Global Journal of Flexible Systems Management (June 2017) 18(2):111–122
DOI 10.1007/s40171-016-0144-2

ORIGINAL ARTICLE

Institutional Growth and Industrial Competitiveness: Exploring the Role of Strategic Flexibility Taking the Case of Select Institutes in India

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Received: 14 April 2016 / Accepted: 29 August 2016 / Published online: 13 October 2016

Abstract *The internationalization of human resources, supply chains and technology management is driving the rise of institutes from Asia. The focus may shift from institutional growth to dynamism for technology-based focal institutes keen to contribute to industrial competitiveness. The role of strategic flexibility to enhance the contribution of institutes to competitiveness is an unexplored area. We study situations and trends in the growth of select leading institutes in India to explore patterns and problems. We attempt to structure the key problem factually to find root causes. While literature review is of limited help to detect any key patterns, interactions and observations indicate that flexibility in the ability to shift proportion of paths in the portfolio of an institute may enhance its vitality and competitiveness. The study contributes to the method of 'problem structuring' by proposing 'actor-based root cause diagram', and ambiguities to evolve sharper research questions. The study identifies several topics for further research to accelerate catch-up by institutions on quality and vitality.*

Keywords Cooperative strategies · Emerging industries · Flexible and fit human resources · Organizational competitiveness and growth · Strategic flexibility and institutional excellence · Sustainable organization · World-class universities

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'Where your talents and the needs of the world cross, there lies your purpose'.
Aristotle, Greek philosopher and scientist.

Introduction

Re-emerging Asian countries promise to regain their high level of contributions to world production and trade, and India has the resources to innovate sustainably. The leadership provided by relatively less populous countries such as Japan, Korea, Taiwan, Singapore and Hong Kong has been motivating many countries, including larger ones such as China, India and Iran. Japan may not have the youth of 1964 (hosting the first Olympics in Asia), but has growing maturity of institutions, along with technological and innovation capabilities, to be a role model as it revitalizes for 2020. It will become the first Asian country to host the Olympics twice. From its spectacular successes in engineering (e.g. defence to space; Kalam and Rajan 2002), India is moving ahead on innovations that benefit the masses (e.g. ICT access) or profit businesses internationally (e.g. IT services). Some firms of Indian origin (FIOs) have been trying painstakingly to compete internationally, not only in software services, but also in technology-based emerging industries such as biopharmaceuticals, where cooperative strategies with institutes can be highly fruitful. Higher stages in the competitiveness journey of firms (Momaya 2001) or institutions can demand much higher flexibility (e.g. Sushil 2007) and health for systematic innovation (Krishnan 2010). The capitalist model of economic development that India has embraced depends on the industrial firm as the driver of progress. As cost advantages erode rapidly in the face of intensifying competition (reaching levels of hyper-competition in several

markets in India, e.g. automotive, electronics, FMCG, telecom), focal FIOs (FFIOs) will have to discover other sources of competitive advantages or character competence (e.g. Sharma 2016).

Flexibility, innovation and vitality can be some of those sources of advantages. Flexibility has been emerging as an important concept that can link functional silos (such as operations, marketing and finance) to provide agility to organizations to cope up with change. The paradigm of 'strategic flexibility' came to the forefront of industrial practice, which synthesized the strengths of most of the previous theories of strategic management in a novel way to fill gaps (Sushil 2015, 2016). Strategic flexibility also acts as a predictor of vitality and sustainability of the enterprise (Sushil 2011). Innovation on multiple fronts—from process and product to business model and technological—is becoming important as India aspires to accelerate on competitiveness enhancement and growth. While firms are the key drivers of growth and adapt from many alternate strategies for growth (Ghosh 2010), focal institutes can also play an important role to shape the ecosystem of competitive industries. The phenomenon of 'pre-mature stagnation in journey' seems to be quite common to organizations of different types and needs characterization. The phenomenon is visible even in advanced countries, but is more natural to emerging countries. Since many countries could overcome problems such as 'child mortality', it may be possible to at least reduce incidences of the phenomenon, as costs of stagnation are too high for resource-scarce emerging countries. Path-setting scholarship may be needed to tackle the widespread disappointment with lack of interesting and impactful work that addresses complex problems of competitiveness. Since identification and characterization of the phenomenon can help refine problems and research questions, we want to explore approaches such as problematization (Alvesson and Sandberg 2011) to generate better research questions and methods. A key objective of our study is to develop a systematic approach to characterize the phenomenon by adapting a powerful method of 'problem structuring' (Mingers and Rosenhead 2004; Saxena et al. 2006). For the context of research, we have selected institutes as 'research sites' for several reasons.

Human capital is taking on increasing importance in creating specific advantages, and institutions that nurture highly skilled human resources are liked by many stakeholders. The importance of highly skilled and capable human resources is increasing as other factors of production (e.g. capital, natural resources and technology) become more mobile across national borders (e.g. Stubbart and Terry 1995). In this context, 'how can smoother flow of human exchanges across the world become possible' evolves to be a fundamental question.

Institutions of national importance are created with high goals of contributions across levels, including to industrial competitiveness of at least regions if not the home country. A research university with world-class capacity, often called a *world-class university*, is regarded as a central part of any academic system and is imperative to developing a nation's competitiveness in the global knowledge economy (Wang et al. 2011). However, the implementation of such a paradigm seems to have been done systematically in only a few countries such as China. In contrast, the institutes in India appear to be moving too slow. They should develop the strength to achieve basic balances and to grow on relevant dimensions. The ones that aspire to climb steps to contribute massively to community, industry and country should have strategic flexibility and vitality. For instance, despite having the potential to climb new peaks, the Indian Institute of Technology (IIT) system appears to be at a critical juncture (Gulhati 2007). The challenges, both external and internal, faced by the IIT system reduces optimism about the ability of existing IITs to realize their dream of reaching world-class levels (Jayaram 2011). In such a context, we wish to explore the following questions: What can be the linkages between institutional growth and industrial competitiveness? Can strategic flexibility play any role in shaping these linkages? An effort is being made to study the growth aspects of the Indian Institute of Technology Bombay (IITB) and other leading IITs by reviewing the existing literature. Studies related to institutional health and excellence in India are reviewed in order to throw light on basic terms, definitions and criteria used to define institutional health, vitality, excellence and their contribution to industrial competitiveness. The patterns of gaps between IITB, other strong Indian universities, and the world's leading select universities are studied in enhancing their contribution to the competitiveness of select knowledge-based emerging industries.

An attempt to review literature related to organizational health or vitality of institutions and FFIOs found major gaps in both and also in strategic flexibility. Our ongoing research on competitiveness of FFIOs has found major opportunities due to stagnation at higher levels (e.g. Global 500) and slow catch-up at middle levels (e.g. Global 2000 list of Forbes; Momaya 2015). Based on the extensive literature review, our study will contribute to the literature of 'strategy and growth' and 'institutions and industrial competitiveness' with more effective definitions and measures of institutional growth (IG). It may also contribute to criteria of innovation and flexibility to enhance at least operational vitality, if not intellectual and other kinds of organizational vitality (e.g. Bishwas and Sushil 2015, 2016).

Literature Review

Attempts were made to progress systematically from quantitative analysis of literature towards qualitative, to identify key concepts, their contexts and definitions for exploring potential linkages to institute growth and industrial competitiveness. Working definitions of key concepts used in this paper are given in Appendix 1.

Quantitative Trends

To get a complete picture of quantitative trends in the existing knowledge on health/vitality/growth of educational institutions, a structured approach was followed. Using Scopus database, keywords, '*organizational health*', '*organizational vitality*', '*organizational growth*', '*institute/institutional health*', '*institute/institutional vitality*', '*institute/institutional growth*', were searched in 'article title, abstract, keywords'. Again, the search was repeated by combining each of these keywords with '*leadership*', '*innovation*' *and* '*flexibility*' in 'article title, abstract and keywords'. Other than these keywords, many more proxies were also used to locate the relevant literature. From the results that were obtained, only those related to management were filtered choosing 'Business management and Accounting' in 'subject area' filter. Finally, the resulting papers were manually filtered according to relevance.

The results showed that though there is considerable work done on performance of educational institutions, phrases like institutional health and institutional vitality are still not prevalent in them. Only 11 papers related to institutional health and 3 papers related to institutional vitality were found in the longitudinal search covering the years from 1985 to 2014 (see Table 1). Phrases like institutional health and institutional growth are occasionally used in literature, but they mostly refer to the health and vitality of the social or environmental set-up of a country or community. Considerable efforts have been done in measuring the competencies, quality and performances of IITs and other higher education institutes in India, especially with respect to innovation and entrepreneurship, but efforts to map entrepreneurship to industrial competitiveness are limited. The concept of strategic flexibility emerged during the late 1980s, and it has been growing rapidly since the late 2000s. The number of papers published in this area has increased steadily over the years. However, strategic flexibility w.r.t. institutions is a less explored area in literature.

Qualitative Analysis

Institute Health, Growth and Vitality

Institutions in India are often in growth mode, and quality, ranking, etc. seem to attract more attention than health and vitality. The impact of population growth in India, which is driving the youth segment, implies that input factor-driven growth in the institutes will continue for some time. Intensifying competition (including from foreign universities entering India or recruiting from India for their international bases) is a factor demanding improvements in quality and rankings.

Focal institutes are institutes with strengths to be an important node in an ecosystem. They need not be large in size or located in large cities. The research university option is often suggested as a good road to academic excellence, and the central government in India seems to be quite open to explore. For instance, Shri Kapil Sibal, then minister of Human Resource Development, Government of India, gladly shared his views that India is in the process of setting up universities for innovation that are at the cutting edge of research in his preface for a book on world-class research universities (Altbach and Salmi, 2011). Synthesizing learning from nine aspiring universities, the book

Table 1 Longitudinal trends of publications in select areas. *Source* Developed based on search on 'article title, abstract and keywords' in Scopus, update as of 8 August 2015

Keywords/year	1985–1989	1990–1994	1995–1999	2000–2004	2005–2009	2010–2014
Institute/institutional health	3	1	3	2	1	1
Institute/institutional growth	0	0	1	1	2	1
Institute/institutional vitality	0	0	0	1	1	1
Organization/organizational health	8	11	18	39	33	55
Organization/organizational growth	1	5	14	8	38	41
Organization/organizational vitality	0	0	0	2	1	0
Strategic flexibility	1	0	13	25	58	106
Educational institutions + flexibility	0	0	0	0	1	5
Educational institutions + innovation	0	1	0	7	15	40
Educational institutions + leadership	0	1	0	6	8	31
Total	13	19	49	91	158	281

concluded that a new institute can, within two or three decades, can grow into a high-quality world-class research institute, if talent, resources and governance are adequately aligned from the beginning. In our context, the focal institute is one having strategic intent, capabilities and growing contributions to the industrial competitiveness of diverse industries or clusters from local to international.

Like organizational life cycle (e.g. Kimberly and Miles 1980), institutions may also need to think in terms of life cycle to enhance their contributions to industrial competitiveness. Even after assuming a longer horizon of life cycle in India for several reasons, the 70s can be considered a ripe time for institutes of national importance to think differently about institute health. Factors of their priority may shift from teaching and research to technology transfer, ventures, incubation and internationalization.

Industrial Competitiveness

With the rapid acceleration on some dimensions of macro-competitiveness of India (Momaya 2015), industrial competitiveness may regain high importance. Competitiveness of several industries in India was evaluated, e.g. auto component, engineering construction and telecom (Momaya 2001), software (Ambastha and Momaya 2004). While improvements are happening in at least some segments—e.g. services segments of software, telecom, healthcare—improvements in the competitiveness of Indian manufacturing are less researched, and the ground reality indicates vast gaps and hence opportunities for improvement.

Institutes can play an important role to enhance the competitiveness of industries, in at least nearby clusters, if not the region or whole country. Quality human resources developed by an institute can often be the most important contribution to industry. As an institute can develop alternate pathways such as consultancy, sponsored research and ventures (Fig. 1), the relative importance of different pathways in different contexts can provide flexibility to an institute. Bridging the mutual knowledge gap between two entities with a vast difference in culture—e.g. institute and industry—is not easy, and many issues of coordination and commercialization need to be resolved (e.g. Kotha et al. 2013).

Strategic Flexibility

The importance of flexibility for competitiveness has been appreciated (e.g. Bhardwaj and Momaya 2006). The importance of staying flexible was highlighted as a survival strategy for local companies on home turf, when competing with giants (e.g. Dawar and Frost 1999). Strategic flexibility can be defined as proactive as well as reactive strategic moves for change, both internally and externally, by leveraging the vital and desirable aspects of continuity of the organization in terms of core values, culture, core competence, brand and its strategic positioning (Sushil 2014). The concept may seem too new or difficult for many institutes and even firms, but can become relevant for focal firms and institutes, if they wish to climb higher stages of competitiveness (Momaya 2001) amidst high turbulence.

Approaches to Characterize Phenomenon and Structure Problems

Problem well understood is half the problem solved. Problem formulation has long been acknowledged as a core activity in strategic decision-making, and strategic problem formulation (SPF) has attracted some attention from scholars (Baer et al. 2013). Yet most organizations rarely devote adequate attention to systematically understand the problem and explicitize it adequately for easy sharing. Approaches such as problem structuring that has systematic steps for identifying symptoms, root causes and even ambiguities (e.g. in the form of dilemma about less settled debates or orthodoxies) can be of great help (e.g. Mingers and Rosenhead 2004). An attempt has been made to experiment with the approach and key elements over the years. An example of its application to the context of this paper has been shared in Appendix.

Methods

The conceptual nature of this exploratory study demanded more focus on qualitative approaches. Concepts and constructs were evolved based on interactions with experts in academia and industry. Interactions with about two experts in each were carried out in the pilot phase. The same were refined through a literature review. In all kinds of problem solving—from operational and tactical to strategic, across levels from group, firm to industry and even country—we need to define the problem clearly. After that, we need to generate ideas, structure them, develop scenarios, build consensus, manage plurality, resolve conflicts, evaluate options against multiple criteria, involve relevant actors and prepare an action plan (Saxena et al. 2006). Problem structuring is a very powerful initial step that needs further development to enhance its utility. An attempt has also been made to collect some quantitative data for problem structuring as well as literature review.

Participant and situation observation is an additional method that has been used in the idea generation phases. More than two decades of rich experiences of the first author in Indian and North American (Anglo-Saxon) contexts as well as East Asian contexts (through deep

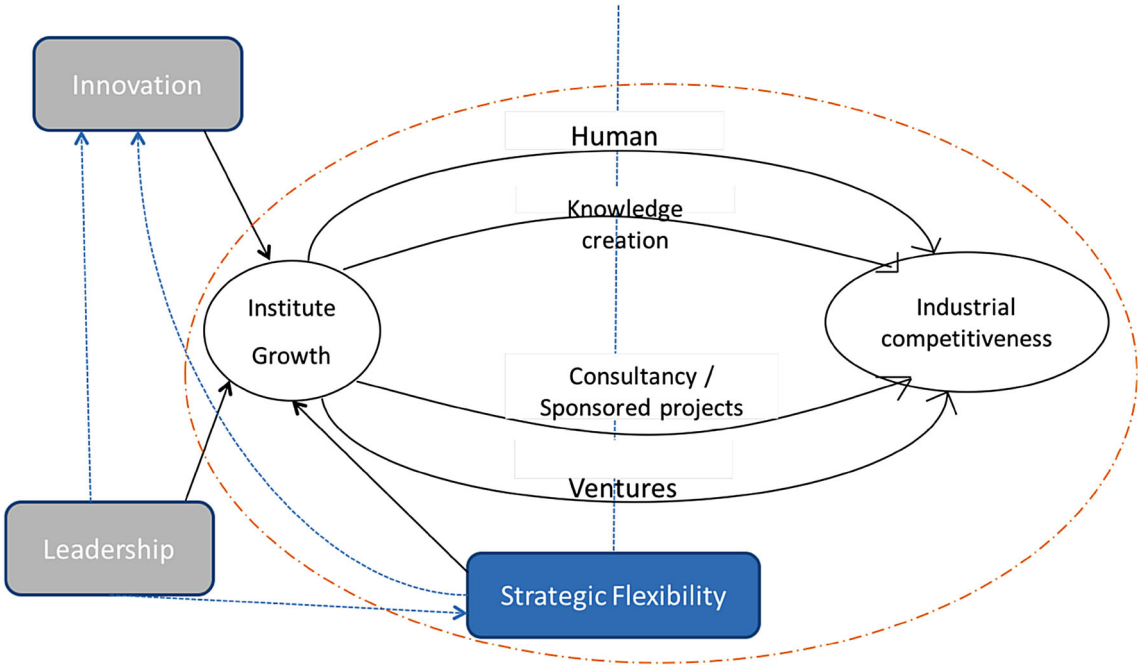

Fig. 1 Conceptual framework depicting pathways of institute contributions to industrial competitiveness. *Dashed with dotted lines* indicate scope of the paper. *Solid lines* indicate linkage between attributes and Institutional growth covered in this paper. *Dotted lines* indicate linkages among attributes, which are not included in this paper. *Source* Adapted from IRCC (2014)

immersions in Japan, e.g. as a Visiting Professor for a year) have given him some rare opportunities for situation observation. Participant observations are mostly for Indian contexts, where he—as a senior faculty contributing to many committees in department as well as institute—has had opportunities to observe dilemmas, decisions and their impact.

Emerging Findings and Discussion

We will discuss emerging findings from literature first, and from problem structuring and other analysis later.

Attempts at systematic literature review provide interesting findings and focus for subsequent stages. 'Institute health' emerged to be a more used term as compared to 'institute growth' or 'institute vitality', indicating that the journey to vitality may be a long one. A review of literature and interactions indicates that it might be too early for most Indian institutes to think seriously about vitality.

While the number of articles in Scopus for a keyword search on 'institute/institutional health' expanded from 47 (title search), 827 (title, abstract and keywords) to 4479 (all fields), a detailed analysis found that a majority of the 47 articles are in the subject areas of medicine, environmental and other sciences and engineering. This suggests a less explicit focus on any of the terms—growth, health or vitality—in the institutional context in India and several countries except the USA.

Summary Findings from Problem Structuring

For the case of IITs, apart from research, some other paths to industrial competitiveness can become more critical depending on the context. For instance, IIT Madras (IITM) seems to have developed strategic flexibility on the research path through MS (research) programs and industrial contributions through a 'Research Park' that creates options for entrepreneurship by means of incubation and industry interactions. Quick benchmarking with select institutes provided rich insights about the gaps for IIT Bombay; a glimpse is provided in Table 2.

Low ability to make a major impact to enhance the international competitiveness of indigenous industries is a major problem for most IITs and other institutes in India. Key competitiveness dilemma include significant loss of market share on the domestic front for Indian firms, poor ability to predict when bottoms will be touched, and how sound the recovery can be.

While Mumbai has increased its percentage share of contributions in terms of revenues and profits, indicating sustenance of cluster, entrepreneurial and other advantages (Momaya 2016), contribution of IITB to achievement and sustenance is often questioned. The relatively low capability of IITB to enhance industrial competitiveness is a neglected

Table 2 Glimpse of contributions of select IITs on different factors of competitiveness. *Source* Developed based on data collected from annual reports of the institutes and Scopus

Output through competitiveness channels	IIT Bombay			IIT Madras			IIT Delhi		
	2009	2014	Change (%)	2009	2014	Change (%)	2009	2014	Change (%)
Quality human resources	6339	9000	42.0	5120	8234	60.8	5920	8040	35.8
Research publications	1025	1659	61.9	1067	1517	42.2	1214	1714	41.19
Sponsored research and consultancy services (in lakh rupees)	7300	21,360	192.6	9050	20,500	126.5	9261	9596	3.62
Ventures created till date	30	55	83.3	17	40	135.3	26	42	61.5

problem which was structured by us (details in the Appendix 2). Since the branch related to 'strategic flexibility' was found to have some high-potential root causes, a next level root cause diagram (RCD) was developed focusing on that (Fig. 2). We have tried to innovate in the RCD by clustering different causes along key actors. The top management of IIT and faculty emerge to be the key actors, but several complex causes seem to hamper their capabilities and flexibility to take the bold decisions needed to catch-up with very energetic young institutes such as 'Top 50 under 50', particularly from Asia.

As latecomers to the strategic arena of higher education, where dominant designs in the English language world are set by the Anglo-Saxon countries, institutes in India face major dilemma about speed. India has rich traditions of education and some are sustaining for centuries and developing more holistic human beings, but they are sidelined by mainstream driving forces, where higher education is seen as a gateway to a job. Increasing technological and investment intensity where dominant designs such as Google have huge oligopoly in the English language world (and closure to absolute monopoly in India) means that most institutes keen on speed will have to follow the Anglo-Saxon dominant designs. Being latecomers and very slow movers, public institutes cannot aspire speed like select Korean or Singapore universities. Even if some IIT aspires, do they have energy, endurance and persistence to face failures is a challenge question.

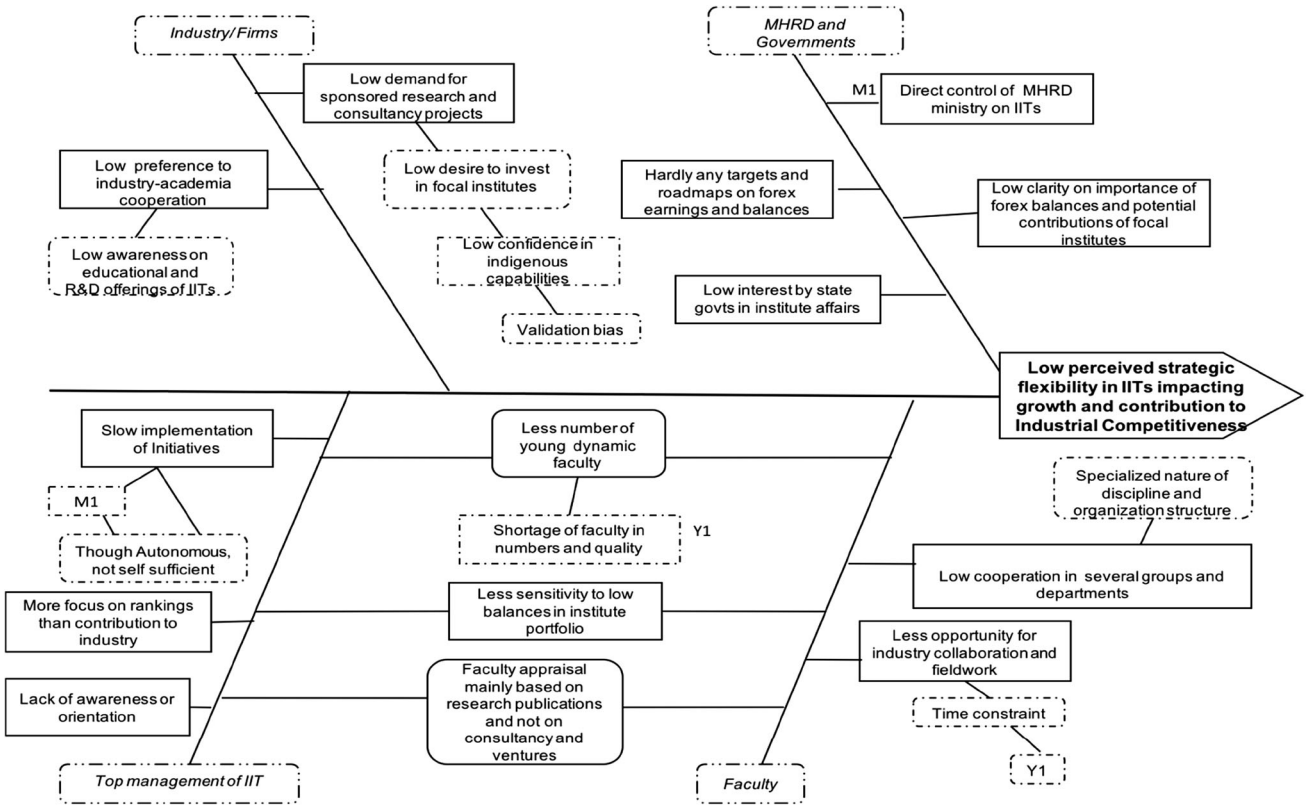

Fig. 2 Illustrative summary of root cause analysis in a branch of root cause diagram focusing on strategic flexibility

Perhaps one of the most challenging dilemma institutes in India face may be regarding financial balances. By tradition, education has been considered a very unique field in India, e.g. परंपरा से, भारत में शिक्षा ग्यान का क्षेत्र है, इसलिए उसमें शुध्धता होनी चाहिए, उत्कृष्टता होनी चाहिए, गुणवत्ता होनी चाहिए, श्रेष्ठता भी होनी चाहिए, इसके मानक के रूपमें विध्वानों की मान्यता आवश्यक है (काटदरे २०१५). In old times, the expenses of teachers and students were very moderate, and hence, it was possible to sustain Ashrams or institutes on limited land or some donations. The costs of laboratories with high priced sophisticated equipment, as well as those associated with students, faculty and other staff, are escalating very fast. While financial balances may be achieved in some parts, overall balances on trade, technology, investments, etc. (e.g. Mittal et al. 2013; Manthri et al. 2015) can be very challenging to achieve. At the same time, a root cause of so many Indian firms less able to move forward on the ladders of above-discussed balances may lie in institutes where majority of the leaders of the firms are trained or educated.

Sustainability of IITs is questioned on several paradigms. Public institutes may strive to provide education at low cost (if not at no cost or with scholarships), but their cost per student can be quite high due to excessive wastages in several contexts in India (at least when compared to efficient private institutes). What kind of balances a focal institute can strive for (e.g. budget balance, dependence on grants from government, trade balance and for IITs, technology balance) is very fuzzy even for top leaders of the focal institutes. Our interactions with very senior leaders in administration brought out the above conclusion. Choices on a more balanced portfolio of revenue streams in alternate paths discussed above depend on strategic intent, which is often less clear. Mismatches in structure of engineering R&D at IIT Bombay has been highlighted by Sohoni (2011). Intensifying international competition that can shift not only market forces, but even government policies to extremes, may demand high strategic flexibility on the part of a capable focal institute to build on its journey of quality. Whether an institute has evolved the organizational culture, structure and systems needed to implement strategic flexibility remains a very challenging area of research.

Limitations and Areas of Further Research

The conceptual nature of this exploratory study involves some key limitations and exciting areas of further research. This study is a very humble attempt by a concerned Group on Competitiveness (GoC) with slightly limited experiences of administration—where the decisions are made. At the same time, the first author's experience of more than two decades in IITs and attempts to observe key differences among Indian, Anglo-Saxon and East Asian systems at close quarters (including year-long immersions in Japan) have helped evolve several high-potential areas of future research for energetic researchers. The ideas for future research that evolved through group idea generation techniques were converted into questions, prioritized and those with high-potential were selected. The group involved young researchers and sessions were facilitated by a seasoned professional having a deep knowledge of creative problem solving, including the strengths and limitations of different idea generation techniques. Further, to help the researchers, we have attempted to cluster the ideas under specific areas as research opportunities (Table 3). For instance, the traditional form of firms, such as company (the basic building block of capitalism), is being reinvented (e.g. Economist 2015) by disruptive models being evolved by firms such as Airbnb, Alibaba and Ola Cabs. Institutes such as IITs nurturing ventures and alliances may like to initiate research on the role of better organizational forms to enhance competitiveness. Improving the total factor productivity becomes possible with export-oriented policies (Moon 2016), and most developed countries have leveraged technology and its management effectively. The export competitiveness of Indian firms (e.g. Manthri et al. 2015) has stagnated prematurely at very low levels and requires urgent research. Questions for such research were evolved and are summarized in Table 3. We sincerely hope that the areas and questions may spark ideas for the top management of institutes to think differently, and help researchers to explore the opportunities to enhance institutional growth and contributions to industrial competitiveness to accelerate India's journey of development.

Latecomers that succeed in becoming international leaders may require series of massive restructuring and transformation. Such restructuring within a short period of time is considered a key factor behind successful climb up the technological and other capability ladders for global leaders such as Samsung (Moon 2016). That demands the ability to radically change and upgrade what they have accumulated.

For focal institutes with origin in technology, management of technology (MoT) can provide a rich area of research and practice to differentiate. Advanced countries such as Japan developed alternate arenas such as MoT and value creation (e.g. Nobeoka 2011) to achieve and sustain their competitiveness, whereas some countries over-depend on MBA-type education and have faced major challenges. The choice of relevant arenas for growth provides an exciting area for research and practice.

Table 3 Examples of opportunities for future research and questions

Topics for research opportunities	Research questions
Institutional health/vitality	1. What are the attributes/variables defining institutional health/vitality?
	2. How can it be measured longitudinally and utilized to aid in key decisions?
	3. What can be the role of cooperative strategies for 'group health' and shared values for better alignment?
Industrial competitiveness	1. Should firms and industries expect major contribution from institutions in a democracy like India? From public institutions with very high freedom to stakeholders?
	2. How can firms with over-dependence on imported technology shift towards balances and in-house or cooperative R&D with local institutes?
	3. What alternate approaches to cooperative strategies are feasible in India other than the given pathways (Fig. 1)? Which pathways may be better when firms wish to compete towards higher stages of value curve? To compete in advanced countries?
Strategic flexibility in institutions	1. What is the relationship between strategic flexibility and balances (self-sufficiency may be too difficult in India) of the focal institutes?
	2. What is the role of sub-flexibility (flexibility within each channel) in contribution to industrial competitiveness?
	3. What can be the role of values that may reduce strategic flexibility during catch-up?
Institutional health/vitality and industrial competitiveness	1. Which pathway (Fig. 1) is better in what context for maximum contribution to industrial competitiveness?
	2. How can focal institutions catch-up on venture path with other Indian institutions and world leaders?
	3. How can focal institutions contribute to industry in achieving forex balances?
New organizational forms to enhance competitiveness	1. In what contexts, the traditional form of firms such as company is becoming less relevant? What are the root causes for that and how firms can address them?
	2. What alternate forms may be more relevant in the context of emerging countries?
	3. Start-ups, ventures, spin-offs are emerging as popular mechanisms for energizing human resources. Can some traditional modes be more sustainable?
	4. Can adaptations of corporate entrepreneurship (Bhardwaj et al. 2011) work in institutional contexts?
Methods to improve problem characterization and finding root causes	1. What are the barriers to adapt problem structuring, particularly root cause analysis, to organizational problems?
	2. How can actor-based root cause analysis be improved? Which computer tools (e.g. 3D linkages) can enhance actionability?
	3. What can be approaches to improve actionability of problem structuring? Can tools such as option profile help?

Concluding Remarks

India had been a strong country in business, economy and technology for many centuries, till the 1700s. Despite enduring invasions of many kinds, India is now quickly re-emerging as a contributing competitive country due to hard work, entrepreneurship, education and her noble values such as वसुधैव कुटुंबकम. Institutes of national importance are also expected to contribute to competitiveness through relevant actions and better balances. Choices on the dimensions of institutional excellence are posing key strategic dilemma for the top leadership of accomplished Indian institutes that aspire for next levels in the journey towards becoming world class. The leadership has started appreciating the challenges posed by the accelerating international competition in India and the need for enhancing contributions to competitiveness, particularly of companies. While the serendipitous internationalization of IIT students or alumni can be of some help, without impactful contributions to the industrial competitiveness of local focal firms or clusters, even leading IITs may start 'stagnating prematurely', a phenomenon observed for many Indian firms and even industrial houses. India cannot afford to let the IITs slump (Gulhati 2007), but other key stakeholders should not underestimate their responsibility. Among the stakeholders, faculty will have to demonstrate higher energy to be role models for other stakeholders. How do we create people with values to realize an ambitious vision 2020 (Kalam and Tiwari 2015; p. 4), is a vexing problem for India and focal institutes should strive to address it. Dimensions of institutional excellence are emerging to be more complex than envisaged, and hence,

we were less able to explore the role of strategic flexibility in depth. However, the paper makes significant contributions in conceptualizing alternate pathways between institutional growth and industrial competitiveness, and the role of strategic flexibility in enhancing balances among them. The paper also contributes to the methodology of 'characterizing the phenomenon' using a systematic approach of 'problem structuring'. Developing the 'actor-based root cause diagram' by clustering causes to enhance the actionability of findings is another major contribution. Rich areas for further research and specific questions identified may help many researchers to undertake research in the exciting area of competitiveness, an urgent necessity for India to achieve and sustain healthy growth. A comparison with firms such as Toyota—known worldwide for producing talented people (e.g. Liker and Meier 2007)—may seem less acceptable to most academicians in India. But the fact remains that even firms can nurture exceptional talent and contribute massively to develop the ecosystem of a globally competitive industry. Should not leading IITs, which attract high IQ talent of the country, think differently about quality and competitiveness? Clues to the challenge may lie in the quote (Vivekananda 1999):

> 'We want that education by which character is formed, strength of mind is increased, the intellect is expanded, and by which one can stand on one's own feet.'
> Swami Vivekananda

Acknowledgments This research was partially funded by Industrial Research and Consultancy Centre, IIT Bombay. We thank directors of IITs, deans and faculty active in different roles, who shared their views on issues in informal and structured interactions. The authors gratefully acknowledge inputs from the Associate Editor and anonymous reviewers. We thank associates of Group on Competitiveness (GoC), particularly Pranusha Manthri, Ankur Basumatary and Divyang for proactively contributing to design of experiments and supporting at different points in very long journey of this study.

Appendix 1: Working definitions of key concepts

Focal Institute

Focal institutes are institutes with noble mission, deep strength to be a leading contributor to a holistic industrial ecosystem. They are known for their outstanding contributions to at least local clusters, if not a state or a large country. They strive to develop capabilities to achieve balances and progress sustainably on an arduous journey of excellence if not world class (e.g. Altbach and Salmi 2011).

In contexts, where knowledge creation (e.g. Nonaka and Takeuchi 1995) is replacing ownership of capital assets and labour productivity as the source of growth and prosperity, they can be knowledge-creating universities.

Institute Growth

Institute growth may not have been defined very systematically, particularly in public institutes that largely depended on government funds. From criteria such as number of faculty, staff and students, institute may be moving towards growth in budgets, if not revenues. Considering that revenues are rarely able to match relatively very high wastages and rapidly rising costs, following definition can provide long-term pathways:

> Multi-dimensional shift in growth from input-focused factors such as students and faculty towards growth in output factors such as no. of ventures graduated or scaling-up, balances (from budget and financial to knowledge and trade). Weighted indices with road-map of improvements can be evolved.

Institutional Excellence

Institutions can be of many types. In context of this research related to competitiveness (Momaya 2001) and focus on IITB, it can be defined as:

The ability of an institute to undertake research, education and outreach (including industrial collaborations) of increasingly superior quality.

In our context, focal institutes are expected to contribute on multiple dimensions. Their contribution to competitiveness of clusters—at least in the region, if not country—is becoming very important. Excellent institutes are known for very impactful contribution to regions and even country (e.g. MIT, TIT, ETH). The contributions come in many forms such as skills, technology transfer and entrepreneurs, to ventures that become focal firms and evolve dominant designs.

More pragmatic definition can be:

Capability of an institute to *innovate* in order to achieve growth on multiple factors of assets, processes and performance to reflect on key performance indicators (see examples in Table 1).

Excellent institutes have energy to start contributing positively to at least industries in proximity, if not country, and move to higher levels of maturity on balances—from financial, forex to knowledge and technology.

Other terms that are being used are institutional quality/effectiveness and competitiveness (e.g. AICTE 2004).

Appendix 2: Examples of Select Elements of Problem Structuring

Key objective of the paper is to characterize the phenomenon 'pre-mature stagnation in contribution of IITs to enhance industrial competitiveness' through problem structuring (PS). PS involves several interactive activities whose outcomes are summarized into specific elements. Typical PS can have 4–5 key elements such as problem statement, goals blocked and root cause analysis (RCA). While summary of RCA is given as root cause diagram in Fig. 2 in the main paper, other elements are given here as examples.

Problem Statement

Old IITs have contributed enormously in first half century of their journey and attract best of India's aspiring engineers, technologists and managers. Expectations from the IITs, particularly IITB, are rising rapidly, as Indian firms face the paradoxes such as hyper-competition and formidable international players with superior capabilities on key fronts. The IIT is expected to significantly enhance its contribution to industrial competitiveness of at least region, but there is lot of ambiguities on internal fronts (from strategic intent, values and culture to processes and systems) and external fronts of the opportunities and the problem of less able to contribute to catch-up in competitiveness of focal firms. Structure the problem to find out root causes and ambiguities, particularly role of organization health/vitality and strategic flexibility.

Goals Blocked

Goal orientation in many IITs can be quite loose, decentralized and implicit. What stated here are examples of goals evolved from review of contributions of select leading institutes such as ETH, MIT, SNU, Stanford and Tokyo Institute of Technology.

- Graduating learners, whose contributions to indigenous industry are distinctly more, e.g.
  - Help in rapid breakout in competitiveness (from bottom, if any).
  - Nurture venture and spin-off that create interesting jobs.
- Motto ग्यानम परमम ध्येयम (Gyanam paramam dhyeyam) is very inspiring, but not sure what kind, levels of knowledge exchanges are more relevant with whom, for competitiveness of India and what are trends, e.g.
  - What can be minimum levels of knowledge flow to indigenous industry and trends?

Unwanted Symptoms

- Reducing flexibility due to tight finances (rigid structure with >60 % budget going to salaries {& pensionary benefits?} without link to revenue streams).
- Diverse faculty interests with very low alignment even for balances (not surpluses) or industrial competitiveness.
- Less systematic knowledge about health and vitality of faculty, staff and students.
- Less respectful balances on number of graduates contributing to indigenous firms and organizations.
- Large number of ventures stagnating prematurely on levels of IC.
- Not progressing fast on journey of low-carbon institute despite a leading position in climate change.
- Excessive dependence on 'Validation from West' (e.g. for their students and even faculty) and foreign multinationals for alternate paths towards industrial competitiveness (IC), e.g. anchor client in Research Park.

Root Cause Analysis

This analysis is very iterative and went through cycles of analysis, data finding, discussion, improvements to reach at some high-potential root causes. Idea generation techniques help evolve long lists of causes in group sessions that were refined by fact finding and discussion. The causes were clustered around key actors that were prioritized. An example of actor-based root cause analysis is given in Fig. 2.

Ambiguities

This is the last, but perhaps the most creative and challenging part of iterative process of problem structuring. Identifying key dilemma related to root causes is very difficult. Still, an attempt is made here.

- What kind of balances among local/state, country and international contributions an institute of national importance aim at?
  - While technology is more universal, should management schools focus more on local and country level? How can they balance student interest to work in foreign MNEs?
- While ventures path appears to be more relevant (e.g. matching, scalable) for IITB, how flexibility among other

paths (e.g. HR of higher quality and values) be aspired and achieved for steady and sustainable progresss?

- Do leading German, Japanese or Korean universities have much lower entrepreneurial capabilities? If yes, then how are they contributing to high IC?

- Top management of IITs and faculty are identified to be key driver actors to nurture linkages with students, firms and industries. What values they can imbibe and effectively evolve with students? Do shared value concept work in IITs? Has any IIT explicitized it?
  - Can change in top management bring major change in strategic intent, directions and major catch-up in performance?
  - Can explicit emphasis on health/fitness/vitality link with institute vitality?

Appendix 3: Example of Factors to Characterize the Phenomenon

From the generic phenomenon 'pre-mature stagnation of organizations', we evolved specific phenomenon 'pre-mature stagnation of institutes in India'. The institutes here refer specifically to IITs, the institutes of national importance that have potential to achieve great heights themselves on multiple factors from health, human capital output, knowledge output to higher levels of ventures. Capable institutes have high potential to contribute to formation and vitality of clusters with many technology-based focal firms that are emerging MNEs. Here are just examples of few select factors that evolved through interactions with some top leaders.

- Origin
  - Symptoms of phenomenon: shift in values to some short-term goals, declining balances, widening inequity (incl. financial, as some faculty are able to manage large portfolio).
  - Likely period of start: can happen earlier also, but often when first generation (that laid foundations of values, culture, etc) retires.
- Journey
  - Journey can be characterized on many factors, e.g.
    - Quantitative: Nos. of faculty, students, budgets, publications, patents,
    - Quality: Sustained programs, laboratories, breakthrough inventions, ventures,
- Potential Key Reasons
  - Gaps in strategic intent (e.g. mismatches among elements & with environment).
  - Less able to secure industry projects.
  - Low flexibility (to revitalize, even after biggest discontinuity).
  - Gaps in health and fitness to sustain on challenges.
  - Gaps in knowledge, understanding or alignment of key actors.

Above are just indicative examples of factors to characterize the phenomenon. Refinements in such factors and new factors will emerge as we sustain research.

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Key Questions

1. What are the key attributes or variables defining institutional health or vitality?
2. How can we diagnose health of an organization longitudinally?
3. Which initiative to improve the health has worked in the organization and is sustaining?
4. Which pathway (Fig. 1) is better and in what context for maximum contribution to industrial competitiveness?
5. How can the focal institutes in India become role models of organizational vitality and drivers of growth of new industries and clusters?

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