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Analysis of impact of industry-academia interaction on quality of technical education: A system dynamics approach

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ABSTRACT

Indian technical education since the year 1995 experienced an exponential growth which adversely affected the quality of engineering graduates. Many research studies have strongly emphasized on improving the quality of technical education in India. The industry is proactively involved in improving the quality of its raw material suppliers, but it has overlooked academia despite it being an important supplier of human capital to the industry. This is perhaps because the industry adopted myopic approach towards academia considering it as a fruitless option. As a result, there is a visible disconnect between industry and academia in India which is a major cause for the poor quality of technical education. This research paper presents a novel approach to analyze the impact of industry interaction on the quality of technical education through system dynamics (SD) modeling. A computer based model was developed to explain the impact of Industry-Academia (IA) interaction in enhancing the quality of technical education as seen through the employability of graduates. The paper attempts to prove that the proactive involvement of industry in academia is a profitable proposition for both the stakeholders. The study also analyzes the impact of key policy variables on unemployment level, shortage of employees and total cost of involvement of industry in academia. The model was developed using SD simulation software STELLA (version 10.0) and four scenarios were generated to analyze the system behavior. The SD model was simulated for fifty years. The findings of the study reveal that proactive involvement of industry is essential for improving the quality of technical education and is profitable in the long run. The insights from the study would be helpful to policy makers and researchers from the industry and academia in analyzing the long-term implications of decisions using SD modeling.

1. Introduction

There is an ever-increasing pressure on industry to make superior quality products using high quality input resources and latest technology for sustenance in the globally competitive environment. The quality of human capital is vital for subsistence for any organization. Therefore, industry needs highly employable graduates who can contribute significantly towards the organizational growth. Academia, which is an important supplier to Industry (of human capital), gets minimal attention from it in comparison to the suppliers of other input resources. The industry has focused considerably on Tier-1, Tier-2 and Tier-3 suppliers for the improvement of their processes through proactive involvement. On the contrary, academia has been put on the flip side. As a consequence, there appears to be a significant gap in the interaction between industry and academia. It widens as we move downstream along the suppliers of Tier-I (under-graduate and post-graduate institutions), Tier-II (secondary and senior secondary schools) and Tier-III (primary schools) categories, respectively. Although the academia is important like any other supplier, the industry has not proactively involved itself in improving the quality of academia. This paradox can best be explained through the concept of SD. The outcome of any action of involvement in academia comes with a significant delay and has long-term implications. Whereas, profit-driven organizations look for short term gains which are not seen in academia in a shorter time frame. As a consequence, academia is given low priority by industry. This paper aims to illustrate, through SD approach, how proactive involvement of industry in academia is more profitable to it rather than remaining indifferent or reactive.

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2. Framework of the study

In Section 1, the research paper gives an overview of higher education in India and the challenges faced by it. Section 2 presents the literature review on the application of SD in different social systems including education. Section 3 gives the dynamic hypothesis of IA interaction model. In this section, the detailed causal loop diagram of the model is presented and discussed which is then converted to stock and flow diagram. Section 4 presents the model validation, results and analysis of behavior of different policy variables. Section 5 gives the managerial implications of the proposed policies (see Fig. 1).

3. Literature review

The literature review was conducted to understand the Indian higher education system, causes of poor quality in technical education in India, and to know the extent to which SD has been applied in understanding the behavior of complex systems. This section gives a review of the literature covering primarily three aspects: (1) Scenario of higher education in India; (2) Quality issues in technical education in India; and (3) Application of SD in education and other complex systems.

3.1. Higher education scenario in India

The Indian higher education system has 712 universities and university-level institutes and about 36,671 colleges. Amongst universities, 310 are state universities, 143 private universities, 43 central universities and 127 deemed universities (PWC Report, 2012). The technical education system in India covers courses in management, engineering, technology, architecture, pharmacy, hotel management and catering technology, and applied arts and crafts. The gross enrollment ratio (GER) in higher education is 18.8% which is still lower than the world average (24%) and much lower than that of the developed nations (58%) (PWC Report, 2012) (see Table 1).

Tables 2a and 2b give enrollment data for different programs in higher education in India for the year 2012–2013. Percentage enrollment for B.Tech in engineering is around 13.27% (For B.E. and B.Tech) making it the second highest enrolled programme after Bachelor of Arts. The percentage out-turn/pass-outs in the engineering and technology in the year 2012–2013 was around 10 (MHRD-Report, 2013). This seems rather alarming since the cur-

Table 1
Number of higher educational institutions in the year 2013–2014. *Source:* MHRD-Report (2013).

Higher education	**Universities**	Type	Number
		Central University	42
		State Public University	310
		Deemed University	127
		State Private University	143
		Central Open University	1
		State Open University	13
		Institution of National Importance	68
		Institutions under State Legislature Act	5
		Others	3
		Total	**712**
	Colleges		**36,671**
	Stand alone institution	Diploma Level Technical	3541
		PGDM	392
		Diploma Level Nursing	2674
		Diploma Level Teacher Training	4706
		Institutes under Ministries	132
		Total	**11,445**

Table 2a
Percentage enrollments in different undergraduate programs in higher education (year 2012–2013). *Source:* MHRD-Report (2013).

S.No.	Programme	Percentage enrollments
	B.A.-Bachelor of Arts	32.55
1	B.Com.-Bachelor of Commerce	11.42
2	B.Sc.-Bachelor of Science	11.17
3	B.Tech.-Bachelor of Technology	7.01
4	B.E.-Bachelor of Engineering	6.26
5	B.Ed.-Bachelor of Education	2.01
6	L.L.B.-Bachelor of Law or Laws	0.69

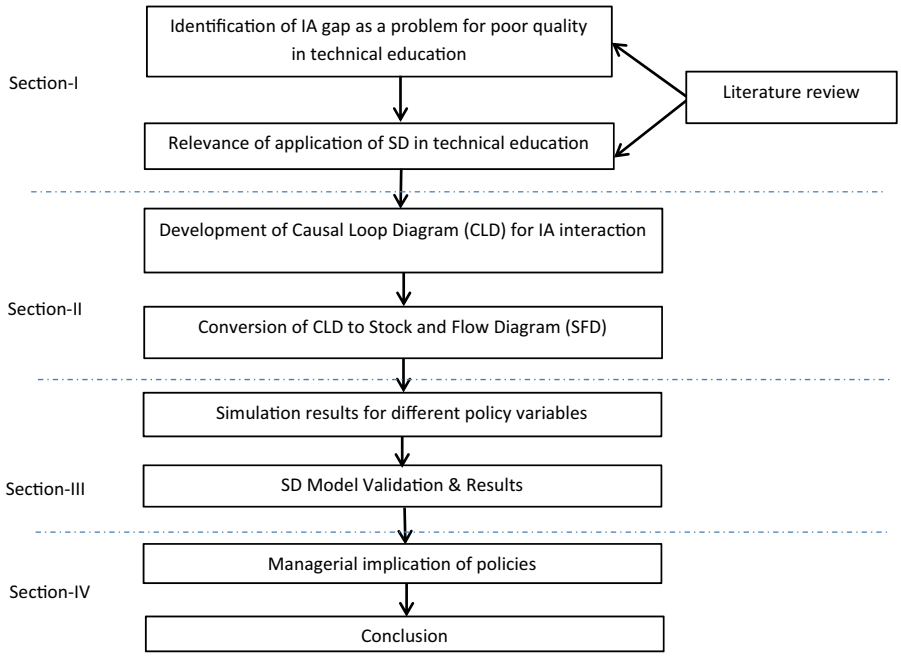

Fig. 1. Framework of the study.