPI analysis creates, by academic field of study, a statistical score and a ranking based on the cumulative scoring of a program's faculty using these quantitative measures compared against national standards within the particular discipline. Individual program scores can then be combined to demonstrate the quality of the scholarly work of the entire university. This information is gathered for over **230,000 faculty** members representing **118 academic disciplines** in roughly **7,300 Ph.D. programs** throughout more than **350 universities** in the **United States**. [266]

12.9. Parameters to Attract Productive Faculty

The teacher is the backbone of any educational institute or university. To attract productive faculty of the world the following parameters need special attention. Remember that, the fully Residential Campus with amenities is again one of the dominating factor.

SN	Facilities to attract Global faculty
Internal Academic Factors	
1.	Academic Freedom
2.	Minimum 4 full time PhD scholars
3.	Minimum one Postdoc scholar
4.	Best academic environment
5.	Talented UG / PG students
6.	Brand Name of your University
7.	Best Practical & Specialized R&D Labs
8.	Best Library Facilities and Digital Learning Space
9.	Best Computing facilities, Computerization and atomization
10.	ICT for Education
11.	Research Facilities
12.	Excellent Industry collaboration and partnerships (Many parameters see chapter 10 for details)
13.	Faculty Exchange
14.	Collaborative Research
15.	Visiting Professor
16.	Sharing of Industrial Lab
17.	Equally good faculty members to form a highly interdisciplinary team
18.	Growth opportunities

Financial Aspects	
19.	High Salary structure
20.	Incentives
21.	Research grants projects
22.	Fellowships / Scholarships for students
23.	Funding for attending conferences and other events
24.	Transport facility
Internal Other Factors	
25.	Efficient Administrative System
26.	Administrative Freedom
27.	Best Campus Environment and Infrastructure
28.	Best Intercontinental Food at subsidized rate for 24x7
29.	Better city life
30.	Decent Culture
31.	**Residential campus with world class amenities**
32.	Logistic facility
33.	Recreation Facilities
34.	International standard other amenities
35.	Sophisticated & Caring Management
36.	Support Services like maintenance division, network services etc.
37.	Logistic facility
38.	International office for help regarding legal formalities related to visa etc.
External Factors	
39.	Good City with Flight & Train connectivity
40.	Better educational facilities for children at cities and inside campus
41.	Jobs for spouse

Table 12.2: Parameters to attract good productive faculty

More details on searching and attracting good faculty are available in Chapter 8 (pages 186-203) of my book "Strategy to Develop World Class University".

12.10. Role of Human Resource Management Division

The Human Resource Management (HRM) Department plays a very crucial role in developing the Tier-1 Institutes or WCU. The functions of this department are:

SN	Responsibilities of HR Department
1.	Develops organization strategies by identifying and researching human resources issues
2.	Contributes information, analysis, and recommendations to University's strategic thinking and direction
3.	Manages human resources operations for recruiting, selecting, orienting, training, coaching, counseling, and disciplining staff
4.	Planning, monitoring, appraising, and reviewing staff job contributions; designing systems; accumulating resources; resolving problems
5.	Builds Relationships, Organizational Astuteness, People Skills, Retaining Employees
6.	Performance management
7.	Payroll management
8.	Identify the unwanted staff members based on performance reports
9.	Continuously search for the best global faculty

	• Other institutes or universities • Research Scholars who are in final stage of submission of PhD thesis • Alumni faculty members • Attending various conferences • PhD Guides • Social networking sites like LinkedIn • Searching the database of Job sites
10.	Find the most appropriate person for different category of faculty and keep balance between them • Purely Teaching faculty • Faculty with wide Research contribution • Faculty with wide industry exposure • Seed Faculty and Professor Emeritus • Visiting and Adjunct Faculty • Academic Administrators
11.	The crucial components of the HR Policies are • Policy for appointing Seed Faculty • Staff Recruitment Policy • Foreign Faculty Recruitment Policy • Best Staff Retention Policy • Faculty Salary Policy

Table 12.3: Responsibilities of HRM Department

12.11. Examples of HRM Divisions of World Renowned Universities

Almost every World Renowned Universities have their own HR Departments and websites. I would like to highlight the important points from these websites.

12.11.1. Manchester Metropolitan University, UK

HRM Division - Supporting the University for World-Class Professionals. The success of the University depends on the people who work here. We support managers to ensure excellent leadership and management to achieve engaged, motivated and customer focused staff who provide our students with the best possible experience. Manchester Metropolitan University is the University for World-Class Professionals. That applies to the students we nurture and the people we employ - from academic staff through to professional services. [267]

12.11.2. The University of Edinburgh, UK

To attract, develop, reward and retain the best staff for a world class institution. The People strategy (20 pages document) is given at their website. [268] [269]

12.11.3. Carnegie Mellon University, USA

Carnegie Mellon is a global research university recognized for academic excellence, groundbreaking research and interdisciplinary collaboration. Human Resources supports the university by attracting, developing and retaining a world-class, diverse workforce. Recognizing that each employee plays an important role in advancing Carnegie Mellon's success, Human Resources also provides a variety of high-quality programs and services that help employees thrive. [270]

12.11.4. The University of Nottingham, UK

The Human Resources Department (HR) is critical in providing strategy, policy, procedures and advice ensuring we continue to support both individual and managerial staff throughout employment at the University. This includes:

- Delivery of effective recruitment and staffing solutions
- Supporting a motivated workforce through opportunity, professional development and pay and reward
- Enabling a flexible working environment, recognizing that individuals have different needs
- Embracing diversity in all that we do
- Ensuring ongoing achievement though effective performance management.

The University of Nottingham's HR website is designed to provide up-to-date information and guidance to managers and staff to support both individual and managerial staff related needs. [271]

12.11.5. University of Cambridge, UK

The Division provides a range of services to leaders and staff across the University. The Division works closely with staff with HR responsibilities in Institutions, and devises HR policies, procedures and initiatives to promote the University's objectives of being a good employer. We have a team of specialist HR Business Managers who are each assigned to a School. The HR Business Managers and their teams are supported by HR Business Services, who administer the University's payroll, maintain staff records and report on staff-based statistics. The Division also includes the Disability Resource Centre, Occupational Health, Counselling, Dentistry, Safety Office, Pensions and Childcare — these sections provide a service to all staff, but also work with the HR Business Managers, to provide an integrated service. Finally, as well as offering guidance on employing staff, our recruitment team produces a listing on the University's job vacancies and runs the Temporary Employment Service which supplies support staff to University departments. Our Centre for Personal and Professional Development provides a range of training and development opportunities for all University staff and our Equality and Diversity team ensures the University is compliant with regard to diversity legislation while providing welfare support for all employees. [272]

12.11.6. Boston University, USA

Our role is to design, develop, and implement a comprehensive human resources program to serve the University community and attract, reward and retain high-quality faculty and staff. [273]

12.11.7. University of Louisville, USA

Welcome to Human Resources at the University of Louisville. Faculty and staff are the University's #1 asset and are Human Resources' #1 priority. Human Resources' role is to help campus administrators recruit, retain, recognize, and reward top quality faculty and staff. We are committed to the following strategies to foster an environment in which we add value to the University:

- We will strive to align our services with the academic, research, and service mission of the University and continuously evaluate our services through the eyes of our customers.
- We will continue to embrace a "judgment-based" approach to Human Resources administration (and move away from a historical "rule-based" approach to HR).
- We will advise, but we will not direct. We will serve, but not regulate. We will "look for ways to say yes," with multiple levels of review cascading up to the chief HR officer before we say no.
- We will share our knowledge and judgment, but without supplanting managers' judgment for our own.
- We will maintain appropriate internal audit and public accountability mechanisms and satisfy external stakeholder requirements, but will do so in the least intrusive manner possible.

This page provides an array of information regarding HR services including employment & compensation, salary and benefits administration, staff development & employee relations, and our health and wellness programs. [274]

12.12. How to Increase Productivity of University or HE Institute?

How can institutions of higher learning reduce costs and increase student quality in an effort to increase productivity?

12.12.1. Vision-Mission and Productivity

The productivity also depends upon the Vision, Mission, Goals and Objectives of the University.

12.12.2. Adopt Appropriate Efficient & Effective Governance Model and Mechanism

The University Act gives broad governing framework. It is expected that the Board of Governance (BOG) should develop Efficient & Effective Extended Governance Model and Mechanism considering legal framework, financial requirement and availability of resources, which can optimize the productivity of the University.

12.12.3. Use of Technology for Enhancing Governance Mechanism

The technologies are Providing New Dimensions to administration and enhancing the productivity of the University. Few prominent technologies in this list are:

- CRM
- ERP
- Business Intelligence
- Big Data
- Analytics
- Predictive Analysis
- Visualization
- VOIP
- Surveillance Systems
- Intelligent Campus Systems
- Document Management Systems
- Online Scheduling System

Microsoft Education Blog stated that "Nearly two thirds of universities in the US reported in June 2012 that analytics or business intelligence was a major priority for their institution, or some departments within their institution. And 84% reported that it was more important to them than two years ago." [275]

I have discussed this issue in details in my book "Technology-Storms Redefining World Class Universities".

12.12.4. Teaching Learning Powered by Technology

The National Educational Technology Plan (NETP) 2010 draft of U.S. Department of Education Learning namely "Transforming American Education: Powered by Technology" covers lot of details. This draft stated that "Just as technology is at the core of virtually every aspect of our daily lives and work, we must leverage it to provide engaging and powerful learning experiences, content, and resources and assessments that measure student achievement in more complete, authentic, and meaningful ways. Technology-based learning and assessment systems will be pivotal in improving student learning and generating data that can be used to continuously improve the education system at all levels. Technology will help us execute collaborative teaching strategies combined with professional learning that better prepare and enhance educators' competencies and expertise over the course of their careers. To shorten our learning curve, we can learn from other kinds of enterprises that have used technology to improve outcomes while increasing productivity. The National Educational Technology Plan (NETP) calls for revolutionary transformation rather than evolutionary tinkering." [276]

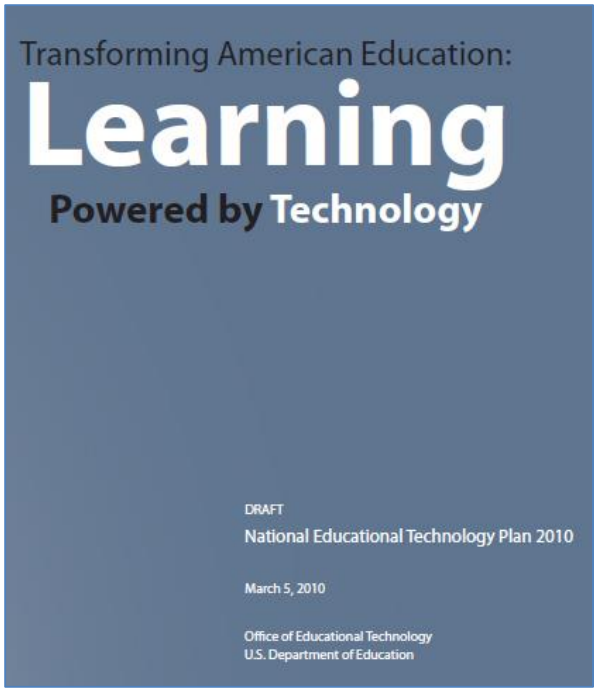


Fig.12.2: USA Education Policy 2010: "Learning Powered by Technology" [276]

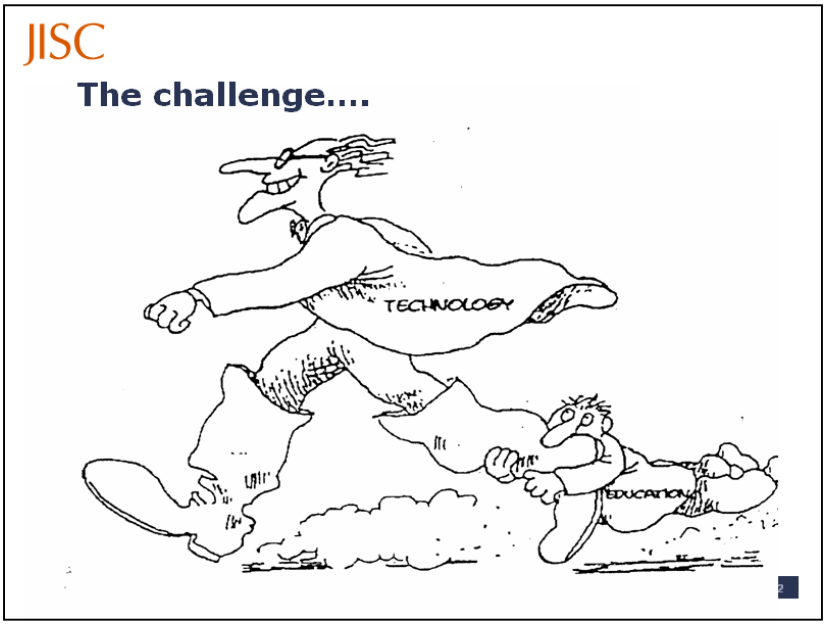


Fig. 12.3: Technology dragging the field of education [277]

I have discussed this issue in details in my book "Technology-Storms Redefining World Class Universities".

12.12.5. Attract Global Talent: Students and Faculty

The talented students and faculty can only enhance the productivity of University of Higher Education institute. I have discussed this issue in detailed in Chapter 7 and 8 (Pages 138-203) of my book "Strategy to Develop World Class University"

12.12.6. Use of Best Practices and Processes

I have discussed this issue in details in my series of books "Strategy to Develop World Class University", "Funding Techniques of World Renowned Universities" and "Technology-Storms Redefining World Class Universities".

12.12.7. Faculty and Staff Training and Development

The productivity of the University can't increased without continuous training and development of faculty and staff of the University. Generally this aspect is neglected in India.

12.12.8. Increase Research Productivity

To enhance the research productivity needs global talent and research culture. I have discussed this issue in more details in my book "Strategy to Develop World Class University".

12.12.9. Adopt the Processes Which Generate Revenue, Enhance Teaching Learning and Employability

The processes like Distance Learning, Vocation Education, Involvement of Alumni, Strengthening HR and T&P divisions etc. increases productivity, generate revenue, enhance teaching learning and enhance employability. I have discussed this issues in more details in my book "Strategy to Develop World Class University".

12.12.10. Maintenance and Support System

The prompt maintenance and excellent support systems can boost the productivity of human resources of the University.

12.12.11. Policy for Optimum Utilization of Resources

The policy of optimum utilization of resources is needed to enhance the productivity of the system. Many times the vital resources of the university are underutilized like library services, ICT infrastructure and services, laboratory instruments, teaching resources etc. Many universities have framed standard procedures for installation of new instruments, operational procedures and manuals, maintenance etc. They keep strict vigilance on utilization of resources. The authorities

can get instant information about underutilized resources and utilization policies can be restructured immediately.

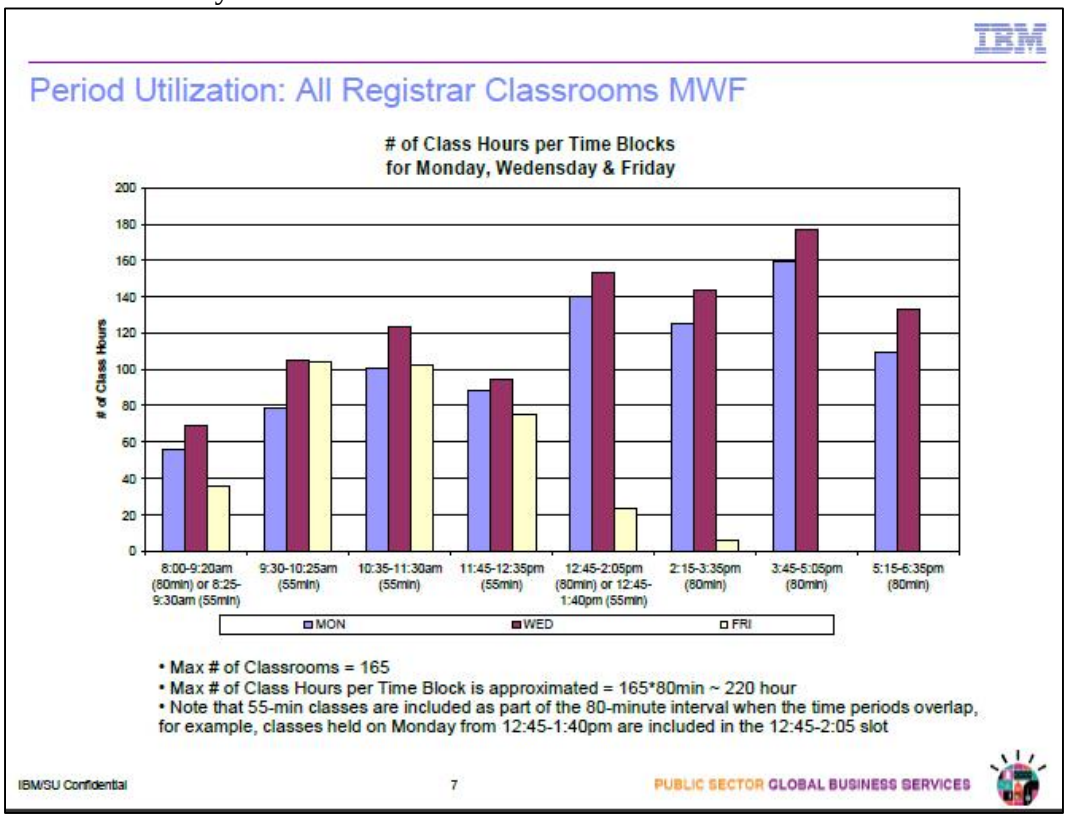


Fig. 12.4: Syracuse University USA: Classroom utilization report [346]

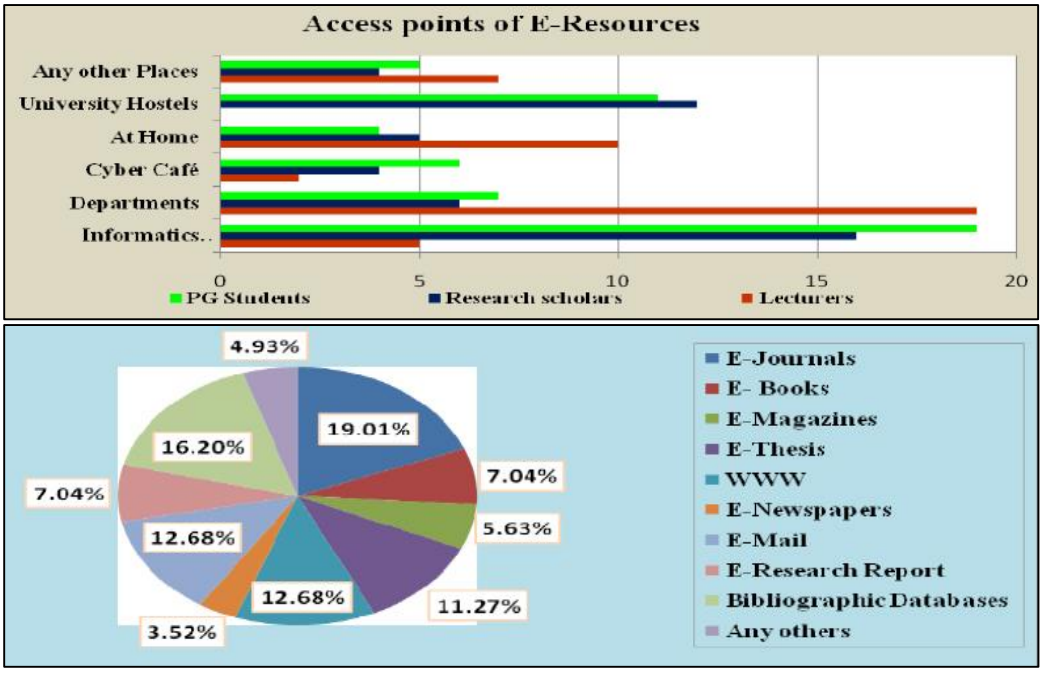


Fig. 12.5: Utilization of E-resources of the University [347]

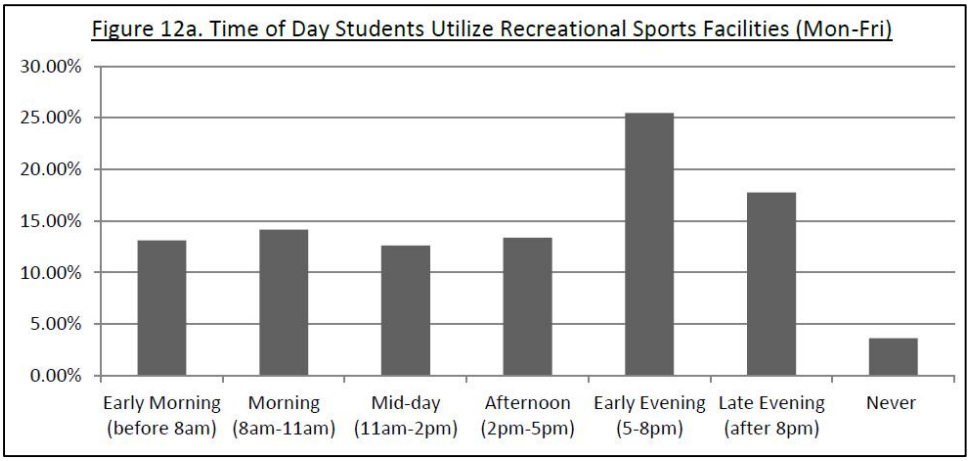


Fig. 12.6: Time of Day Students Utilize Recreational Sports Facilities (Mon-Fri) [350]

12.12.12. Cost Saving and Optimum Fund Utilization Policies

I have discussed this issue in more details in Chapter 9 (pages 110-124) my book "Funding Techniques of World Renowned Universities".

12.12.13. Promote Innovation

The National Innovation Council defines innovation as: "Innovation today is increasingly going beyond the confines of formal R&D to redefine everything. Today innovation can mean

- New and unique applications of old technologies
- Using design to develop new products and services
- New processes and structures to improve performance in diverse areas
- Organizational creativity
- Public sector initiatives to enhance delivery of services [207] [278]

"Innovation is being seen as a means of creating sustainable and cost effective solutions for people at the bottom of the pyramid, and is being viewed as an important strategy for inclusive growth in developing economies." [207] [278]

It requires nothing short of a paradigm shift in the established ways of thinking about university education. It calls for

- Redefinition of knowledge and its purpose
- Reorganization of branches of knowledge
- Rethinking the existing practices of teaching-learning and research
- Recognition of the limits of what we know [207] [278]

The innovation increases the productivity of the organization at all levels.

- Innovative Teaching and Academics Programme
- Innovative Research Programme

- Organizational Innovations
- Innovative Exposures to Business, Industry, Administration and Internationalization
- Innovative Faculty Recruitment & Retention Process
- Innovative applications of Technology

I have discussed this issue in more details in Chapter 19 (pages 407-426) of my book "Funding Techniques of World Renowned Universities".

12.13. Complexities of Measuring Productivity of University

Productivity measurement is difficult in most service industries, and education is certainly no exception. [255]

A major difficulty therefore with measuring the productivity of higher education is that higher education has **multiple goals** (e.g. excellence in teaching and research, equity and diversity) that are **pursued at the same time**. The **various stakeholders** (government, parents, students, institutions or individual staff members) have **different views** as to these goals. The **diversity of institutions** adds another complexity. For example, some Universities emphasize undergraduate teaching while others emphasize research. Consequently **we should not try to measure productivity starting from the assumption that all universities have common missions and goals**. A further difficulty is that higher education is a **service industry with multiple outputs**, some of which are **difficult to measure**. This is in contrast to the product sector of the economy where the outputs are easier to measure – for example in an industry producing goods such as motorcars it is relatively easy to obtain output figures. Outputs of higher education which can be measured directly include the **number of awards** conferred or the **number of research publications**. Outputs that cannot be measured directly include the **value added to students** in terms of knowledge and competencies conferred through university teaching and other externalities such as the **contribution of university research to society**. A major response to the difficulty in measuring the output of higher education has been to use a **range of performance indicators** to track performance over a period of time. However although there has been a great deal of discussion as to an appropriate set of indicators for higher education there has been no real consensus reached. One of the most contentious factors in measuring productivity or implementing productivity improvement strategies is **whether quality is being sacrificed**. An increase in productivity is achieved only if it is consistent with quality objectives which could be an increase or no change in quality. Of course, there is **no scientific formula for measuring quality** – each situation must be subject to scrutiny and assessment by the stakeholders concerned. It is a subjective and qualitative measure, so it **often raises debate**. Nevertheless **quality is a key factor in measuring productivity**. An increase in productivity is achieved only if it is accompanied by an increase or no change in quality. Hence a key indicator of improving productivity is an increasing ratio of output to input at constant or improved quality….measuring the productivity of higher education is not straightforward and an appropriate assessment… [279]

Application of a productivity metric to a specific industry or enterprise can be **complex, particularly for education** and certain other service sectors of the economy. Applied to higher

education, a productivity metric might track the various kinds of worker-hours that go into producing a student credit hour or degree. The limitation of this approach is that, because higher education uses a **wide variety of operational approaches**, which in turn depend on an even **wider variety of inputs** (many of them not routinely measured), it may not be practical to build a model based explicitly and exclusively on physical quantities. Of even greater significance is the fact that the **quality of inputs (students, teachers, facilities) and outputs (degrees) varies greatly across contexts**. [253]

A primary objective of industries, enterprises, or institutions is to **optimize the efficiency of production processes**: that is, to maximize the amount of output that is physically achievable with a fixed amount of inputs. Productivity improvements are frequently identified **with technological change**, but may also be associated with a movement toward **best practice or the elimination of inefficiencies**. The measurement of productivity presumes an ability to construct reliable and valid measures of the volume of an industry's (or firm's) output and the different inputs. Though productivity improvements have a **close affinity to cost savings**, **the concepts are not the same**. Cost savings can occur as a result of reduction in input prices, so that the same physical quantity of inputs can be purchased at a lower total cost; they are also attainable by reducing the quantity or quality of output produced. But, by focusing on output and input volumes alone, it becomes difficult to distinguish efficiency gains from quality changes. [253]

12.14. Case Studies: Productivity of University & HE Institutes

12.14.1. Bond University, Australia: Prof. Ken Moores, VC and President,

The statistical data of the University can be collected like

Teaching and Learning

1. Student enrolments rose 15% from 604,176 to 695,485;
2. Student load increased by 19% from 467,748 to 557,763;
3. Award course completions rose 21% from 140,918 to 171,089;
4. Overseas student enrolments rose 84% from 51,944 to 95,607;
5. The "overall satisfaction" of students with their educational experience, as indicated by the Graduate Careers Council of Australia's Course Experience Questionnaire, increased by 2 percentage points from 88% to 90%;
6. The Student: Staff Ratio (ratio of student load or EFTSU to Teaching Only and Teaching and Research Academic Staff FTE) rose by 26% from 14.9 to 18.8; [279]

Research

1. Higher degree research load or EFTSU increased by 16% from 25,138 to 29,205;
2. Higher degree research completions rose by 62% from 2,327 to 3,781;
3. Research grant earnings increased by 40% from $694 million to $972 million (in year 2000 dollars);
4. International research grant funding increased by 182% from $32.1 million to $90.6 million (in year 2000 dollars);

5. Weighted research publications increased by 77% from 15,191 to 26,822 [279]

Resources and Finance

1. The staff "Staff Full Time Equivalent (FTE) resources (academic and general staff) going into producing the above outcomes rose by only 2% from 80,754 to 82,233;
2. The expenditure of the higher education system rose 27% from $7.1 billion to $9.0 billion (in actual dollars spent);
3. The real increase in expenditure by the system measured in year 2000 dollars was 16% up from $7.8 billion in 1995 to $9.0 billion in 2000 [279]

Productivity per unit of labor resources invested

1. The productivity of labor resources, in terms of student load per staff member (academic and other) increased by 17% or 3.3% per annum;
2. Completions per staff FTE increased by 19% or 3.6% per annum;
3. Research earnings per staff FTE increased by 37% or 6.6% per annum;
4. Weighted Publications per Staff FTE increased by 73% or 11.6% per annum [279]

Productivity per unit of financial resources invested

1. Student load per million of expenditure increased by 3% or 0.5% per annum;
2. Completions per million of expenditure increased by 5% or 0.9% per annum;
3. Research earnings per million of expenditure increased by 21% or 3.8% per annum; and
4. Weighted publications per million of expenditure rose by 52% or 8.7% per annum. [279]

Based on this data, the productivity can be calculated.

Productivity of Higher Education : Selected Measures

	Outputs			Inputs	Inputs	Productivity			
Completions	Award Course Satisfaction	CEQ % Broad Publications	Weighted Research	Staff FTE	Operating Expenses	Completions / Staff FTE $ millions[a]	Completions / Operating	Publications / Staff FTE Expenses	Publications / Operating Expenses
1995	140,918	88%	15,191	80,754	7,755	1.745	18.170	0.188	1.959
1996	145,228	89%	16,222	82,888	7,985	1.752	18.187	0.196	2.031
1997	155,275	90%	22,689	81,404	7,977	1.907	19.464	0.279	2.844
1998	161,556	89%	26,090	80,285	8,379	2.012	19.281	0.325	3.114
1999	164,423	90%	26,932	80,832	8,974	2.034	18.323	0.333	3.001
2000	171,089	90%	26,822	82,233	9,006	2.081	18.997	0.326	2.978
Total Increase	21%	2%	77%	2%	16%	19%	5%	73%	52%
Annualised Increase	4.0%	0.5%	12%	0.4%	3.0%	3.6%	0.9%	11.6%	8.7%

Table. 12.4: Productivity of Higher Education [279]

12.14.2. University of Texas-System: Productivity Dashboard

UT System created the Productivity Dashboard to increase transparency; measure more effectively the productivity, efficiency, and impact; and demonstrate more clearly the accountability of the system.

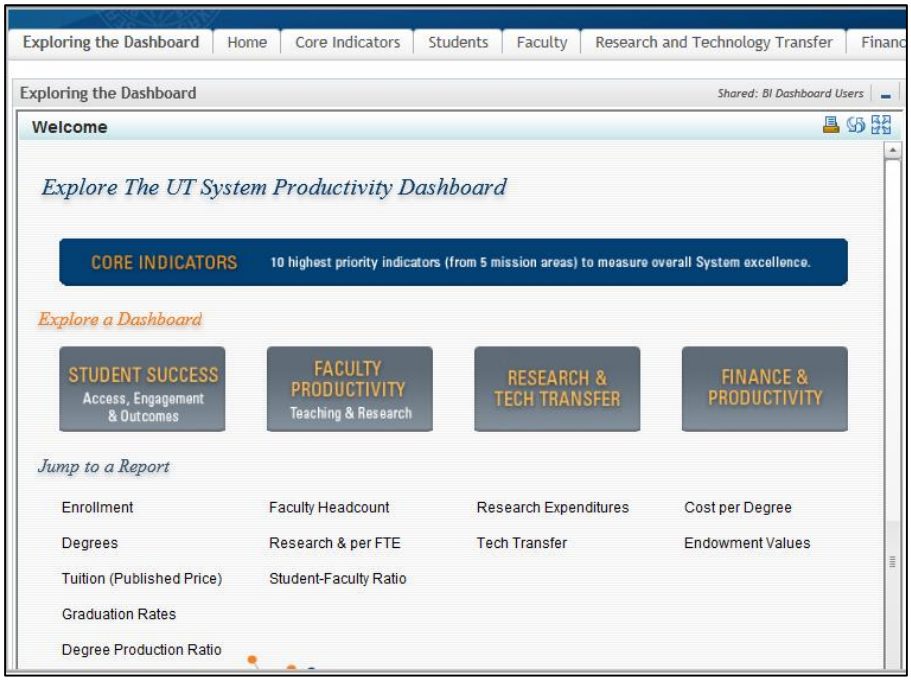


Fig. 12.7: University of Texas System Productivity Dashboard [280]

It is a business intelligence system that includes web-based applications for extracting and analyzing institutional data. It provides current data, trends over time, and comparative benchmarking across a variety of metrics in support of better decision- and policy-making.

12.15. References

The detailed discussion on this topic is beyond the scope of this book. You can refer the book "Improving Measurement of Productivity in Higher Education", by National Academic Press, Washington D.C. [253]

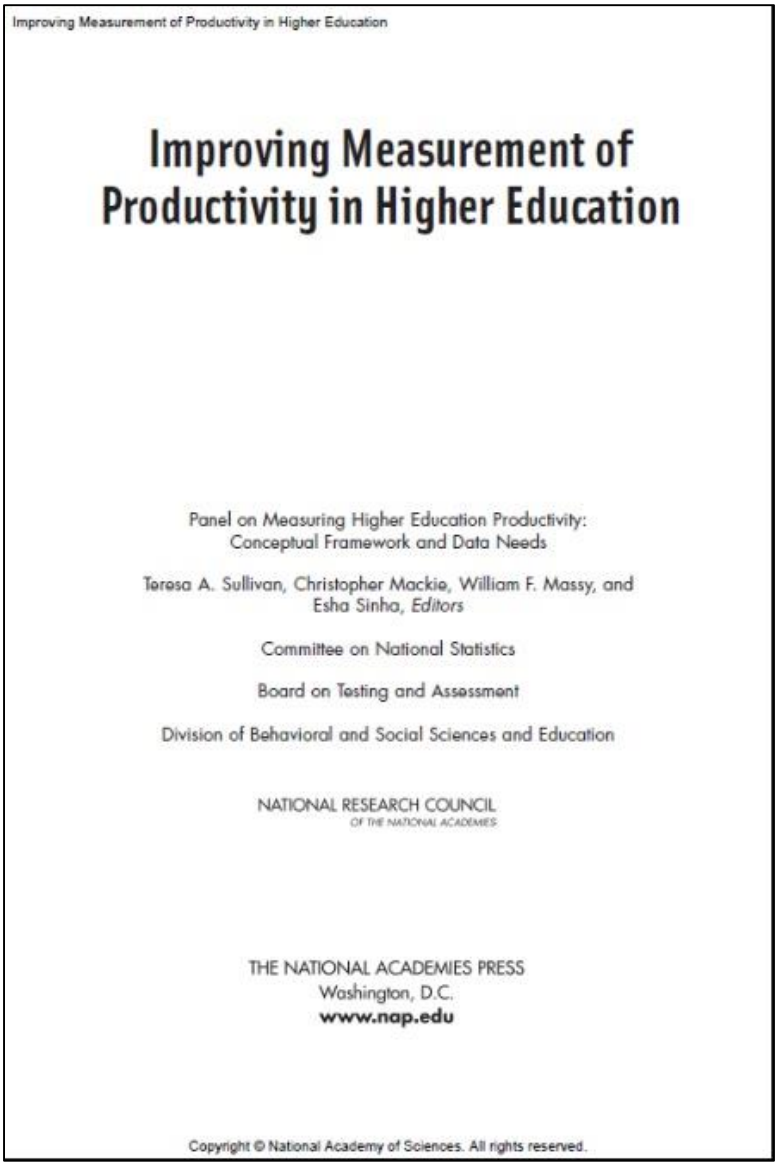
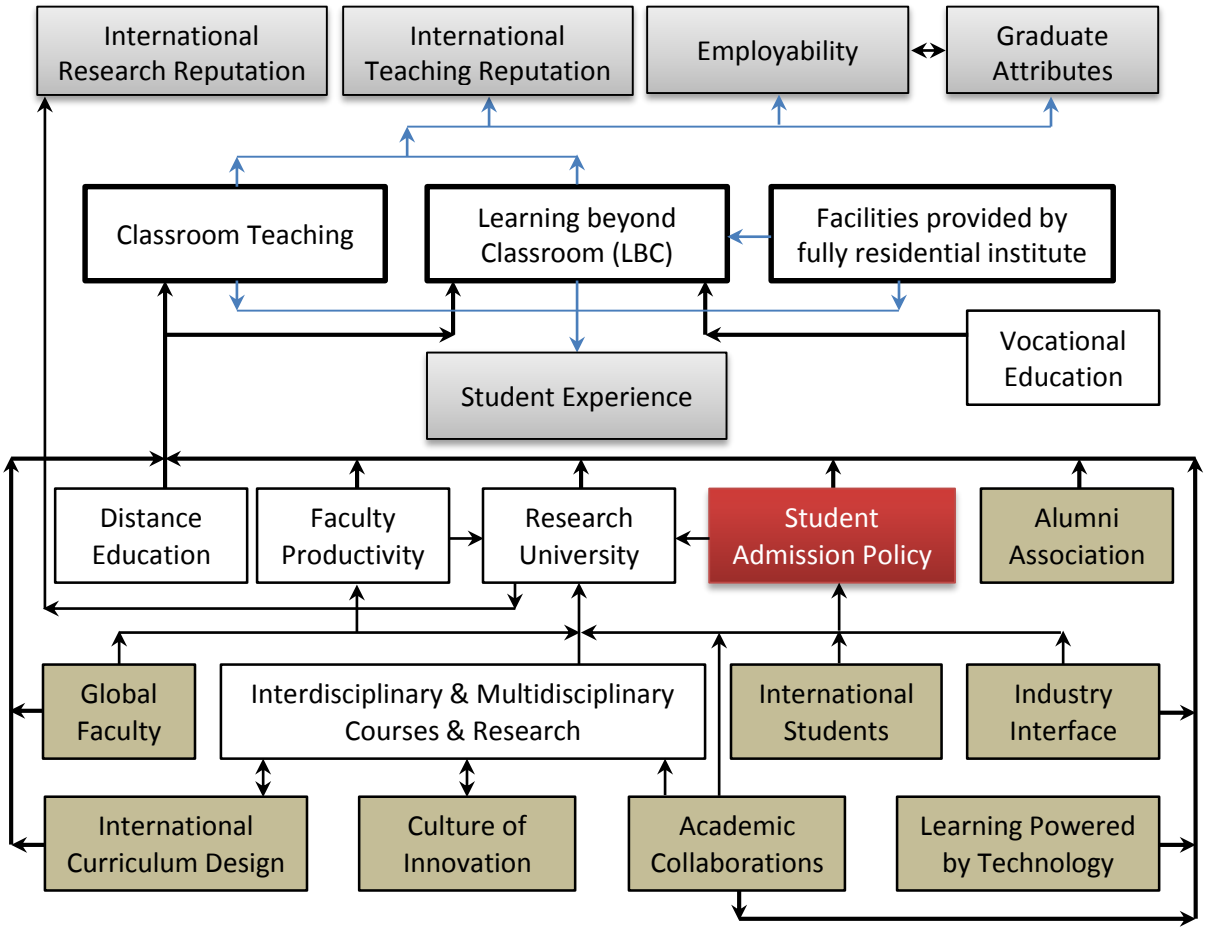


Fig. 12.8: Book on Productivity by National Academic Press, Washington D.C. [253]

Chapter 13: Student Admission Policy for Excellent Educational Outcomes

Better Outcomes of Higher Education is directly proportional to Human Capital, which mainly includes students and faculty. Thus Student Admission policy is very crucial factor for better Outcome of HE institutes and for achieving accreditation goals to become Tier-1 institute or WCU.



13.1. Increasing Student Strength Policy: Involved Huge Cost

The "annual expenditure per student" is one of the important parameter to judge the quality of the education provided by the University, which solely depends upon the total student strength of the University.

- In 2005, the annual expenditure per student of Stanford University is US$ 189000 (Rs. 1.13 Crore)
- In 2005, the annual expenditure per student of University of Pennsylvania is US$ 223,000 (Rs. 1.33 Crore) [83]
- In 2013, the annual expenditure per student of IIT is 3.4 Lakh [87]

	Harvard Univ.	Stanford Univ.	MIT	Caltech	Princeton Univ.	Columbia Univ.	Chicago Univ.	Yale Univ.	Cornell Univ.	Univ Pennsyl-vania
Annual expenditures per student (×US$000)	131	189	174	--	135	89	--	150	93	223

Table 13.1: The statistics of top 10 Private US Universities (2005) [83]

The leaders of new institutions sometimes think that they can rapidly enroll large numbers of students, often in the tens of thousands. This is rarely achieved without sacrificing quality…It is almost always a better idea to begin with a small number of programmes and student body if quality is a priority. Once a strong academic culture is in place, it is easier to scale up from there. [84]

The WCU is always limited in size and not Scalable. For details refer Chapter 6 (6.18) in my book "113 Difficulties in Developing World Class Universities".

Increasing Student Strength involves huge cost. If you avoid this investment then quality will be hampered. Let's see few examples.

13.1.1. BITS Pilani

To be among the top research-driven institutions in Asia by 2020, Birla Institute of Technology and Science (BITS), Pilani, plans to invest **Rs 1,000 crore** to increase the batch size across its bachelors and **Masters and PhD programmes by 50 per cent and 400 per cent, respectively**, over the next seven years across its campuses at Pilani, Goa and Hyderabad. This means the class size at its Goa and Hyderabad campuses will go up from 600 students to 900. At Pilani campus the class size will go up from the present 800 students to 900. The strength of its batch sizes for **Masters and PhD will be up from 100 to 500**. [281]

Bijendra Nath Jain Vice Chancellor BITS, Pilani stated that "More recently, on Oct 31, 2011 Chancellor Mr. Kumar Mangalam Birla has accorded in-principle approval to the direction and extent of growth in academic programmes at our campuses in Pilani, Goa and Hyderabad. Currently, the total number of students in these campuses is nearly 9,700. We expect this to grow

to nearly 12,000 by 2015, and to little less than 15,000 by 2020. In terms of growth rate this constitutes a modest cumulative **growth of over 4.5% per annum**. However, the growth in higher degree (or post-graduate) programmes and in doctoral programmes is expected to be very significant. In particular, we are planning for **140% growth in higher-degree programmes** and **650% growth in on-campus full-time PhD students by year 2020**, while the number of students in the **first degree programmes will grow at a modest rate of 27% only**. We are convinced this emphasis on post-graduate studies will help BITS transform itself into a **research-focused university**, a pre-requisite to achieve its stated vision, viz. be listed as one of top three technical institutions in India by 2015, and as one of top 25 technical institutions in Asia." [282]

Professor Jain says the institute has set growth targets towards the objective, which include a six-fold growth in the number of PhD students and a **200% growth in the number of post-graduate students over the next eight years**. [79]

13.1.2. IIT: Strengthening PhD Program

The Council of IITs this week, with a view to increase the number of PhDs from 3,000 at present to 10,000 by 2020, approved the recommendation of the Empowered Task Force headed by Anil Kakodkar for "strengthening the PhD programme at the IITs". [281]

13.2. UG – PG Ratio: Impact on Finance and Research

In India, most of the **private universities** are teaching university and focusing on undergraduate education. Thus normally the UG – PG student ratio is around 10:1, which is not expected for WCU. In contrast the **public universities** are having only PG courses, whereas the affiliated colleges are mainly focusing on UG courses.

For establishing WCU the UG – PG ratio must be much higher than existing Indian ratio. Let's study the status of Public and Private WCU in USA and UK as given in the four Tables (3.2 to 3.5)

- In Top Private Universities of USA the Average ratio of UG – PG is around 1.25 : 1
- In Top Public Universities of USA the Average ratio of UG – PG is around 2.7 : 1
- In Top Universities of UK the Average ratio of UG – PG is 2.48 : 1

The average the UG-PG ratio in WCU is 2 : 1 i.e. 66% UG students and 33% PG students. This ratio is vital for establishing Research University. **More PG students means more chances of tangible research output**. But remember that the **UG courses are main source of tuition fees**. Whereas the **PG course are capital intensive**.

The Finance and Research both are essential factors for **better outcome**. There is a need to keep the balance while framing the policy.

13.3. Admission Policy and Technology: Brand Name

In the Internet Era the things are changing very fast. Gone are the days when glossary brochures could satisfy the customers.

For universities competing **to attract top students, it's no longer enough to have a glossy brochure and a sleek website**. Schools like Johns Hopkins are reaching out to engage with applicants on Facebook and Twitter. They're also finding that a robust social media campaign, along with such creative features as student-run Blogs, can lure prospective students while a stale online presence can turn them off. The younger generation has grown up with social media. It's something, like electricity, they expect it to exist. [283]

When Ashmi Pathela, a University of Notre Dame senior, was applying to colleges, she was still receiving the traditional brochures. If she had the option of social media, she said, she would have learned more about the schools much faster. "I think the younger generation has grown up with social media," Pathela said. "It's something, like electricity, they expect it to exist." [283]

Dean Tsouvalas, editor-in-chief of StudentAdvisor.com, also noticed this reliance on social media when students in a focus group made it clear that university catalogs did not always impress them. "**Students view the brochures similarly to school propaganda**," he said. "There's an aversion among them to the glossy versions that colleges put out." Tsouvalas said that applicants often turn to the Web to talk with enrolled students about their experiences. [283]

Now a days prospective students are interested to interact with admitted students and alumni too. If the intake capacity of your University is 4K and 20K international students are interested to take admission at your University for various Programmes. If suppose the admitted student strength is 15K and there are say 100K registered alumni of your University. How will you control the interaction between Prospective students (20 K), Admitted Students (15 K) and Alumni (100 K)? Through CRM software, you will have to watch these conversations and provide appropriate information to enhance your brand name.

The other major use for CRM in higher education today is in tracking the applications and admissions process and communicating with students once they enroll. Here the advantages are reduced cycle times, student efficiencies and cost savings. Customer management has the potential to streamline and automate much of the enrollment paperwork that runs a modern university. For example, a well-managed student system makes it easier to keep track of who has applied to the school, systemically advance their application, and automatically coordinate with housing, financial aid, scholarships and other related programs. For most schools this can represent a major savings in time and effort. [284]

Another related use for CRM is to provide more self-service capability for students in dealing with the administration. With CRM software applications and the web schools can let students get the information they need online and handle routine jobs unassisted. This makes life easier for the students and takes a load off administrators. A strong Customer Relationship Management (CRM) system is very helpful for your admissions department’s technology strategy. CRM systems incorporate robust data management features with communication tools that can reach students in

multiple ways: via email, text messaging, and social media integration. Often replacing paper-based strategies such as letters and direct mailing, CRM systems improve institutional efficiency and centralize efforts in one place allowing you to send out timely yet cost-saving electronic communications to targeted groups of prospects at different times of your admissions calendar. Instead of costly snail mail communications, students can be directed instead to personalize Web pages that track and assist them at various stages in the application-to-enrollment cycle. [175] [285]

More colleges are using Facebook to recruit students, according to the results of a recent survey of college admissions and marketing staff that was released recently. Nearly 80 per cent of the institutions reported using the social-networking site for admissions purposes, a 13-percentage-point increase from last year. This is the second survey of Facebook use in admissions conducted by Varsity Outreach, a company that helps colleges with online promotion and networking. More than half of the respondents said they considered Facebook to be a 'very important' admissions tool, rating it above YouTube, Blogs, Twitter, and other social-media networks. Sixty-three per cent of the colleges described Facebook as an integral part of their marketing strategy, and more than half said it had had a significant impact on recruiting students. The effectiveness of colleges' Facebook pages were primarily measured by counting 'likes', 'followers', group members, and comments, according to a report on the survey results. The number of admissions and marketing professionals who said they were comfortable with Facebook has also grown, with more than a third considering themselves 'experts', and only six per cent saying they are 'not too familiar' or 'novices'. Nearly three-quarters of them reported using a combination of pages, groups, applications, and personal profiles to promote their colleges to prospective students. According to Varsity Outreach, 150 colleges completed and returned the online survey out of roughly 2,000 colleges solicited. The company did not calculate a margin of error for its findings in the survey. [286]

If you are interested to become global player then **one must understand the current admission complexities**. Things are becoming more complicated and you will have to adjust as per market trends.

13.4. Student / Staff Ratios and Class Sizes: Impact on Finance, Research and Personalization

In India, as per regulatory bodies the faculty: student ratio is 15:1. As per Table 3.2 to 3.5, at WCU the faculty student ratio varies from 1.9 : 1 to 20 : 1 . The faculty salaries is one of the major expenditure.

- Thus if the ratio is 6:1 then there will be huge salary burden but the research output will be excellent.
- If the ratio is 20:1 then there will be low salary burden but the research output will not be up to the mark.
- In my opinion the ratio should be around 10:1 to keep the balance.

Leading University	Student Staff Ratio	% of Classes Fewer than 20	% of Classes 20-50	% Classes 50+
Harvard	7 to 1	69	18	13
Yale	6 to 1	76	17	7
Caltech	3 to 1	75	17	8
MIT	7 to 1	61	25	14
Stanford	6 to 1	73	17	10
Columbia	6 to 1	71	21	9
Princeton	5 to 1	72	18	10
U C Berkeley	15 to 1	61	25	14
Chicago	6 to 1	72	24	4
Pennsylvania	7 to 1	74	18	8
Cornell	9 to 1	60	25	15

Table 13.2: Student Staff Ratios and Class sizes of WCU [117]

The above table shows the student staff ratio and class sizes of WCU. These two parameters are directly connected to productivity and outcome of the institute. Let's see following observations.

- The most highly-ranked universities in the world generally have very low student/staff ratios
- Personal interaction between students and academic staff can lead to 'transformational' learning experiences
- Personalized, richly interactive student learning is probably most easily achieved in but is not exclusive to smaller classes
- Aspiring universities are seeking innovative ways to keep class sizes to a minimum and to provide students with meaningful interaction with academics, mentors and advisors using a range of strategies
- Top universities and colleges in the US emphasize the importance of interaction between first-year undergraduates and faculty members. For example, 'Stanford's academic program prioritizes engaging students in serious critical inquiry from their first days on campus, working closely with faculty members'.119 Stanford's faculty/student ratio is 6 to 1, and 73 per cent of their classes have fewer than 20 students; the learning experience they aim to provide 'emphasizes close interaction with faculty'.
- The most important single characteristic of world-class higher learning is the provision of personalized, richly interactive student learning. There are no viable alternatives. [117]

The faculty student ratio is not good in Indian Public Universities because of scarcity of faculty and wrong policies, which I have mentioned in my book "113 Difficulties in Developing World Class Universities". In many private universities, because of restriction of regulatory authorities, they had maintained the ratio but unable to attract good faculty. To establish the university of National or International Repute the faculty quality and quantity cannot be compromised.

13.5. International Students Admission Policy

The international student is one of the most important sources for revenue generation, which can enhance the financial strength of the University. This strength can be utilized to develop better facilities and human resources for better outcomes.

In India, the percentage of international student is very low. Only few private universities like Symbiosis, Manipal, SRM and Amity and Public Universities like Pune, Mysore could focus on this issue.

As per four Tables (3.2 to 3.5), the average percentage of international students in WCU is 18%. For engineering discipline few universities had more than 90% international students. The International students is more than $100 Billion market. The suppliers are India, China, Japan and South Korea. The favorite destinations are US, UK, Australia and Canada.

For India the main supplier can be African countries, Arabian countries, Sri Lanka, Bangladesh and China.

The detailed information on this topic is available in Chapter 7 (pages 138-185) my book "Strategy to Develop World Class University" where I had included many important issues like

- Benefits of Admitting International Students
- Globalization and the International Student
- Aspects of International Student Recruitment Strategy
- Student's Preference for Study Abroad
- Intead's 88 Recruitment Techniques for US Universities
- International Student Office at University
- Vital Information for Recruitment and Retention
- Parameters for International Student's Satisfaction at Destination
- StudyPortals Recommendations Based on Student's Reviews
- Teaching International Students: By University of Melbourne
- Best Practices of Social Integration by Universities

From very first day of the University, the focus should be on International Students. We will have to develop our own strategy and act up on it. The target should be minimum 18% international students. For engineering courses this can be more than 50%.

13.6. Entrance Examination: Attracts Better Talent & Generates Revenue

The top most Self-financed Indian Universities conduct its own all India entrance examination for various professional courses. The basic purpose of these entrance examination is to select nationwide talented students for the University.

It is also a source of revenue. Last year over **1.6 lakh** candidates appeared for VIT entrance examination. This year the cost of application form is Rs. 975. Thus approximate collection of this entrance examination is Rs. 16.18 Crore. This single activity can generate more than Rs. 12 Crore per year. [287] [288]

This year, the entrance exam conducted by BITS Pilani for admission to its integrated first-degree programmes will complete 10 years. Over **1.8 lakh** students will appear for BITSAT this year. [230] [289]

The entrance test is simultaneously conducted at hundreds of centers throughout India. Lot of preparation is required to conduct this test like

- Business model of entrance test
- Advertisement of entrance test
- Rules and regulations for conducting test
- Preparation of Admission brochure
- Syllabus design
- Paper settings
- Scrutiny of application forms
- Examination center wise student's arrangement
- Scheduling of examination
- Selection of team and providing training for conducting test
- Finalization of 200 exam centers
- Organizing test at 200 centers
- Evaluation of answer sheets
- Declaration of result
- Several rounds of admission process

The well defined policy is needed for organizing such kind of all India level entrance examinations.

13.7. Highly Selective Admission Process of Leading Universities

Leading universities are highly selective largely on the basis of academic potential. They assess applicants using an array of evidence, not just a number or score. They devote considerable resources to this process and they often only accept a small proportion of those that apply.

13.7.1. Diversity

- Students can learn most in classes rich in many kinds of diversity
- Many leading universities educate students from all over the world making their influence truly global
- Most leading universities work proactively to recruit a diverse group of students; they strive for an ethnic, racial, socioeconomic and gender balance
- Many develop a range of recruitment initiatives in order to achieve this balance
- Many world-class universities recognize the social good that comes from educating students from historically disadvantaged groups [117]

13.7.2. Selection Procedure

- US and UK universities and colleges do not usually rely on a single measure of academic achievement to qualify potential candidates for admission

- Selection procedures vary but a range of personal qualities and extracurricular achievements may be assessed as a guide to academic potential, and candidates are sometimes interviewed
- Some universities in the US employ large numbers of admissions staff to facilitate the admissions process; in the UK much of this work is completed by academics.
- In some US universities members of the academic staff, alumni and students may also be involved in selection procedures. Networks of local committees, which may include alumni, assess candidates' files and conduct interviews.
- It is argued that relying upon the score as the sole measure of scholarly potential is flawed
- Systems for measuring and weighting performance and potential will have to be devised if these are to be adopted as selection criteria
- Many world-class institutions have traditionally considered candidates more holistically, relying not just on a single measure of scholarly achievement to qualify potential candidates but assessing each person on a range of attributes including academic potential, extracurricular achievements and personal qualities
- At Bristol University, for example, a 'holistic assessment of the broader context of a candidate's academic achievement' is made by admissions staff. The performance of the secondary school the candidate attended is considered in relation to exam results; the candidate's personal statement and a reference are taken into account. The University requires admissions staff to consider the 'candidate's response to the opportunities and challenges faced, in the understanding that these are not the same for all' and to make allowances for candidates who have had to deal with 'verified exceptional circumstances or who [have] faced difficult challenges in positive ways (e.g. illness, death of a parent, poverty, disrupted education, refugee status)'. [117]

13.7.3. Talent scouting

- Many leading institutions are proactive in searching for, identifying and communicating with promising prospective students locally, nationally and internationally. At Harvard, for example, the Dean of Admissions makes school visits on an annual basis all over the US and worldwide looking for potential freshmen. He has completed student searches in Tibet, Turkey, Thailand, Indonesia and Jordan and, most recently, in mainland China.
- Harvard recruiters undertake joint recruitment trips with Princeton, Duke, Georgetown and Stanford universities and the Universities of Pennsylvania and Virginia, searching for talented students. They present joint slide shows and talk to prospective students and parents; in the US they target tiny rural towns and particularly families with 'low to moderate incomes'.

13.7.4. Outreach programs

- Many leading universities identify and work with talented high school students with the aim of enhancing their chances of making a successful application to a top college or university
- Princeton targets specifically 'high achieving, low income high school students from local districts'; their program is free of tuition fees

- Princeton's approach is holistic – as well as providing scholarly training, their outreach program strives to 'develop and nurture … self-esteem, intellectual courage, self-reliance, personal responsibility, wellness, and constructive relationships'
- At Yale efforts are made to increase access for students from families of limited or modest means through a nationwide outreach scheme. The undergraduate admissions office sends over 100 Yale students as outreach ambassadors each year to high schools around the US with large numbers of economically disadvantaged students.
- Within Australia, the University of Melbourne, for example, has implemented equity initiatives including Access Melbourne, which reserves 20 per cent of undergraduate places for students who demonstrate educational disadvantage, and the Melbourne Access Program in which the University works intensively with students in the middle secondary years in a group of under-represented local schools.

13.7.5. Student Finance

University	Average Financial Aid Package US $	Proportion of Students Receiving %	Student Employed On Campus %
Harvard	33,635	49	48
Yale	32,533	43	50
Caltech	25,923	58	34
MIT	29,519	68	48
Princeton	29,624	52	46
Pennsylvania	29,845	43	39
Cornell	29,466	42	50

Table 13.3: Financial Aid Package [117]

- The wealthiest universities in the US are able to offer 'need blind' admission and have recently limited or even eliminated loans as part of financial aid packages to low- and middle-income families; a Harvard education is now virtually free for students from lower socio-economic groups
- The highest-ranking US universities include living costs in their financial aid packages
- Universities are keen to normalize the receipt of financial aid – to make it runof- the-mill or unremarkable – and to ensure that the availability of assistance strategies is widely promoted
- Many institutions are striving to make access to financial aid as straightforward as possible
- Students who receive financial aid will often be found paid work on the campus if they decide to work as part of the self-help component of their financial aid package
- Many universities employ large numbers of students on the campus – in cafes, in libraries, in the development or advancement office and in alumni relations, for example.
- Students in the US may also be employed through the Federal Work-Study program
- Alumni Affairs and academic departments may also hire students
- Where the number of hours in paid work is kept to a modest level students report that working has a positive effect on their overall satisfaction with college

- **'Need blind' admission**: The US universities at the top of the ranking tables, such as Harvard, Princeton, Yale and Stanford, offer 'need blind' admission. Institutions offering need blind admission accept students based on their merits (scholarly and personal qualities) without regard to their capacity to pay fees or living costs; financial aid is then allocated based on need. These institutions endeavor to meet all the demonstrated financial need of each student, including living costs, and have instituted programs to help students attend their institutions by limiting or eliminating the loan portion of their financial aid packages.
- **Scholarship and loan arrangements**: Other universities may not be able to match Harvard's generosity to students but they can put in place the best and most flexible scholarship and loan arrangements they are able to provide and make the availability of financial aid widely known, access easy and receipt of aid 'normal'.
- **Student employment**: A key element of financial assistance to students in many US universities is employment of students on campus. As well as providing them with financial support, this can enhance students' sense of belonging to the university and/or college community. At MIT, for example, undergraduates who receive financial aid, and who decide to work as part of their self-help component, will be helped to find a student job through the Student Financial Services (SFS) department. [117]

The "Globally Employable Student" is the most important outcome of any educational institute of the world. For getting better output the input as well as processes should be good. The institute must enhance the processes and search the best global talent while admitting the student. Thus to enhance the productivity of higher education institute the admission process has tremendous importance and must be designed very thoughtfully, which is must for becoming Tier-1 Institute or WCU.

Chapter 14: State, Location & Legal Provisions Can Affect Governance Model, Finance & Resources

The Governance Model, Governance, Resources and Functioning of University depends upon the University Act and it differs from state to state in India. In addition to this, the location of the University and the financial condition of the state, in which the University is located, decides the funding and flow of human resources. Before starting any University one must consider these issues very seriously because of their irreversible nature.

14.1. University under Trust, Society, Company Act 25

Every Self-Financed Educational Institution established under the following Acts shall be eligible to establish Self-Finance Universities.

- A Trust registered under the Bombay Public Trust Act,1950
- A Society Registered under the Societies Registration Act, 1860
- Any Public Trust registered under the Indian Trust Act, 1882.
- Any Educational Institution/Self-Finance Universities established under section 25 of the Companies Act, 1956.

Before establishing the University under specified act, one must take legal opinion.

Examples

- The International Foundation for Research & Education (IFRE) is a not-for-profit (Section 25 Company) that has been established with the vision to set up the Ashoka University. [290]

The following Table shows the Comparison of Section 25 Company, trust and society.

Areas of Comparison	**Trust**	**Society**	**Section 25 Company**	**Private Limited Company**
Permitted Scope of Activities	A trust may be created for any lawful purpose. Generally it is created for ***charitable, educational or socially beneficial activities*** . The responsibilities and obligations of Settlor and Trustee need to be clearly defined in the Trust Deed.	A society can be created only for ***literary, scientific,*** or ***charitable purpose*** or for the promotion of ***science, literature***, or the ***fine arts*** for instruction, the diffusion of useful knowledge, the diffusion of political education, the foundation or maintenance of libraries or reading rooms for members or public.	A section 25 company can be registered as a limited company for promoting ***commerce, art, science, religion, charity or any other useful purpose***. The Company needs to apply its profits if any or other income in promoting its objects. The Company cannot distribute any dividend to its members.	A Private Company can be incorporated for any profit making activity.
Ownership	Trustees	Members	Shareholders	Shareholders
Setting up Process	For Public Trust, registration required with Deputy Charity Commissioner of the region. The process takes between two to three months. For Private discretionary trust no registration required, such	7 or more persons subscribe their names to Memorandum of Association and file the same and certified copies of the same with the Registrar of Joint Stock Companies and the fees.	A section 25 company needs registration under Indian Companies Act with the Regional Director. The incorporation process takes between three to four months.	A private limited company needs registration under Companies Act with the Registrar of Companies The incorporation process takes approximately four to five weeks.

	trust can be created by execution of Trust Deed.			
Liability	Unlimited	Limited	Limited	Limited
Overseas Borrowings	Not Permissible as per ECB	Not Permissible as per ECB	Not Permissible as per ECB	Permissible subject to ECB guidelines
Compliance Requirements	Trust does not have any statutorily defined guidelines to be followed for its day to day operations	List of the names, addresses and occupations of the governors, council, directors, committee, or other governing body must be filed annually with the registrar of joint Stock Companies to be filed every year either on or before 14th days after the AGM or in the month of January.	Annual accounts and annual return of the company to be filed annually with RoC Maintenance of various secretarial records including inter-alia minutes books for board meeting, general meeting and registers of various directors, allotment of shares and regular filing with RoC.	Same as applicable in Section 25 company.
Alteration of Objects	Difficulty in modifying objects and impossible in the event of original settlers being unavailable or unwilling.	Objects can be modified with the approval of 3/5ths of the members	Objects can be modified anytime subject to approval of Central Govt	Can be modified in accordance with procedure prescribed.
Management Control	Trustees as appointed under the Trust deed.	Governing Council as elected by the society members.	Directors as appointed by the shareholders.	Directors as appointed by the shareholders.
Operational Control	Trustees in line with the Trust Deed	Governing councils / directors / committee	Directors in line with the MOA and AOA	Directors in line with the MOA and AOA
Members Participation	Trustees have the final say	As per the MOA of the society.	All the rights of the shareholders as per the Companies Act and MOA, ordinary resolution, special resolution etc.	All the rights of the shareholders as per the Companies Act and MOA, ordinary resolution, special resolution etc.
Termination	The trust can be dissolved by Settlor	Can be dissolved by 3/5th of the members.	Winding up is a cumbersome and time consuming process which can take anywhere between 10-12 months	Same as applicable in Section 25 company.

Funding (Foreign Contribution Regulation Act)	If grants are received directly by the Trust from overseas, approval of Ministry of Home Affairs under Foreign Contribution Regulation Act is required which is a time consuming process and can take up to four to six months. In case of a foreign trustee, credibility of the foreign trustee needs to be established before the regulator.	If grants are received directly by the Society from overseas, approval of Ministry of Home Affairs under Foreign Contribution Regulation Act is required which is a time consuming process and can take up to four to six months.	If grants are received directly by the Company from overseas, approval of Ministry of Home Affairs under Foreign Contribution Regulation Act is required which is a time consuming process and can take up to four to six months.	Subject to Foreign Exchange laws
Repatriation of funds	Profits to be utilized for the furtherance of the trust objectives and for beneficiaries and any form of repatriation would require RBI approval.	Funds to be utilized for the furtherance of society's objectives only and in case of dissolution to be transferred to other society – Repatriation not possible.	Prohibition on distribution of dividend – so repatriation not possible	Funds are freely repatriable in form of dividends or on liquidation subject to provisions of Companies Act and payment of applicable taxes.
Exchange Control/ FDI policy	Where an Indian trust has either a foreign trustee or a foreign beneficiary, provisions of exchange control regulations will apply **In case of foreign trustee** In case the trust has foreign trustee certain assets which are statutorily required to be registered, such as immovable properties, would be registered in name of trustee. This shall entail prior approval of Reserve Bank of India (RBI), which	N/A	Ownership of stock in the company would be governed by the FDI policy of the Government of India As per the FDI policy, the following activities fall under automatic route, i.e. no Government approval is required educational research publishing of books (not magazines & periodicals) tendering scholarships education (AICTE and University Grants Commission (UGC) guidelines, prohibit a company form of entity for setting up a college, university or educational institute.	Same as applicable in Section 25 company.

	will not be possible as a nonresident in not permitted to own immovable property in India. **In case of foreign beneficiary** In case of a foreign beneficiary prior RBI approval would need to be obtained on account of the ability to make remittances in future and distribution on dissolution of the trust. In our experience, obtaining such an approval is again extremely difficult In summary, if a trust structure is to be set up, there should be no foreign beneficiary. In case there are foreign trustees, then the trust cannot own immovable property.			
Transfer of Ownership	Not permissible	Permissible with appointment of new members and resigning of old members and approved by 3/5ths members resolution	By transfer of shares	By transfer of shares
Tax Implications in hands of entity running the institution	Tax exemption can be sought u/s 10(23C) of IT Act after obtaining requisite approvals *[Exemption available to university or educational institution existing solely for educational purposes and not*	Same as Trust	Same as Trust	Profits earned from running the institution would be taxable as in hands of the company @ 33.99% Tax exemption not available as activities would be construed as 'for purposes of profit'

	for purposes of profit] *Entity to obtain approval for eligibility u/s 80G of IT Act.*			
Tax Implications in hands of entity providing funds	50% of the amount of donations eligible for deduction u/s 80G of the IT Act	Same as Trust	50% of the amount of donations eligible for deduction u/s 80G of the IT Act unless contributions in the nature of 'share capital'	

Table 14.1: Comparison of Section 25 Company, trust and society [291]

14.2. Institute with Minority Status

The education institute can have minority status like Linguistic Minority or Regional Minority etc. The institutes with minority status can have certain relaxations. It's not for every society or trust. One must study such rules and regulations before establishing Universities in specific region.

14.3. Selection of State: Funding and Legal Provisions

The state financial position can affects funding. Thus selection of state is very important for better outcome of the institute. Greater Mumbai Municipal Corporation budget is larger than that of 9 state government budgets while Municipal Corporation of Delhi's is larger than 4 state government budgets in India. The city of Mumbai's budget (Rs 26,581 crore or Rs. 265.81 Billion) is larger than many small Indian state government budgets, including Goa, Himachal Pradesh, Uttarakhand, Meghalaya, Manipur, Nagaland and Arunachal Pradesh. [292] [293]

The Rules for Deemed University, State University are different. Even state wise the rules are different. These rules may affect the governing structure and functioning of the university.

Swati Mujumdar, Director, Symbiosis International University has published very interesting article "Analysis of Private University Laws & Recommendations for Policy" at India Education Review, which compares laws of the self-financed universities [294]

I feel that one must study the rules and regulations of respective states before establishing Universities.

Criteria/States	Himachal Pradesh	Rajasthan	Haryana	Gujarat	Assam	Punjab
Territorial jurisdiction, Affiliation	State, No Affiliation	State, No Affiliation	State, No Affiliation	State, No Affiliation	State, No Affiliation	State, No Affiliation
Off-Campus, Off-Shore Campus, Study Centers	N/A ref to UGC guidelines	N/A ref to UGC guidelines	Upon approval of UGC & State	Upon approval of UGC & State	N/A ref to UGC guidelines	
Medium/Mode of Education (conventional distance, etc)	Both Allowed	Both Allowed	Both Allowed	Both Allowed	N/A	Both Allowed
Nature of the sponsoring body (applicant) of the proposed University	Society/ Public Trust / Sec 25 Company/ Sponsoring body registered in any other State * UGC 2010 Regul. Do not allow Sec 25 Co.	Society/ Public Trust / Sec 25 Company/ Sponsoring body registered in any other State * UGC 2010 Regul. Do not allow Sec 25 Co.	Society/ Public Trust / Sec 25 Company/ Sponsoring body registered in any other State * UGC 2010 Regul. Do not allow Sec 25 Co.	Society/ Public Trust / Sec 25 Company/ Sponsoring body registered in any other State * UGC 2010 Regul. Do not allow Sec 25 Co.	Society/ Public Trust / Sec 25 Company * UGC 2010 Regul. Do not allow Sec 25 Co.	Society/ Public Trust / Sec 25 Company/ Sponsoring body registered in any other State * UGC 2010 Regul. Do not allow Sec 25 Co.
Application Fee	10 lakhs	1 Lakh	As prescribed at the time	As prescribed at the time	10 lakhs	1 lakh
Term of Existence	3 years	5 years	5 years	5 years	No restriction	5 years audited statm t + 10 years experience in HE reqd
Area of land requirement	50 Bighas/ 100 Kanals (10 acres)	30 acres	20 acres outside municipal limits/10 acres inside municipal limits	N/A	N/A	35 acres
Required Construction Area	15,000 sq mtrs	10,000 sq mtrs	10,000 sq mtrs	N/A	N/A	30,000 sq mtrs Engg; - 60,000 sq mtrs
Procedure for application for Private University	Project Report with documents (20 copies)	Project Report with documents (1 copy)	Project Report with documents (1 copy)	Project Report with documents (1 copy)	Project Report with documents (10 copies)	Project Report with documents (11 copies) * sufficient proof

					* sufficient proof of land ownership & bldg plan	of land ownership & bldg plan
Procedure after application and subsequent compliances	Inspection LOI, Compliance Rpt.2 yrs	Inspection LOI, Compliance Rpt.1 yr	Inspection LOI, Compliance Rpt.1 yr	Inspection LOI, Compliance Rpt.	Inspection LOI, Compliance Rpt.	Inspection, LOI, Compliance Rpt.2 yrs
Authorities of the University & Committees, Constitution etc	Same across each state	Same across each state	Same across each state	Same across each state	Same across each state	Same across each state
Composition of the governing body & Powers	Same across each state	Same across each state	Chancellor, Vice Chancellor, Secr, HE is member of Gov Body	President & Provost, Secr, HE is member of Gov Body	Nothing mentioned	Same across each state
Requirements for compliance of UGC	Requirement to follow UGC Regulatory Guidelines.	Requirement to follow UGC Regulatory Guidelines	Requirement to follow UGC Regulatory Guidelines	Requirement to follow UGC Regulatory Guidelines	Requirement to follow UGC Regulatory Guidelines	Requirement to follow UGC Regulatory Guidelines
Role of Sponsoring Body and 3rd Party Investors for Private University	Apart from sponsoring body a 3rd party investor is allowed to contribute funds	Sponsoring Body + others donors can contribute to Univ.	Sponsoring Body + others donors can contribute to Univ.	Sponsoring Body + others donors can contribute to Univ.	Sponsoring Body + others donors can contribute to Univ.	Sponsoring Body + others donors can contribute to Univ.
Reservations Policies (for students & employees of University)	25% of natives in students & 80% natives in Class III, IV in staff	No reservation mentioned	25% of natives (out of that 10% SCST, 5% get full fee exemp.n, 10% get 50% fee exempn, 10% get 25% fee exempn) in students. No res. in staff.	No reservation mentioned	No reservation mentioned	No reservation mentioned
Funding Requirements & Policies	Endowment Fund 5 cr. Tribal area – 1 cr.	15km away from municipal limits of Div.HQ /	Endowment Fund 3 cr + General Fund (not specified)	Endowment fund amt – not specified	Endowment fund amt – not specified	Endowment Fund 5 cr. General domain, & Multi domain – 3 cr. Also

		10km away from municipal limits of other cities 1 cr Tribal area – 75 lakhs, Other areas 2 cr.				General Fund 1 cr
Separate Regulatory Body at State Level	Bill submitted for Regulatory Commission	None	None	None	None	None
Dissolution of Private University & Consequences of Violation of Policies	Dissolution – 25 yrs	None	None	Dissolution – 6 mths notice provided last batch of students has passed out	None	None
Infrastructure, Manpower	Journals, Books – 10 lacs, Equipment & Infrastructure – 1 cr. Appoint relevant staff	Books, Journals – 10 lacs, Within 3 yrs investment guarantee – 50 lacs. Equipment & Infrastructure – 20 lacs & within 5 yrs – 1 cr & Appoint relevant staff	Books, Journals – 10 lacs, Within 3 yrs investment guarantee – 50 lacs. Equipment & Infrastructure – 20 lacs & within 5 yrs – 1 cr &	No specification	No specification	No specification
Procedure to be followed by State Government	State Govt. has to pass a separate Act of legislation for each specific applicant University	State Govt. has to pass a separate Act of legislation for each specific applicant University	State Govt. has to pass a separate Act of legislation for each specific applicant University	State Govt. has to pass a separate Act of legislation for each specific applicant University	State Govt. has to pass a separate Act of legislation for each specific applicant University	State Govt. has to pass a separate Act of legislation for each specific applicant University

Table 14.2: Private University: State wise laws [294]

14.4. Location of the University or Institute

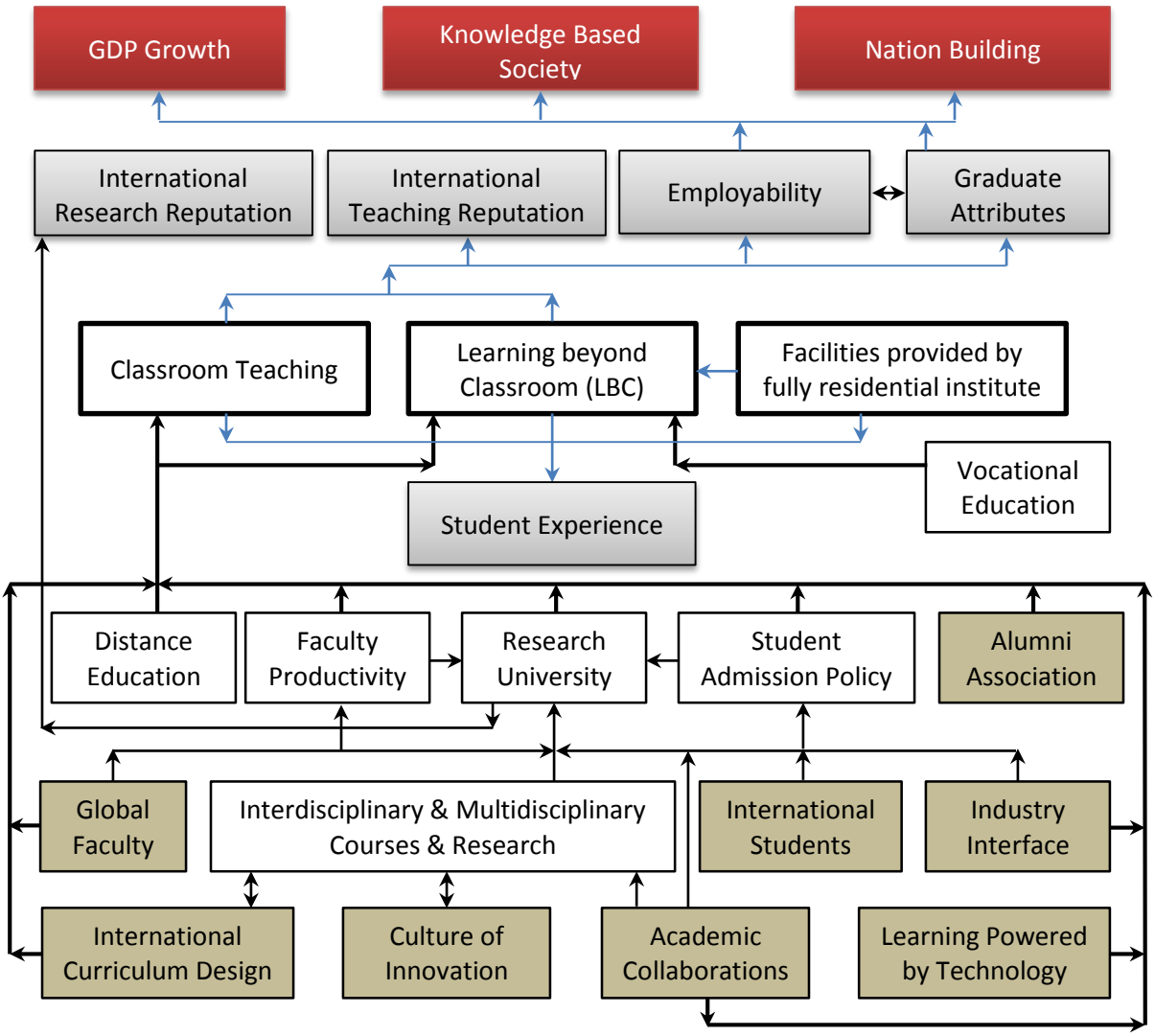
The WCU should be established near metro or mega cities, where hundreds of facilities and environment is readily available. It's difficult to establish WCU at remote places. This is also experience of globally renowned WCUs.

Some of the great American public universities may also offer some insights. Most of the best of them were established in the 19th century in or close to urban centers— the University of California-Berkeley, for example, is near San Francisco and the University of Michigan is near Detroit, while the University of Illinois at Urbana-Champaign is in the middle of corn fields. While the latter is a fine university, it is not as distinguished as Berkeley or Michigan— and it suffers when competing for top faculty. [295]

For more details refer Chapter 6 (6.15) of my book "113 Difficulties in Developing World Class Universities". This book can be download (free) from www.dharaskar.com

Chapter 15: NEED WCU & Tier-1 Institute for Enhancing GDP, Employment, Employability and Knowledge Based Economy

It's an Era of Knowledge Based Society. The GDP growth depends upon it. The quality education and employability can boost GDP growth. Thus India needs more Tier-1 institutes and at least few WCUs for National building and Rapid Economic growth.



15.1. GDP: Defined in Three Ways

The gross domestic product (GDP) or gross domestic income (GDI) is one of the measures of national income and output. GDP can be defined in three ways, which should give identical results. Defining Gross Domestic Product (GDP)

- First, it is equal to the total expenditures for all final goods and services produced within the country in a specified period of time (usually a 365-day year).
- Second, it is equal to the sum of the value added at every stage of production by all the industries, plus taxes and minus subsidies on products.
- Third, it is equal to the sum of the income generated by production like compensation of employees, taxes on production and imports less subsidies, and gross operating surplus [296]

GDP is commonly used as an indicator of the economic health of a country, as well as to gauge a country's standard of living. [296]

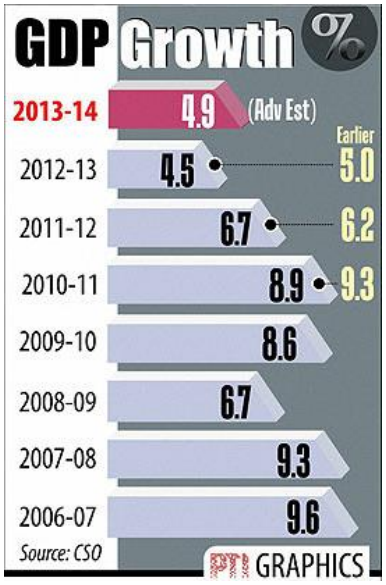


Fig. 15.1: India: GDP [297]

15.2. GDP and Employment

The relationship between Gross Domestic Product (GDP) and unemployment rates can be seen by the application of **Okun's Law**. According to the principles established by this law, there is a corresponding **two percent increase in employment for every established one percent increase in GDP**. The reasoning behind this law is quite simple. It states that GDP levels are driven by the principles of demand and supply, and as such, an increase in demand leads to an increase in GDP. Such an increase in demand must be accompanied by a corresponding increase in productivity and employment to keep up with the demand. [298]

GDP and unemployment rates are linked in the sense that both are macroeconomic factors that are used to gauge the state of an economy. A rise in the GDP is significant in the study of macroeconomic trends in a nation. This is also true of a rise or decrease in unemployment levels. GDP and unemployment rates usually go together because a decrease in the GDP is reflected in a decrease in the rate of employment. [298]

Such a relationship between GDP and unemployment rates is important in two ways. **A rise in employment levels is the natural result of increased GDP levels caused by an increase in consumer demand for goods and services**. **Such a rise in both GDP and employment levels is an indication that the economy is booming.** During such periods, consumer confidence is high and the demand for various goods and services are correspondingly elevated. In order to meet this surge in demand, manufactures and other types of companies **hire more employees**. [298]

The opposite is true in the case of a deflation, which also shows the relationship between GDP and unemployment rates. When there is a dip in the GDP caused by a decrease in consumer confidence and a corresponding reduction in demand, companies must adjust to this low demand. Part of the adjustment process includes the shedding of workers who may have become redundant in the face of sluggish demand by consumers. At times like this, companies look for ways of conserving money since they are no longer making as much money as they used too. One of the cost-cutting measures includes mass sacking of employees whose salaries the companies can no longer sustain. Signs like this are indicators to economists that the demand for goods and services have dropped and that the GDP level is also on a downward slope. [298]

The "Lawrence Economics Blog" of Lawrence University USA has shown the relation of GDP and Employment graphically as follows.

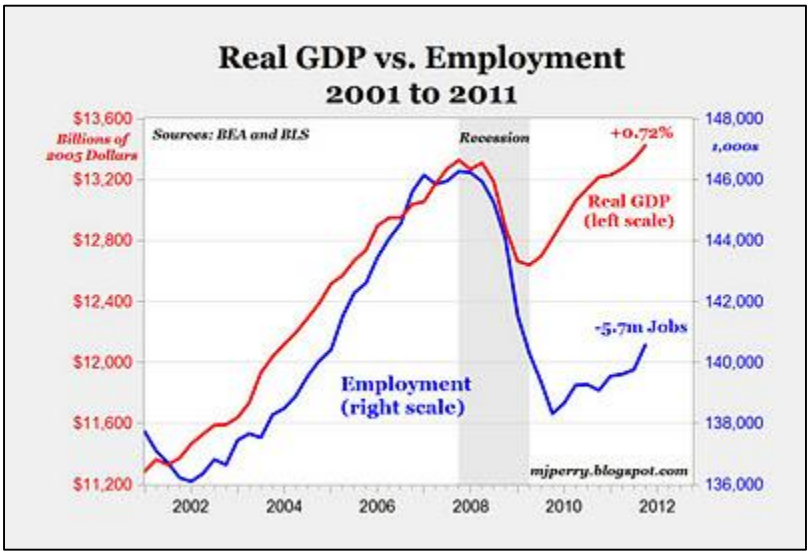


Fig. 15.2: GDP vs. Employment graph by Lawrence University USA [299]

The following graph shows that there is a strong link between GDP growth and employment creation. [300]

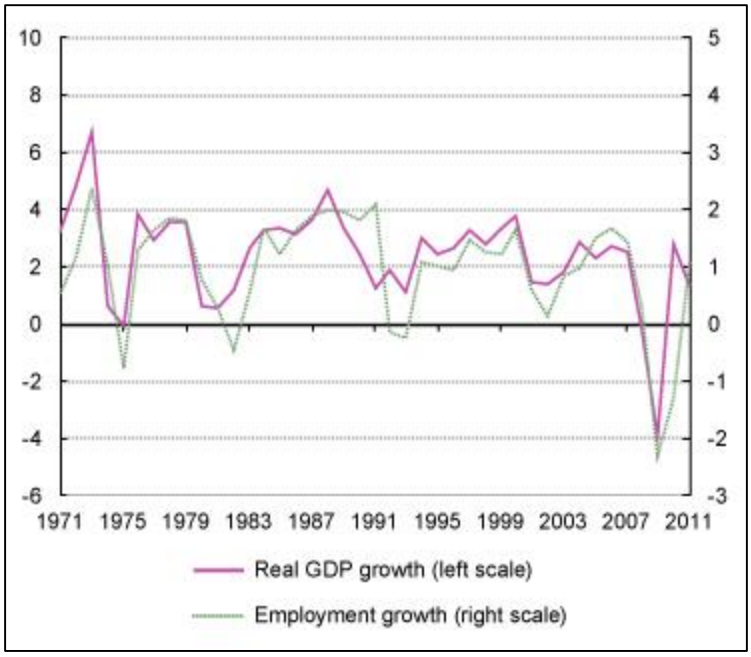


Fig. 15.3: Growth of employment and real gross domestic product (GDP) in developed economies, 1971–2011 (Percentage) [300]

The following chart shows the level of real national output (GDP) and total employment in the UK economy since 1980. In both of the last two recessions (1980-81 and 1990-92), the number of people in work has fallen sharply. But a period of sustained economic growth (as experienced by the UK from 1993-2001) has led to a significant increase in employment levels. Indeed by the summer of 2001, employment in the British economy was at record levels. [301]

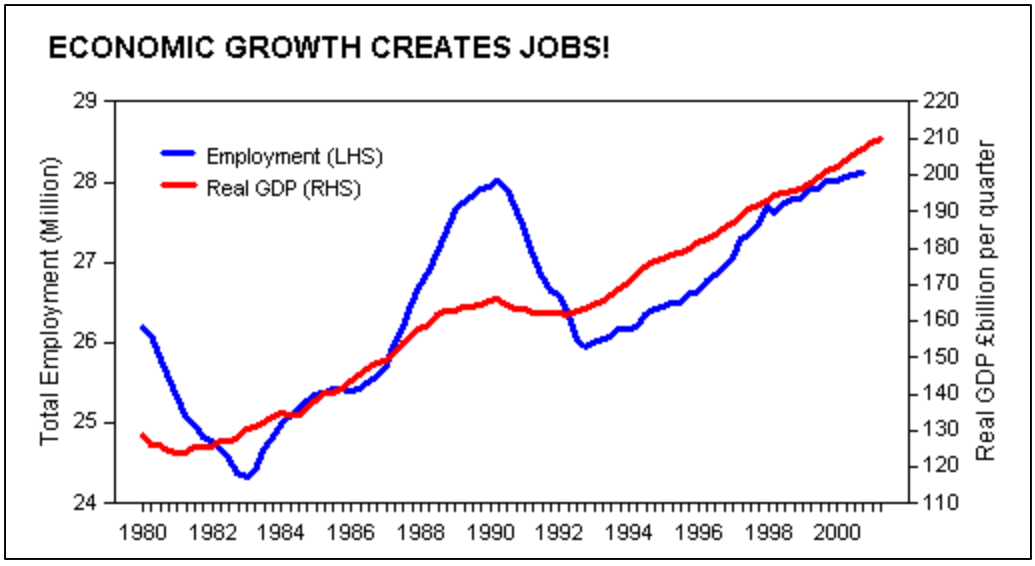


Fig. 15.4: UK statistics: Economic growth (GDP) creates jobs [301]

15.3. Jobless Growth of GDP

Consequently, despite phases of high growth of gross domestic product (GDP), there has not been commensurate growth in jobs — a phenomenon called "**jobless growth**". For the first time in the history of India, the country's GDP grew by more than 9 per cent three years in a row, between 2005-06 and 2008-09. Thereafter, after a gap of a year, in 2010-11, GDP again grew by 9 per cent, subsequently falling below 5 per cent over the last two years — the lowest in a decade. If one looks at the data that has been put out by the National Sample Survey (NSS) Organization, between 1999 to 2000 and 2011 to 2012, the average annual rate of job creation was **only 2.2 per cent**. [302]

In other words, even if the **economy grows at a relatively fast pace, there is no guarantee that new employment opportunities will be created at a similar pace**. That is, even as output grows, **machines are replacing human labor**. This is a phenomenon that economists describe as **low employment elasticity of output**. In other words, for every additional unit of output in manufacturing, the number of jobs created is diminishing not growing. [302]

15.4. GDP, Growth of Engineering Colleges and Vacant Seat Problem

In the year 2012-13, the lion's share of services to total GDP is from **Services** at **59.29%** while that from **industry** is **27.03%**. In this combined **total of 86.32%**, the **contribution by the engineers is certainly very significant** to say the least. Obviously, for this reason, the Government of India and various state governments have been focusing on and given a strong impetus to engineering education in our country. Hence, The Government and the knowledge commission have encouraged **growth of engineering colleges in large numbers across the country**. Gone are the days where our high population was considered a weakness. Today, our population is treated as strength in terms of power of the youth, domestic demand for goods & services, possibility of generating high foreign exchange balance in our favor and so on. In this regard, bird's eye view of the overall human resource would be very partial without considering the engineering discipline. It is good to note that our Indian hardworking and smart engineers have brought us big fame in the international market through intellectual and financial contributions. Also, the contribution of the engineering fraternity to Indian GDP & economic growth cannot be underestimated or ignored. Looking into all these and the government's encouragement, engineering institutions have been producing large numbers of engineering graduates every year. India today is the home for about **3500 engineering colleges** with around **15 lakh seats** being offered in different disciplines. Unfortunately, the demand side of the equation i.e. the industry is not by & large happy with the quality of today's engineers. Industry chieftains and various bodies do openly say that only about **25% - 30% of our engineers are employable**. [303]

In 2012-13, the GDP of India came down from 9 to just 4.5. Obliviously the demand for engineers has been reduced. But number of seats in engineering institutes are same and thus there is a major problem of seats remaining vacant throughout India. Only the quality oriented engineering institutes, who has produced employable graduates, could survive from this shock.

15.5. Relation of GDP, Quality of Education and Employability

Following the 2009 global downturn, the Indian economy enjoyed a recovery, however growth began to fade again in 2011 and new macroeconomic challenges began to emerge. GDP rose by 6½ per cent in 2011-12, the slowest annual growth in almost a decade, and has continued to weaken more recently. This slowdown is only partly cyclical and reflects the emergence of energy, infrastructure, **human capital** and institutional bottlenecks. The rapid economic growth in the two last decades has indeed accentuated the demand for energy and natural resources, for transport infrastructure and **skills**. But supply of these key engines of growth has not been able to keep pace. [304]

Education has a central role in promoting inclusive economic development. It can notably help reduce the share of informal employment going forward and promote social inclusion. **Higher human capital is also essential in supporting productivity and innovation**. **Long-term investment in a small number of elite higher education institutions has helped the development of India's IT and business services sectors and has contributed to the country's strong growth performance during the past two decades**. However, such investments have not, until recently, been matched by broader investment in mass education, leading to inequality and social exclusion of large parts of the population. For example, only about half of the relevant age group is enrolled in secondary education, with many more girls than boys out of school. **The challenge is therefore to improve the quality of education and provide equitable access at all levels.** [304]

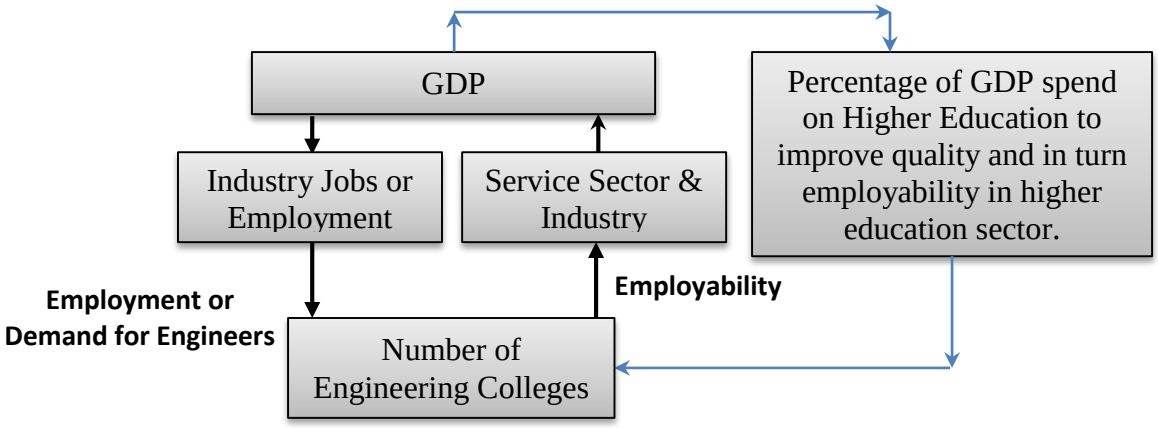


Fig. 15.5: Relation of GDP, Employment, Engineering Colleges, Employability and Industry

Growth accounting analysis indicated that graduate skills accumulation contributed to roughly 20% of GDP growth in the UK from 1982-2005. [214]

The eminent scientist Bharat Ratna Prof C N R Rao said that "The Government of India should make **massive investment in higher education** (**3 per cent of GDP**). Improving the **quality of higher education** should be a national mission since it will determine the future of our country. Planners, politicians and administrators as well as citizens should whole heartedly support this mission." [305]

15.6. GDP and Knowledge Based Economy

The Figure 15.5 shows the relation of quality education and GDP. The service sector has significant share in GDP. That is, the economy is moving towards Knowledge Based Economy. Let's see few examples.

- Knowledge has now become a capital investment and no longer a cost of producing goods. This change has been announced by Brent Moulton, head of national accounts at the Bureau of Economic Analysis (BEA), on April 22nd, 2013. This will change the way gross domestic products are calculated. It will lead to an immediate **3% growth** in the **United States' GDP**. [293]
- In a recent academic journal article co-authored with Godwin Ariguzo and Angappa Gunasekaran, the ascension of the **U.S. economy** from **service-based to knowledge-based** is investigated and a foundational model offered. According to official U.S. sources reporting gross domestic product (GDP) data, the U.S. became a service-based economy (majority of Gross Domestic Product made up by services) at the end of 1958, beginning of 1959 ($211.2 billion GDP services, $200 billion GDP goods), much earlier than previously proposed. Today, services make up 70 percent of total U.S. GDP ($9.8 trillion out of $14.07 trillion). [278]
- Sultan Bin Saeed Al Mansouri, the Minister of Economy, told media on the sidelines of The Second Forum of Economic Policies that "The knowledge-based economy will **contribute 5 per cent** to the **UAE**'s **GDP** by 2021". [306]

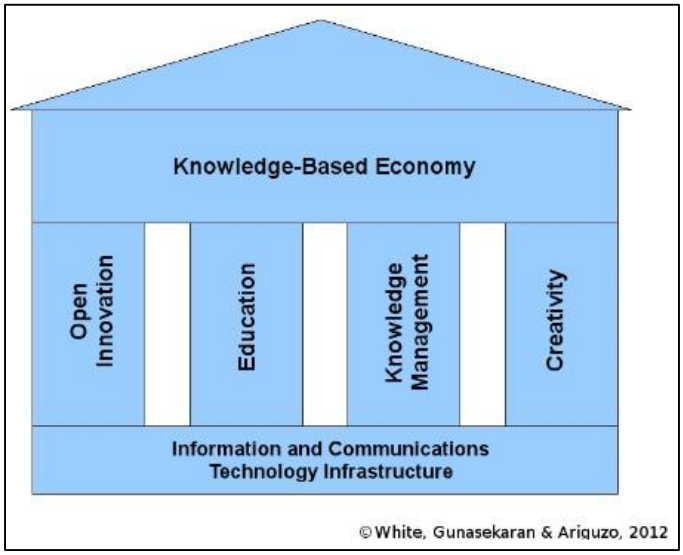


Fig. 15.6: Major component of knowledge base economy [278]

In the era of Knowledge Based Economy, the quality is the buzzword for education institutes. Only the quality oriented institutes can produce "Employable Graduates". For nation building and rapid economic growth, there is an urgent necessity to enhance the employability or Graduate Attributes. Thus India should have more number of Tier-1 institutes and sincere efforts need to be made for developing WCU.

15.7. Relation of GDP, English Speaking Countries, Patents & WCU

The quality of Higher Education can boost the GDP. Every country is interested to develop WCU for enhancing the quality and standards of education sector. To know the truth, let's analyze the relation of GDP and WCU with the help of following data

- GDP (PPP) ranking of the top 25 economies (nations) of the world [323]
- Number of WCU in those top 25 economies [332]
- English Speaking / Non-English Speaking countries
- Number of patents (2010) per country [324]
- Ranking of "National Higher Education Systems" by University of Melbourne [330] [331]

GDP (PPP) Ranking 2013	Country	GDP (PPP) $ Billion	Times HE World University Ranking 2013-14: Number of Top 200 WCU	English Speaking Country	Number of International Patents in 2010	Ranking Score of National HE Systems by University of Melbourne
1	USA	16,799.7	77	Y	45,008	100.0
2	China	13,395.4	5 (China 2, Hong Kong 3)		12,296	44.5
3	India	5,069.2	Nil	Y	1,286	36.3
4	Japan	4,698.8	5		32,150	59.6
5	Germany	3,232.6	10		17,568	68.2
6	Russia	2,556.2	Nil		798	49.5
7	Brazil	2,423.3	Nil		488	45.6
8	UK	2,390.9	33 (UK 31, Ireland 02)	Y	4,891	74.9
9	France	2,278.0	8		7,245	67.6
10	Mexico	1,842.6	Nil		191	42.8
11	Italy	1,807.8	Nil		2,658	52.1
12	South Korea	1,666.8	4		9,669	57.6
13	Canada	1,526.1	7	Y	2,698	80.0
14	Spain	1,391.4	1		1,772	60.5
15	Indonesia	1,292.9	Nil	Y	16	35.3
16	Turkey	1,174.2	1		480	38.9
17	Australia	999.6	7	Y	1,772	77.2
18	Iran	945.5	Nil	Y	6	37.2
19	Saudi Arabia	937.2	Nil		81	52.3
20	Taiwan	929.5	1		N/A	56.0
21	Poland	817.5	Nil		199	51.9
22	Argentina	777.9	Nil		16	45.8
23	Netherlands	700.5	12		4,063	78.2
24	Thailand	673.7	Nil		72	37.9
25	South Africa	596.5	1	Y	295	38.1

Table 15.1: GDP (PPP) ranking of nations (2013), National HE Ranking, Number of Patents and WCU per country [323] [324] [325] [330] [331]

Remark 01:

Among the top 25 economies (nations) of the world, the data shows that

- The **top 25 (only 14 nations** out of 25 nations**)** economies are having **172** Top-200-WCU

This data clearly shows that there is a strong relationship between GDP and World Class Education System or WCU. But the country wise effect of WCU on GDP is not proportionate or predictable.

Remark 02:

Let's see the total GDP of countries having WCU and not having WCU. This analysis support the statement "World Class Education has positive effect on GDP"

Group of nations with and without WCU	Total GDP (PPP) Thousand Billion Dollars	Total Number of WCU
United States, China, Japan, Germany, UK, France, South Korea, Canada, Spain, Turkey, Australia, Taiwan, Netherlands, South Africa	51.780	172
India, Russia, Brazil, Mexico, Italy, Indonesia, Iran, Saudi Arabia, Poland, Argentina, Thailand	19.143	Nil

Table 15.2: Group of nations with and without WCU

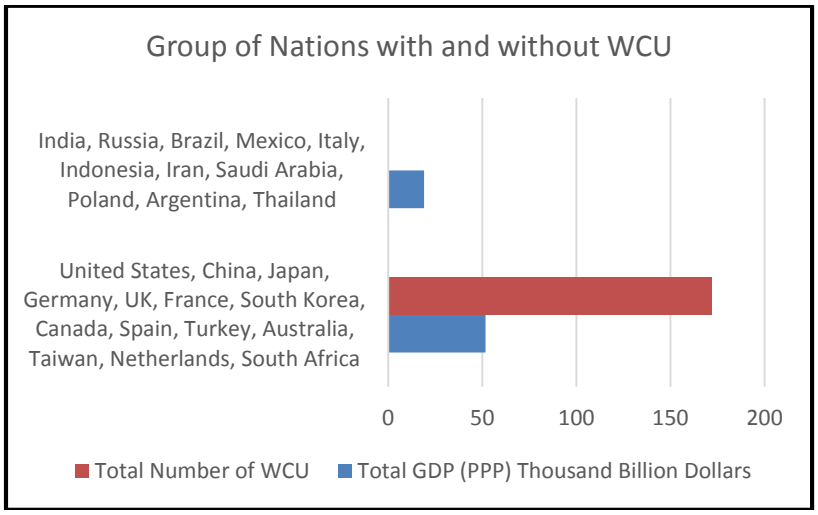


Fig 15.7: Group of nations with and without WCU

Remark 03:

The following data shows that the WCU is not the only way to grow the economy.

- Surprisingly four nations (India, Russia, Brazil and Mexico) are among the top 10 economies of the world, which are not having single Top-200-WCU.
- In top 8 economies, except UK and USA, are having just 28 WCU.

The data clearly shows that, the WCU is not the only way to develop overall standards of higher education of any country. The nations like India, Russia, Brazil and Mexico are among the top 10 economies of the world, which are not having single Top-200-WCU. They have good S&T infrastructure and human capital too. But for global recognition and maintaining the international standards there are only two options i.e. World University ranking and international accreditations. They will have to choose both or any one of them.

Remark 04:

In addition to this, the data shows that

- **The 4 English Speaking Countries are having 124 WCU** (USA – 77, UK – 33, Canada – 7, Australia – 7). That is, 62% top 200 WCU are with 4 English speaking countries. (Total GDP of 4 nations: 21616.30)
- Five Non-English speaking countries are having 40 WCU (China – 5, Japan – 5, Germany – 10, France - 8, Netherland - 12) (Total GDP of 5 nations: 24305.30)

Group of English and Non-English Speaking Countries	GDP (PPP) Thousand Billon Dollar	Number of WCU
USA, UK, Canada, Australia	21.616	124
China, Japan, Germany, France, Netherland	24.305	40

Table 15.3: Comparison of English and Non-English Speaking Countries

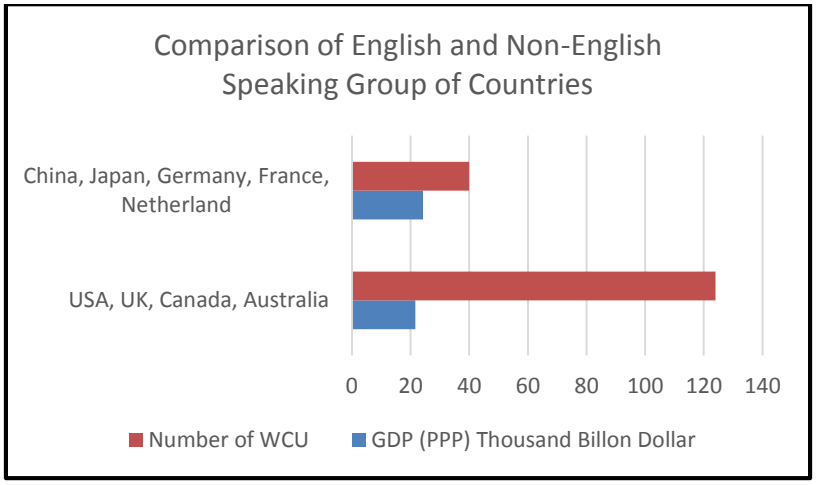


Fig. 15.8: Comparison of English and Non-English Speaking group of Countries

The Internationalization is very easy in English Speaking Countries. They can attract the global talent easily. It is most difficult task for Non-English speaking countries. Thus 4 English Speaking nations with strong economies are having 124 WCU. That is why it says that "Ranking favors few English speaking nations".

Remark 05:

The following fact shows that "every country can't utilize the potential of English language".

- Total 8 nations are English speaking countries. Out of which 2 nations are not having any WCU (India and Indonesia).

Remark 06:

The Ranking of 'National Higher Education Systems' of 50 Countries by University of Melbourne is matching with number of WCU per nations. But it is not proportionate with number of patients per nation and GDP of nation. The WCU must improve these parameters.

Remark 07:

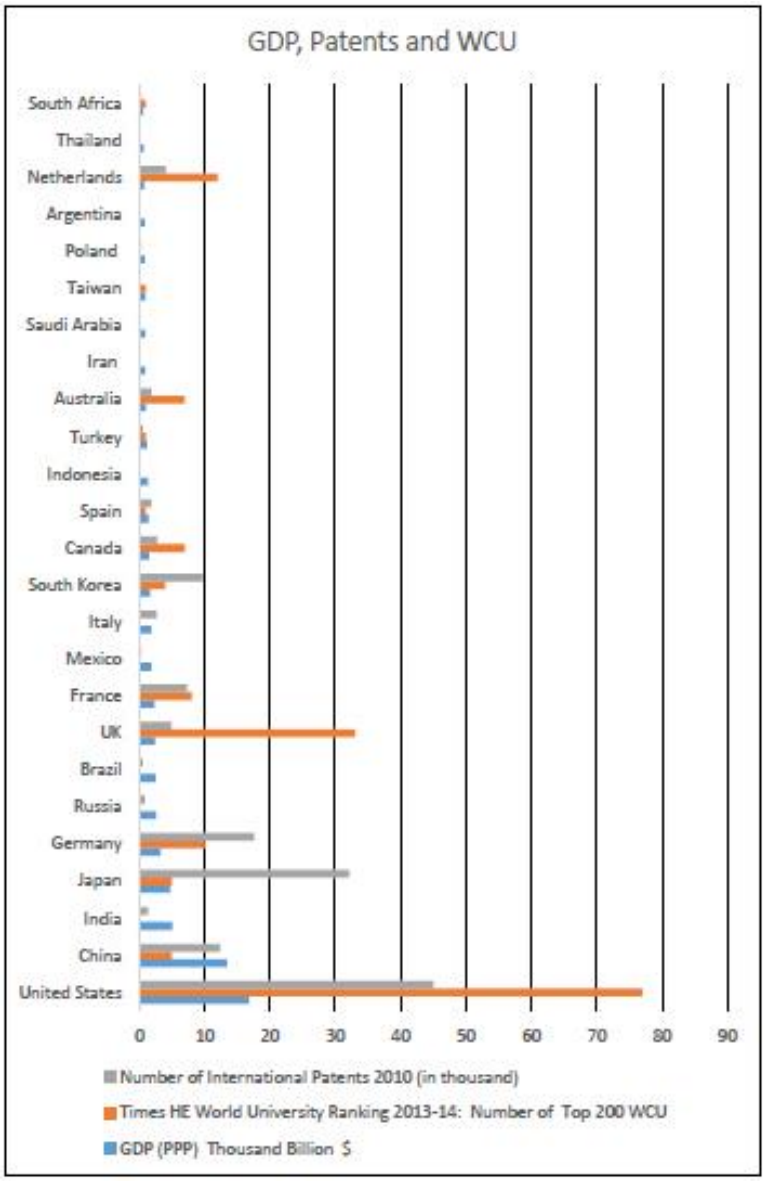


Fig. 15.9: Top 25 economies of the world: GDP (PPP), Patents and WCU

Today is the era of Knowledge Based Economy (KBE) and reflects in GDP. The number of International Patents is one of the indicator of KBE. The Table 15.1 shows that number of WCU and Number Patents are proportionate. **In USA, UK, Canada, Netherland and Australia are having comparatively more WCU and less patents, which is not expected**. Whereas the case is reverse in China, Japan, Germany, and South Korea. It seems that the few countries are focusing more on economic benefits of WCU.

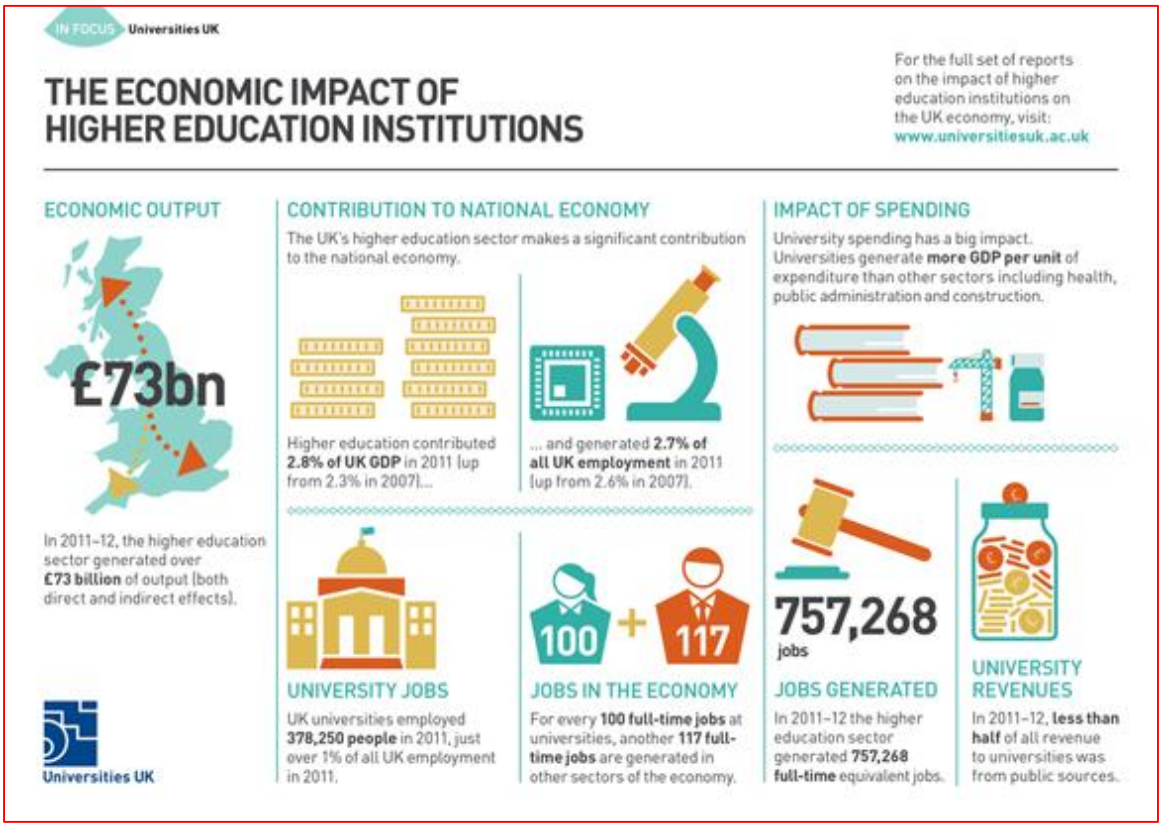
The report on "Economic impact of UK universities" shows that in 2011–12, the UK higher education sector:

- Generated over £73 billion of output – up 24% from £59 billion in 2009
- Contributed 2.8% of UK GDP in 2011 – up from 2.3% in 2007
- Generated 2.7% of all UK employment and 757,268 full-time-equivalent jobs
- Generated £10.7 billion of export earnings for the UK
- Received less than half its income from public sources [326]

Sector	US $ Billion	Jobs in Million	GDP
Indian IT sector	US$ 100 Billion	11.7 Million jobs	7.5 GDP (India)
UK Universities	US $ 100 Billion	13.6 Million jobs	2.8 GDP (UK)

Table 15.4: Comparison of Indian IT Sector with UK University Sector

The education sector contributes about 3% of Singapore's GDP and provides jobs for more than 57,000 workers. Its GDP contribution is projected to reach 5% and employment in the sector to exceed 70,000 by 2015 Similarly, South Africa's 23 universities contributed 2.1% of South Africa's GDP in 2009. [327] [328]



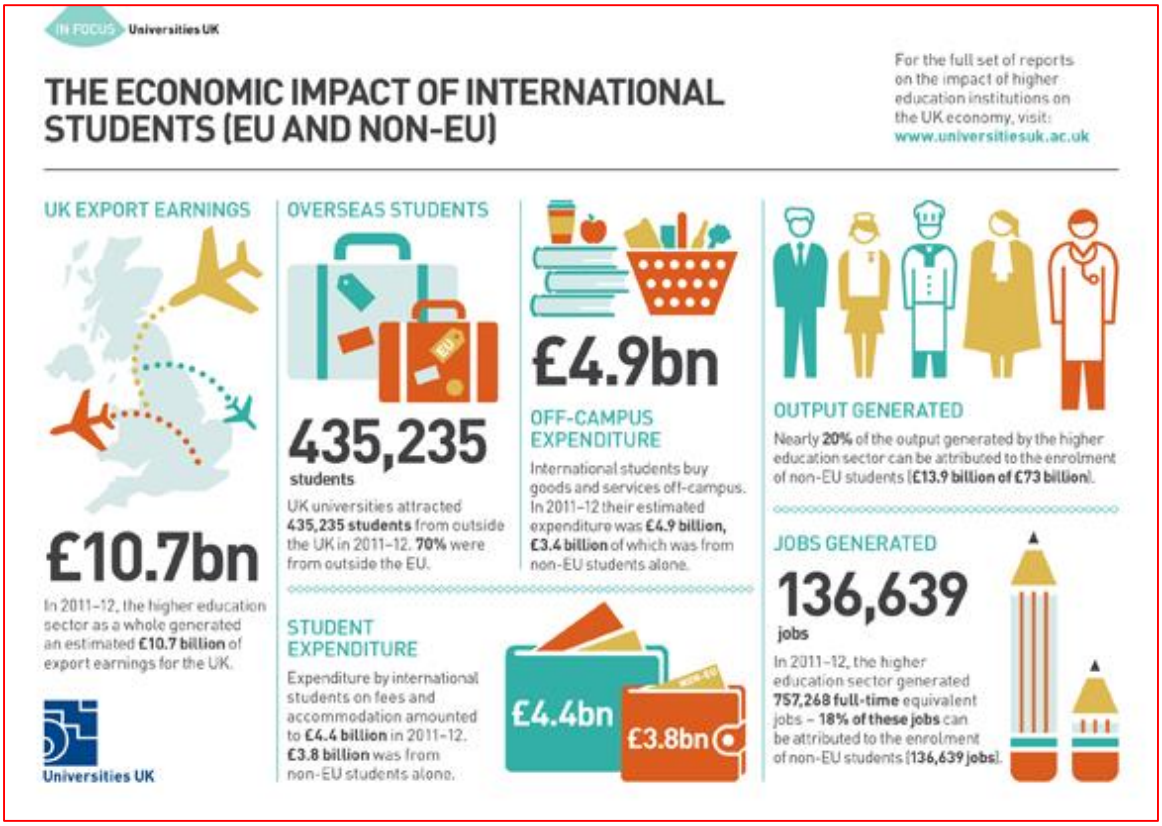


Fig. 15.10: The impact of universities on the UK economy [326]

The University of Birmingham has a major economic impact on the city and region as an educator, employer, research leader and international gateway. The study shows that:

- Generated £1.072 billion of spending in the West Midlands economy in the 2011/12 academic year, a 38% increase since the 2005/06 study;
- Made a value-added contribution of £530 million to the region's economy;
- Supports 11,830 jobs in the region, including a high proportional of highly skilled roles;
- Is a net importer of talent to the region;
- Acts as an international gateway to the city attracting overseas students, visitors and spending
- Attracted £145.5 million research funding in 2011/12 , 87% of the research income received by all Birmingham Higher Education Institutions and 12% of the region's total R&D spend. [329]

The India is third largest economy (GDP-PPP) and having the largest higher education system of the world. Thus India must have at least few WCUs and the growth must be reflected in GDP.

I personally feel that, for higher GDP growth rate, we must give more attention to Washington Accord than WCU ranking. The Accreditation is better than Ranking Mechanism for evaluating standard of higher education. The accreditation provides the international equivalence in more realistic way. Thus for India, the Washington Accord is very vital tool for enhancing the standards of technical higher education sector.

Chapter 16: Food for Thought: Change in World Order Can Affect Developing Cost of WCU & Financial Status of Existing WCU

It's era of globalization. The change in World Order or Global Economy can affect the establishment and operational cost of WCU. It can affect the current financial status of existing WCU and can change the level and intensity of global competition among the World Class Universities. ***It's a Food for Thought****. In this chapter, I have quoted the opinions of economist and experts to clarify the concept of globalization, global economy and* ***how it can affect financial aspect of WCU****. Neither I am interested to show where global economics is moving nor interested in any global economic predictions. These are not my views or opinions.* ***It should be treated as hypothetical case study for understanding the concepts of economics****.*

The World Order may change. It can affect Globalization process. The Global Economy can affect all the economies of the world. The world may move towards global equilibrium through Inflation, Exchange Rate and Interest Rates. The change in world order can affect the currency exchange rate. Thus it can affect **the financial status of existing WCU and cost of establishing new WCU too**. The Globalization, Global Economy, National Economy and Higher Education Sector, all are related to each other. Its' a complex issue and unpredictable. Nothing can be said or guessed. One can't calculate anything. The theory presented can be a speculation. But one should know these facts and keep the watch with open eyes. **It's a food for thought**.

I would like to quote few facts without any explanation and comments. I am not expressing my views in any way. I am just quoting the different views of experts. There are many article in favor of and against the "major change in Global Economy". **One thing is sure, if there is a major change in global economy then it can affect the establishment and operational cost of WCU**.

16.1. Comments in Favor of "Global Economy May Change"

- Throughout the twentieth century, the list of the world's great powers was predictably short: the United States, the Soviet Union, Japan, and northwestern Europe. The twenty-first century will be different. **China and India are emerging as economic and political heavyweights**. [307]
- The **US is a declining economic power** but will remain dominant militarily for several decades… If history teaches us anything, it is that it repeats itself. In 2016, according to the Inter-national Monetary Fund (IMF), **China's economy will overtake America's**. Chinese GDP, assuming an average annual growth rate over the next five years of 9.50%, even as the global economy slows, will rise from $11.20 trillion (by purchasing power parity) in 2011 to $17.50 trillion in 2016. US GDP, hit by the Eurozone meltdown, is likely to grow at an annual average of an estimated 1.75% during the same five-year period, rising to barely $16.60 trillion from its current level of $15.20 trillion - losing its status as the world's largest economy for the first time since the late 19th century. Meanwhile, establishing another milestone, **India, despite the current slowdown, is set to become the world's third largest economy** - ahead of Japan - in 2011-12 with a GDP (PPP) of $4.45 trillion. [308]
- **China and India** are on the verge of becoming far more than economic powers. These two countries are now also planetary powers that are shaping the global biosphere and are therefore central to whether the world succeeds in building a healthy, prosperous, and environmentally sustainable future for the next generation. [309]
- The steel production is one of the indicator of growth of economy. The India is the 4th largest steel producer of the world. In addition to this, the Indian steel companies has major share in steel production of other countries.
    - Tata Steel has manufacturing operations in 26 countries, including Australia, China, India, the Netherlands, Singapore, Thailand and the United Kingdom. The Tata Steel acquired the UK-based steel maker Corus (2007), Singapore based NatSteel (2004-5) and Thailand-based steelmaker Millennium Steel (2005).
    - The Mittal Steel acquired Ukrainian steel manufacturer Kryvorizhstal (2005) and Arcelor Spain (2006)

The top 6 steel producers of the world are as follows. The China steel production of China is 9 times more than US.

Crude steel production (million metric tons):								
Rank	Country/Region	2007	2008	2009	2010	2011	2012	2013
—	World	1,351.3	1326.5	1,219.7	1,413.6	1,490.1	1552.9	1607.2
1	People's Republic of China	494.9	500.3	573.6	626.7	683.3	724.7	779.0
-	*European Union*	210.2	198.2	139.3	172.8	177.7	168.6	165.6
2	Japan	120.2	118.7	87.5	109.6	107.6	107.2	110.6
3	United States	98.1	91.4	58.2	80.6	86.2	88.6	87.0
4	India	53.5	57.8	62.8	68.3	72.2	77.3	81.2
5	Russia	72.4	68.5	60.0	66.9	68.7	70.6	69.4
6	South Korea	51.5	53.6	48.6	58.5	68.5	69.3	66.0

Table 16.1: County wise Production of Steel in Million Tons [310] [311]

- The article at CNBC (17 Oct 2013) stated that "I think, it's part of the **demise of the dollar as an international reserve currency**," Chris Watling, CEO of Longview Economics, said of the U.S. government's political impasse. Alasdair MacLeod, head of research at GoldMoney Foundation, agreed saying the **dollar's credibility has taken a "very, very bad hit"**. [312]
- Another article at CNBC "Is the Dollar Dying? Why US Currency Is in Danger" (14 Feb 2013) stated that "The U.S dollar is shrinking as a percentage of the world's currency supply, raising concerns that the greenback is about to see its long run as the **world's premier denomination come to an end**"… For a country with a budget deficit in excess of $1 trillion a year, the consequences of **losing standing as the world's reserve currency** would be dire… "The No. 1 security issue we have as a nation is the preservation of the U.S. dollar as the **world's reserve currency**," said Michael Pento, president of Pento Portfolio Strategies. [313]
- The Guardian stated that "The coming **'tsunami of debt'** and financial crisis in America (15 June 2014): Forces that caused **the world economy to collapse**, including income inequality and debt, are again in action, and could drag corporations down in their wake." [314]
- According to Donald Trump "The United States could soon become a **large-scale Spain or Greece**, teetering **on the edge of financial ruin**. The United States is **no longer a rich country**. When you're not rich, you have to go out and borrow money. We're borrowing from the Chinese and others. We're up to **$16 trillion in debt**." The US debt is now bigger than the entire US economy. [315] [316]
- The United States calls the shots on the financial markets. Critics may point to America's staggering **17.5 trillion dollar debt** – equivalent to USD 55,000 per head of the population. [317]
- Recently published Two books on American economy highlighted this issue:
  - "The Real Crash: America's Coming Bankruptcy – How to Save Yourself and Your Country" by Peter Schiff
  - "The Death of Money: The Coming Collapse of the International Monetary System" by James Rickards. [318]

- Dr. Bharat Jhunjhunwala, former Professor of Economics at IIM, Bengaluru stated that "Unquestioningly, the US is the largest economy today. Its GDP (Gross Domestic Product) at about 16 trillion dollars is nearly double that of China at 8 trillion dollars. But the growth rates are in the opposite direction. US growth rate was 1.9 per cent last year in comparison to 7 per cent of China. Therefore, China is fast catching up. The bigger problem is that the US is living beyond its means. The US government is borrowing huge amounts from the world markets in order to meet its expenditures. The level of debt is usually measured against the total income of the country known in economic parlance as GDP. A debt less than annual income of the country is considered okay while that above this is considered troublesome…China on the other hand is on an altogether different footing. It has been giving loans to the US. The Chinese government is the biggest buyer of US treasuries and holds nearly 2 trillion dollars-worth of these securities—and rising. Therefore, future of the Chinese economy is on a much stronger wicket than that of the US…China is lending massive amounts of money to keep the US afloat and can pull the rug beneath the US anytime". [334] [335]

16.2. Comments in Favor of "No Change in Global Economy"

- 10 Reasons Why the U.S. Economy Won't Collapse (04 May 2014) [319]
- Dollar Decline or Dollar Collapse? [320]
- US dominance of the financial markets is, and will remain, a fact of life [317]

The WCU needs huge financial investments. The cost of WCU is very high because of currency exchange rates. The change in World Order or Global Economy can affect the currency exchange rate. Thus it can affect the establishment and operational cost of WCU. It can affect the current financial status of existing WCU and can change the level and intensity of global competition among the World Class Universities. While discussing the issues related the WCU, one should have at least basic knowledge about these global dynamics and thus I have included this issue as a small chapter of this book. These are not my views or opinions. It should be treated as hypothetical case study for understanding the concepts of economics. The detailed discussion is beyond the scope of this book.

Chapter 17: Final Word

Prof Pankaj Chandra, Director IIM, Bangalore stated that "Change at the scale we will see in the next ten years in education in India is ***unprecedented in human history****" [321]*

Thanks to more than 5 lakh readers across the world for patiently reading these gigantic volumes of 1700 pages with 1800 references and constantly encouraging me to complete this mind-blowing task of national interest.

17.1. British Council Report: Identified Almost Every Weakness

The British Council has published the Report "Understanding India" (48 pages, Feb 2014) which is based on over fifty face-to-face interviews between November 2012 and April 2013 with higher education leaders, academics and policy makers in India. This report presents an insight into views on the future of higher education in India and areas of potential collaboration with the UK. This is one of the best analysis, I have ever seen, on Indian Higher Education done by foreign agency. According to the Report "India will provide the largest opportunity in the world for international higher education institutions and education businesses".

I could locate this British report after publishing my 4 books. **This report has identified many weakness of Indian HE sector to expand their business. Whereas I have discussed best practices and remedies for improving standards of higher education sector of India in my series of books on WCU**. This document is quite supportive for many points, which I have discussed in my books.

The British Council Report stated that in next decade India will be key source of intellectual capital. The UK should tap it. They are interested to tap Indian Talent for Future Growth of UK. World-class research and innovation depends on access to the best future academic and research talent. In the next decade, India will have the largest tertiary enrolment in the world and will be a **key source of intellectual capital**;

- **UK universities** will **need to tap India's talent pipeline** to engage with the best researchers in the world.
- **UK businesses and industry need the high level skills of graduates in India to grow their business and trade connections**.

Surprisingly, the world is doing research on Indian Talent and finding the technique to use this talent for betterment of respective countries. At least, we must learn to tap our own human resources and utilize their talent to become developed country. [321]

As per findings of British Council Report the weakness of Indian Higher Education system are as follows. This weakness analysis will help them to decide the future collaborative and business policies in the field of higher education.

- A chronic shortage of faculty
- Poor quality teaching. Teachers are poorly trained both in the effective use of technology and in pedagogical terms
- Outdated and rigid curricula and pedagogy: Pedagogies and assessment are focused on input and rote learning; students have little opportunity to develop a wider range of transversal skills, including critical thinking, analytical reasoning, problem-solving and collaborative working.
- Lack of accountability and quality assurance
- Separation of research and teaching
- Very low level of PhD enrolment
- Not enough high quality researchers
- Few opportunities for interdisciplinary and multidisciplinary working. Multi- and inter-disciplinarity in research as critical for future research impact and innovation.
- Lack of early stage research experience
- Weak ecosystem for innovation

- Low levels of industry engagement. Currently limited collaboration with industry
- Need improvement in Credit transfer systems
- Need movement between higher education and vocational skills streams
- Most felt that current digital content and distance learning materials in India are of poor quality and that little good content is being developed at present
- International collaboration in the arts, humanities and social sciences is generally lacking
- Strong need to internationalize Indian higher education
- Reform are "slower and messier" compared to China.
- Low Employability: There is little capacity at present in universities for teaching either skills for employability or entrepreneurship. Engineering colleges are particularly affected by low graduate employment and an over-saturated market. One interviewee was of the view that only 10% of the 300,000 annual engineering graduates from Tamil Nadu's colleges are employable, and reported that 1000 people with engineering degrees recently applied for a vacancy as a rail track clearer for Indian Railways, which only required a Grade 8 education.
- The Government's reforms have broad support within the sector, but many predict it will be a **messy** and **unpredictable process**. The devolution of authority and responsibility for higher education reform to the state governments has begun, but there will be huge differences in the **capability and the will** of different states to act. This will result in great variation in how the reforms unfold across the country. [321]

I have addressed almost every issue in my series of books on WCU.

17.2. FICCI HE Summit 2013 Report: Suggested Similar Approach

The FICCI Higher Education Summit 2013 published the report "Higher Education in India: Vision 2030" (84 pages). This report gives the roadmap of "nuts and bolts of transformation from 2013 to 2030". Few of them are as follows:

- The planned expansion of a differentiated university system
- The transition to a learner-centered paradigm of education
- Intensive use of technology
- Reforms in governance [322]

This report has given enough stress on Higher Education Foundation i.e. Funding and Governance, as well as HE Architecture, which is shown in following diagram.

This report is focusing on almost similar points, which have been already discussed in my series of books on WCU.

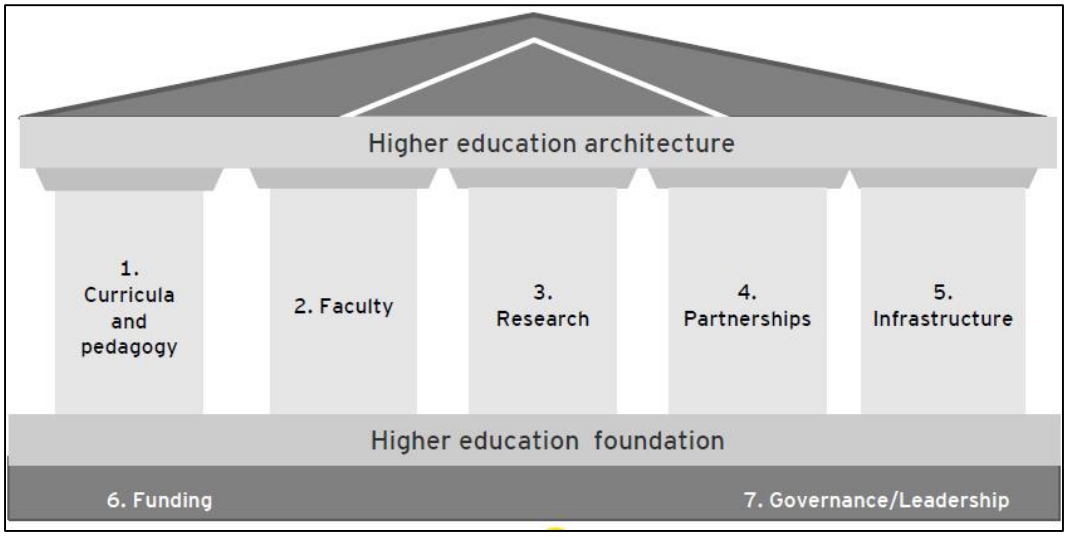


Fig. 17.1: India: Higher Education Architecture [322]

I have addressed most of the issues raised in this report in my series of books on WCU.

17.3. Skill India

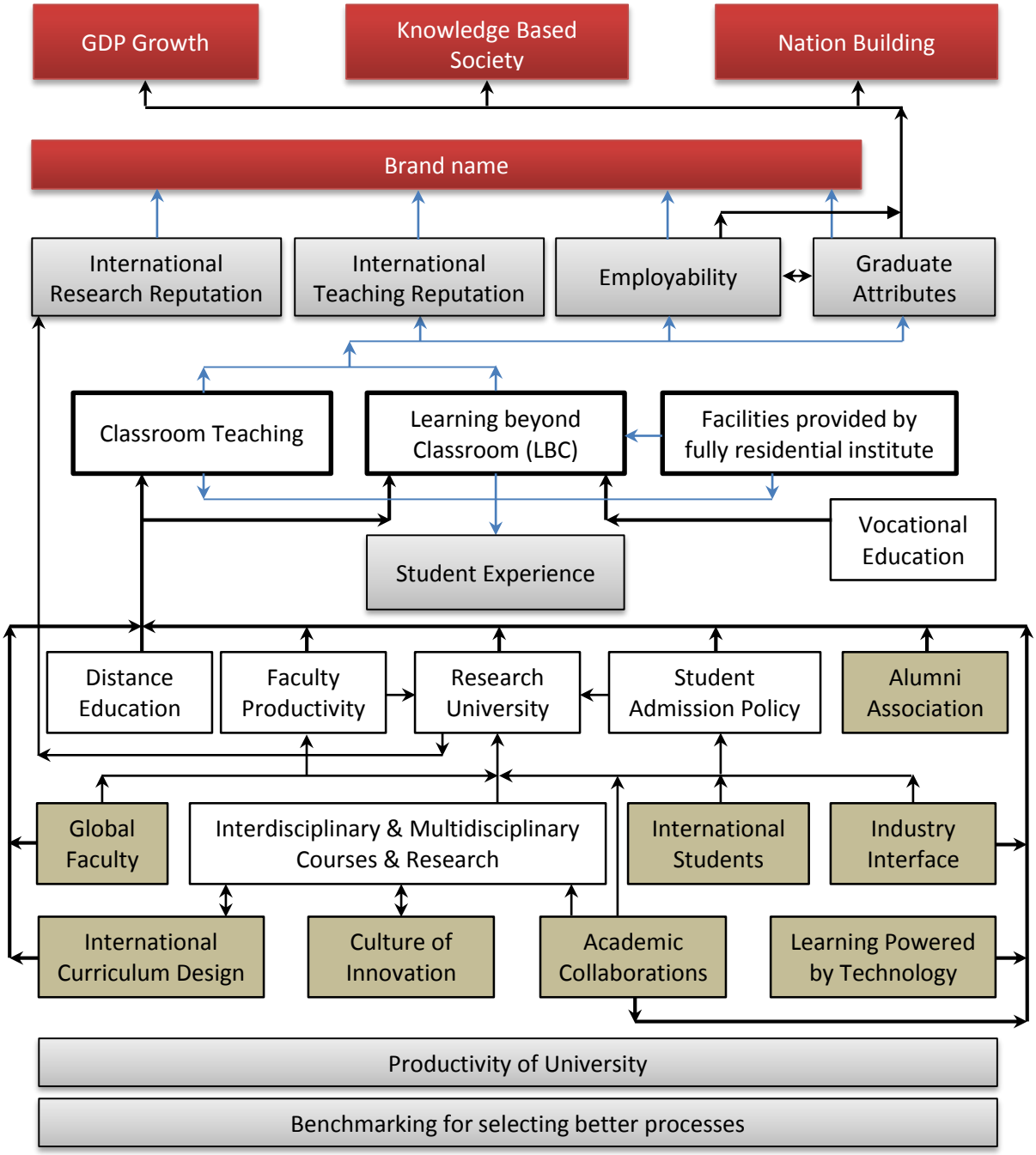
Hon. Prime Minister, Narendra Modi, in his first speech in a Parliament discussion, expressed his dream of "Skill India", which is a central theme of this book.

This FICCI report stated that "India could potentially emerge as a global supplier of skilled manpower." This is possible if we could improve the employability of our students. [322]

The Washington Accord and NBA Accreditation also measures Graduate Attributes or Educational Outcomes, which decide the quality of outcome and employability of students.

The government has initiated many steps to increase the quality of higher education and enhancing employability, like TEQIP, RUSA and even recently restructuring of UGC. The news published at EDU Tech state that "The HRD ministry shall form a committee in order to create a blueprint for restructuring the UGC. HRD Minister Smriti Irani is looking to restructure the UGC in keeping with the BJP's promise turning the UGC into a Higher Education Commission." [333]

We must give highest priority to "Employability" while deciding every higher education policy, which is directly proportionate to graduate attributes or skillset. These attributes depend upon so many factors mentioned in this book (i.e. in the following three diagrams) and need lot of improvements on urgent basis.


GDP Growth
Knowledge Based Society
Nation Building
Brand name
International Research Reputation
International Teaching Reputation
Employability
Graduate Attributes
Classroom Teaching
Learning beyond Classroom (LBC)
Facilities provided by fully residential institute
Vocational Education
Student Experience
Distance Education
Faculty Productivity
Research University
Student Admission Policy
Alumni Association
Global Faculty
Interdisciplinary & Multidisciplinary Courses & Research
International Students
Industry Interface
International Curriculum Design
Culture of Innovation
Academic Collaborations
Learning Powered by Technology
Productivity of University
Benchmarking for selecting better processes

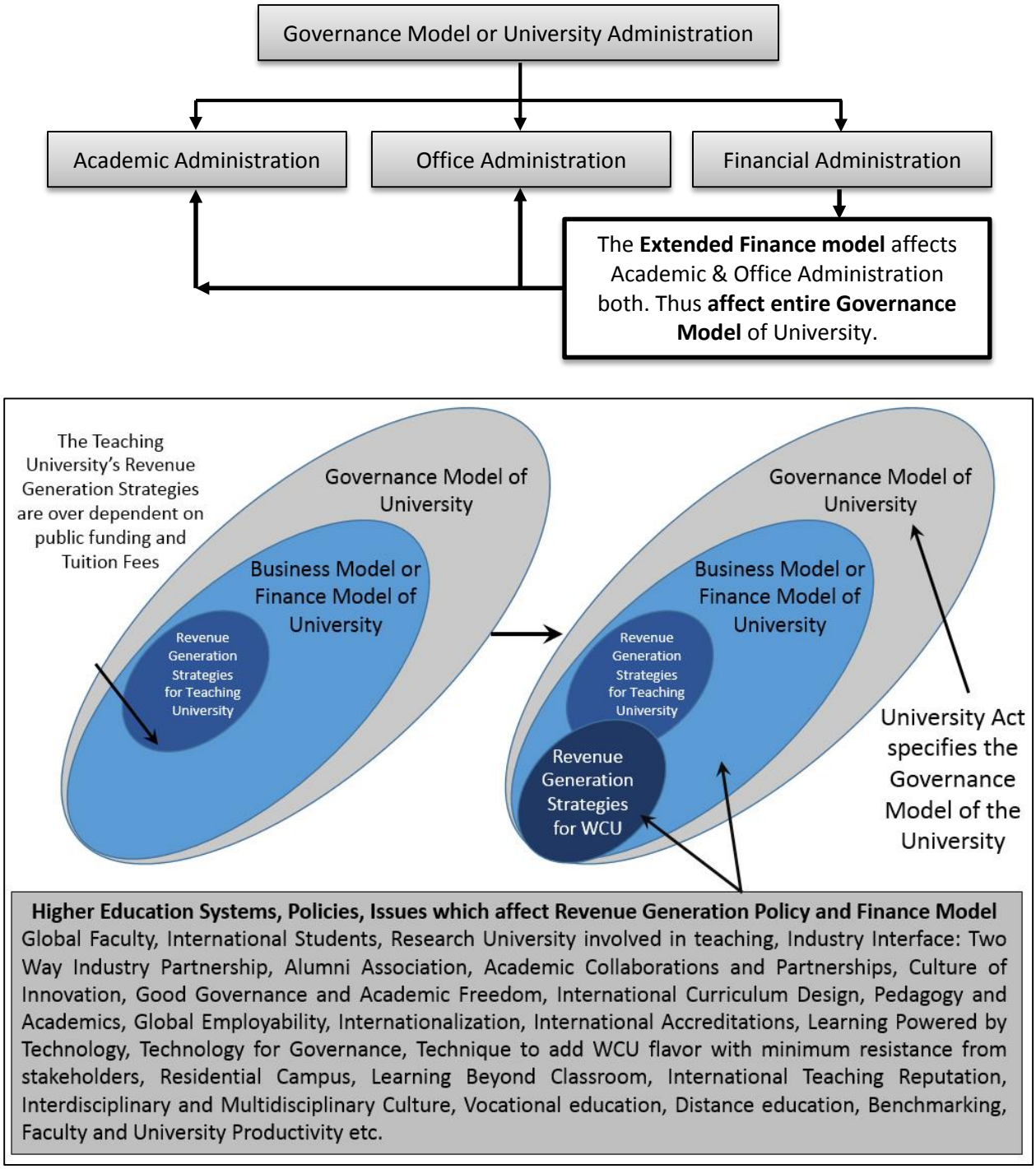


Fig. 17.2: Central theme of the book

In coming decade, I am sure these diagrams along with 1700 pages and 1800 references of these series of compiled books on World Class Universities will act as a vital reference point for academic fraternity of the Indian higher education sector for enhancing student's employability. Its' a question of the fate of 550 Million Young Indians.

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