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## Were We Right the First Time? Adopting a Systems Thinking Approach to Reviewing a Decision in a Higher Education Setting

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### **Abstract:**

*The rapid development of technology and its harnessed impact on globalisation and internationalization, has forced Higher Education Institutions into competitive relationships with each other and invariably increased the complexity of interactions between and among institutions; requiring strategic adaptations.*

*Faced with dwindling participation and resources, the conversion of Polytechnics to Technical Universities is considered as a final resolution to the issues concerning middle level manpower training in Ghana. Expert teams and consultants were engaged to assess and recommend some Polytechnics for conversion. The recommendations of this assessment have been subjected to a strategic decision-making model with a competitive value. The results are then compared with initial recommendations to assess how they hold up.*

*The results affirm that strategically, there was significant variation in the results of the initial assessment and the current model. The tangential institutions are considered highly credible for success as technical universities, and thus meriting conversion.*

**Keywords:** *Decision making, Ghana, higher education, competitive value framework, polytechnic education*

### **1. Introduction**

The dynamic and complexity of social interactions have made it imperative that policy makers adopt a more resilient and empirically supported approach to confronting social issues. No field of policy development has seen a more dynamic development of complexity than the higher education terrain. As aptly put by Arnold and Wade (2015), now, more than ever, systems thinkers are needed to prepare for an increasingly complex, globalized, system of systems future in which everything from Canadian logging to Middle-Eastern oil drilling to Australian diamond mining will produce ripple effects throughout the globe. Based on this reasoning, it could be strongly argued that all people in decision-making roles should have a solid grasp on systems thinking.

The rapid growth of complex systems springing up all over the human landscape is apparent in the increasing instructiveness and interconnectedness between national systems such that, globalization is growing social systems in complex new ways. For example, Technological advancement spawns system after system, each increasing in interdependence on preceding and existing systems. This is exemplified in how international trade ties nations together in powerful economic feedback loops where policy changes in one nation inevitably causes ripple-effects in another (Arnold & Wade, 2015). With the exponential growth of systems in our world, comes a growing need for systems thinkers to tackle these complex problems. This need stretches far beyond the science and engineering disciplines, encompassing, in truth, every aspect of life.

Yurtseven and Buchanan (2016) is of the firm view that decision making within a systems framework has been mostly discussed in terms of mathematical tools and techniques. There are situations when this is applicable, such as where the problematic situation can be clearly described. They advocated for the application of various tools; such as mathematical programming, game theory, simulation models, Markov chain models, decision tress, etc. However, in other cases, such as in decision situations faced by top managers, there may be too much ambiguity about the objective and decision options. Sometimes the information and knowledge available to make an effective decision may be uncertain, incomplete, or even distorted. Their advice is that, under such conditions the problematic situation must be described in its full system context.

What is important to note is that, systems and their growing complexity has always been one of the central concepts in systems movement. Researchers have traced the roots of "modern complexity" to the birth of General Systems Theory (Gorzeń-Mitka & Okreglicka, 2014). Others provide insights into the emergence and evolution of the concept of complex adaptive systems, an approach that seeks to provide a unified model for explaining the core tenets and applications of systems thinking to decision making (Snyder, 2013). Several researchers hold the view that the emergent properties of complex systems can be modelled and operated relatively more effectively as complex adaptive systems (Aelker, Bauernhansl, & Ehm, 2013).

Systems thinking is purported to be highly germane for dealing with complex systems and problems (Maani & Maharaj, 2004). There is a widely held view that systems thinking is superior to other approaches in dealing with complexity (Richmond, 1993). In Checkland's words, it is "the use of a particular set of ideas, systems ideas, in trying to understand the world's complexity" (Checkland, 1981). It is also argued that today systems thinking is needed more than ever as we are being overwhelmed by complexity. This view has fuelled the advocacy for its adoption in decision making for and among managerial processes. The underlying assumption in such mathematically modelled instances has been strongly built on well-defined structures of systems. However, as systems become more complex, managing them and designing relevant decision making processes become more challenging (Yurtseven & Buchanan, 2016).

There is strong evidence to support the notion that managerial and decision-making processes are influenced by organizational structures and culture; with a strong correlation to the personal inclinations of organisational leaders. Thus, individual organisational leaders are likely to have varying goals and preferences contingent on situational variations (time and system conditions). It is safe then to assume that, all actors involved in decision making may have different perceptions of events. Furthermore, problematic situations in contemporary organizations, particularly at the top management level, have to be handled with incomplete, uncertain, and even distorted information in many cases. The complexity gets worse if there are rapid changes in the internal and external dynamics of the organization; organizations have to adapt to this environment in order to survive and grow (Yurtseven and Buchanan, 2016).

There are quite number of research studies published on systems-based approach to complexity decision making. A mixed approach, involving qualitative mapping theory and quantitative group model has been advocated for. This was tested in a computer-based system modelling environment for market strategy development (Pagani & Otto, 2013). Based on their research, they concluded that adopting a holistic approach enhances the quality of decision-making processes. Gorzeń-Mitka and Okreglicka (2014) argued that strategic decision-making in complex environments requires meta-cognitive skills which provide leaders with a tool-bag for innovative and adaptable decision models beyond linear thinking. The call for a holistic approach should therefore include theories and concepts from diverse fields such as psychology, behavioural economics, operations research, and managerial practice, such that decision making may be viewed as a cognitive processes, a function that must be regulated and controlled (Swami, 2013).

The common theme in these studies is that systems thinking, incorporating a holistic approach fosters empirically driven and less subjectively influenced decision making. This invariably increases the predictive component of choice success. Given the dynamic nature of higher education and the myriad challenges that faces policy makers in assuring participation (equity and equality) and quality (pedagogical strength and best practices) with a strong implication for funding, it is imperative that decisions in the sector are hinged on scientifically proven methods. This is more so in emerging knowledge economies where funding and resource allocation should be pragmatically done.

"Classical theories of choice in organisations emphasise decision making as the making of rational choices on the basis of expectations about the consequences of actions for prior objectives, and organisational forms as instruments for making those choices" (March & Olsen, 1986). Research suggests that the dominant paradigm in empirical and theoretical studies in decision making, tends to assume that choices are made by fully rational processes. On the basis of this, theoretical models have been developed to analyse and explain decision making. These models often assume decision processes, seek to maximize the present value of current and future impact of choice behaviour, solve dynamic problems. The overarching assumption then is that decision processes result in Bayesian Nash Equilibrium. However, there is increasing evidence that with increasing complexities in decision making processes, these assumptions tend to lose their validity. There is a strong advocacy for the development of more resilient and formal models that provide for alternative assumptions (Goldfarb et al., 2012).

An example of the failures of rational assumptions in decision making was submitted by Camerer (2003), in an extensive review of research on strategic thinking in game theory, he concluded that subjects often do not play equilibrium even in extremely simple economic environments. This is believed to be as a result of standard equilibrium models embodying three basic assumptions which tend not to be empirically valid. The submitted assumptions were that in the first instance, players develop a concept of expectation of how other players will respond, given same situation. Secondly, responses of players are designed to increase the reinforcing effect on intrinsically determined condition. Lastly, players expect their actions to tangent with that of other players (Camerer, 2003). Goldfarb et al (2012) suggested the relaxation of the effect of the third assumption as players tend to find it difficult guessing the responses of others in the same condition. In practice, according to them, and due to the variation from theory to practice in decision making models, how organisations actually take decisions and how they are expected to take decisions differ greatly.

System agents, regularly face choice tasks of great complexity (Spiegler, 2015). For example, in education, finance, governance and policy development, individual outcomes tend to have elaborate and complex descriptions, and these are greatly influenced by resource availability and ease of access; which is sometimes difficult to calculate. Education policy for example is considered to be very complex for several reasons: diversity of stakeholders, non-linear and frequently changing interaction lines and depth, with a poor alignment to orthodox measurement values. The complexity of educational policy decision making can be either explicit or implicit. Explicit for example; established fees of participation,

termed employment contracts with closed legal loopholes, fixed quotas of participation. Implicit also in the concept of quality of education provided and relational growth.

Borrowing from Spiegler (2015), it is clear that decision making and its related choice complexities are hard to avoid. However, there is a common intuition that part of the complexity that decision makers face is not inherently intrinsic but strategic, with the aim of harnessing the rationality of other contingent variables within the decision game. In the words of Spiegler (2015) who based his analysis on a market-economy-consumer plane, firm decision complexities are designed to take advantage of consumers bounded rationality- especially, their limited ability to make correct value comparisons. In such an instance, choice complexity is an impediment to effective market competition.

### *1.1. Systems Thinking and Higher Education*

The rapid development of technology and its harnessed impact on globalisation and internationalisation, has forced Higher Education Institutions into competitive relationships with each other and invariably increased the complexity of interactions between and among institutions; requiring strategic adaptations. It is critical then, that, decision makers and institutional leaders appreciate the myriad challenges and solutions required to manage this rapidly evolving complex landscape.

Higher Education Institutions are therefore driven to engage in strategic planning processes by a variety of forces. Notably are increasing demand for higher education in the face of shrinking funding pools, diversity of academic populations, as well as the ever-growing competition, all these within the plane of maintaining a status quo reminiscence of traditional comprehensive higher education institutions. The solution was presented by Benjamin and Carroll (1998) when they opined that, strategic planning was the best way out. They forwarded that given that there was no change in the evolutionary trend in the problems confronting higher education institutions, one-third of all qualified applicants to higher education institutions will not gain access and to forestall this, institutions needed to "make major structural changes in their decision-making systems ... and reallocate scarce resources" (Benjamin & Carroll, 1998, p.21). Universities should also "pursue greater mission differentiation to streamline their services and better respond to the changing needs of their constituencies" (Benjamin & Carroll, 1998).

This realisation makes it imperative that, change must occur in all aspects of higher education, including academic programs, student support services, as well as administrative areas. Institutional Heads must therefore be aware that, effecting change in one section of an institution will affect many other areas of the institution. An example is a decision to internationalise the student population. This will impact several areas of the institution, notably curriculum design and delivery including the introduction of international language friendly programs, student housing, food services, as well as faculty and staff training and development programs (Furst-Bowe, 2011).

The advocacy then has been to adopt a system thinking approach to mitigating these evolution related challenges. Furst-Bowe (2011), points out that, systems thinking accounts for a cohesive and comprehensive approach to management with the notion that all key processes are parts of an overall system, rather than in isolation or as segments. Reviewing systems thinking along these lines is hinged on the concept of an organisation having interrelated and interactive parts, working in tandem to achieve a specific purpose. Understanding these relationships is therefore, critical to obtaining desired results, making targeted improvements, and achieving organizational effectiveness. When an organization is governed by systems thinking, work progresses at a faster, more efficient pace. Leaders with a systems-management approach guide synchronous actions across the entire organization, assuring alignment and integration of all units to maximize resources and productivity. She was however quick to point out that, adopting and adapting a systems perspective to decision making as part of managing higher education institutions, may be challenged by hegemonic organizational structures, shared governance, faculty and institutional autonomy, as well as funding constraints (Furst-Bowe, 2011).

The assertion holds that the application of systemic thinking in the management of higher education is a difficult task largely because of systemic factors in education that compound its application. There might be instances of exemption, to the application of systemic thinking in education but the paucity of such cases raises possible and probable concerns, including the misunderstanding of what is meant by systemic thinking. It is of critical value that, institutional leaders appreciate more than just behavioural incidents and institutional operations (Despres, 2004). It is worth nothing that systems discipline has a rich history of how to use methodologies in combination that has culminated in an approach known as critical systems practice (Jackson, 2003). Gregory (2009), advocates two potential contributions of the systems approach to decision making in higher education. Firstly, that it makes a significant contribution to the effectiveness and efficiency of the strategic development process and secondly, how systems methodologies can be put into the service of strategic development (Gregory, 2009).

### *1.2. Higher Education and National Development*

Fact, the transformation and empowering of human society is directly correlated to education (Chinyere, 2013). The transfer of skills, knowledge, norms, mores, social and institutional memory enables the young of society to become productive members of any society. Thus, it contributes directly to sustainable development and therefore a priority for every human society. The government of Ghana has developed several policies whilst engaging in fund directed development aimed at improving quality and access to education at all levels.

The provision of widely spread education and training opportunities has been a long-standing objective of the Government of Ghana. Since Independence, the Government has sought to address the challenges facing the education sector through a range of policy initiatives, often with mixed results. The major focus in the late 80's and early 90's was the attainment of universal participation at the basic level. The early 2000's saw this focus shift to post-secondary education,

and specifically tertiary education. Thus, policy directions in education were concerned with increasing opportunities for access, participation, equity, quality and relevance. Realising the short fall in industry specific skills, some secondary technical institutions were converted to polytechnics to augment the existing ones in 1993. The clear mandate as stated in the PNDC Law 321 and Act 454 of 2007 was emphatic that polytechnics should provide education in areas like manufacturing, commerce, science, technology, applied arts and science, as well as encouraging the study of technical skills. The aim being that, they become directly responsible for providing technical skills training and opportunity for personal and national development, research and publication. However, the country is currently faced with new challenges for educational policy, which marry both the right to universal access to education, and the need to enhance rapidly the development of skilled human resources relevant to industry expectations. The major expansion and transformation in higher education in Ghana over the years can at best be considered as having been minimally successful, fraught with funding short falls and poor policy implementation. The current increase in demand for skills relevant education and training has once again necessitated the review and transformation of the Ghanaian Higher Education landscape.

The proposed new direction is a renewed focus on Technical Vocational Education Training (TVET) through the conversion of polytechnics into Technical Universities (TU's). As argued by Bennell (1999), and encompassed in the Bonn Resolution (October 2004), TVET is the master key for alleviating poverty, promoting peace and conservation of environments. Further, to improve the quality of life whilst promoting sustainable development, developing countries must reorient their development towards sustainable development through enhanced TVET. It is therefore critical that Ghana's current efforts of TU's meets the countries industrial and development challenges aimed at reducing poverty, providing food security and sustainable environmental management.

## 2. Current Status of Higher Education in Ghana

### 2.1. Participation and Quality Assurance

Figure 1 shows the major players in regulating tertiary education in Ghana. NAB per its Act is responsible for the licensure and quality assurance of all tertiary institutions and programs therein. Its role of institutional accreditation is more evident in privately funded tertiary institutions while the publicly funded institutions are evidenced by program accreditation mostly. NCTE, although mandated to oversee all tertiary education, has very little control over the privately funded institutions, creating a policy implementation gap. It is a national policy for all tertiary education institutions to establish and resource a Quality Assurance Department as a prerequisite for obtaining institutional accreditation certificate in Ghana. Most institutions seeking to meet this requirement set up such offices and allocate varying levels of resources to them. Personnel for these offices tend to lack the technical knowhow to assure delivery of quality education. The current standards of quality are a product of competition rather than an intrinsic drive to provide quality. The hope of attaining and maintaining quality in tertiary education therefore rest on the knowledge that, standards sell and quality standards sell faster.

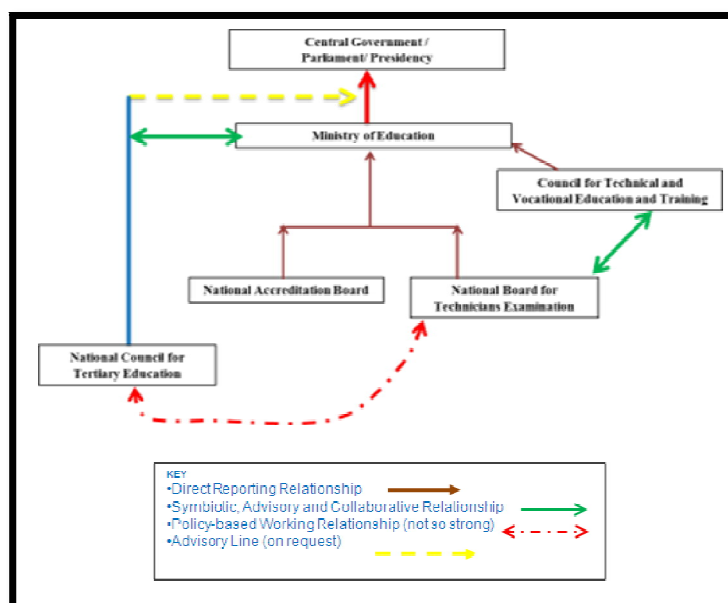


Figure 1: Structural Representation of Regulation of Tertiary Education in Ghana

### 2.2. Institutional Presence

Degree awarding Public TEIs students constituted approximately 59% of all students in the country. This was 3.5 times the population of students in the Private TEIs.

The 10 Polytechnics in Ghana have a student population of 51,169 representing 13.1% of country-wide recorded student population. Polytechnics run Higher National Diploma programmes (HND) and Bachelor of Technology (B-Tech) programmes in various disciplines. There are moves to run M-Tech programmes in collaboration with some Universities in and outside Ghana.

Students in the 41 recorded Colleges of Education constitute almost a 10th of the student population. These Colleges run only Diploma in Basic Education programmes. Colleges of Nursing run Nursing and Midwifery programmes and their student population is less than 2%.

Further, males constitute 61% (236, 649) of the student population. The female population is 153, 248 yielding a male to female ratio of approximately 3:2. Full-time academic faculty for Public & Private Universities and University Colleges comprise 24.5% Professors/ Associate Professors; 12% Senior lecturers and 50.1% Lecturers. The proportion of Professors/ Associate Professors is close to the composite norm of 25% as prescribed by NCTE. However, the proportion of senior lecturers and lecturers are very much at variance with the NCTE norm of 35% and 40% respectively.

	Public TEIs/ Public Quasi TEIs/including Col of Agric	Private Universities	Polytechnics	Colleges of Education	Colleges of Nursing & midwifery
<b>No. of Institutions</b>	19	61	10	41	15
<b>Total Students Enrolment</b>	228,347	65,890	51,169	38,409	6,082
<b>3-Year Average % ↑ in Enrolment (AGR)</b>					
Diploma/ HND * AGR	118.2%	50.6%	5.3%	18.6%	16.2%
Undergraduate/ B-Tech * AGR	5.5%	12.9%	-0.03%	na	na
Postgraduate Diploma AGR	534.1%	-	na	na	na
Masters (NR) AGR	16.3%	74%	na	na	na
Masters (R ) AGR	114.4%	na	na	na	na
Doctorate AGR	26.5%	na	na	na	na
<b>Male to female ratio (2012/2013)</b>	5:3	4:3	15:8	4:3	1:4
<b>Staff (using FTE)</b>	4,464	2,152	1,954	1,816	476
Proportion of Profs & Snr Lecturers	23%/ 1.4%	12.3%/ 8.46%	4%/ 0.5%	3.4%/ 2.3%	5.95%/ 0%
<b>Staff Student Ratio (SSR)</b>	1:51	1:31	1:26	1:21	1:13



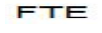
 indicates the direction of growth  
 : coloured star indicate SSR is more in line with norm.  
 : indicates the density of student  
**FTE** : Full-time Equivalency

Table 1: Performance Indicators among Tertiary Education Institutions in Ghana  
 Source: Tertiary Institutions Statistical Report of 2012/2013 (N.A.B., 2014)

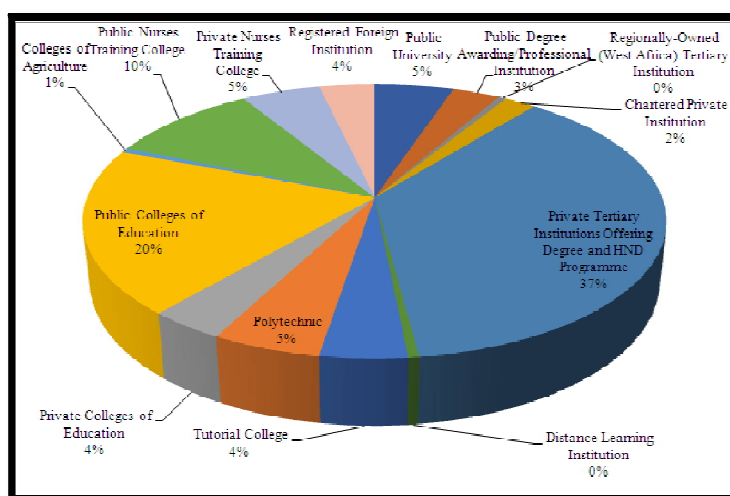


Figure 2: Institutional Presence in Ghana's Higher Education Landscape

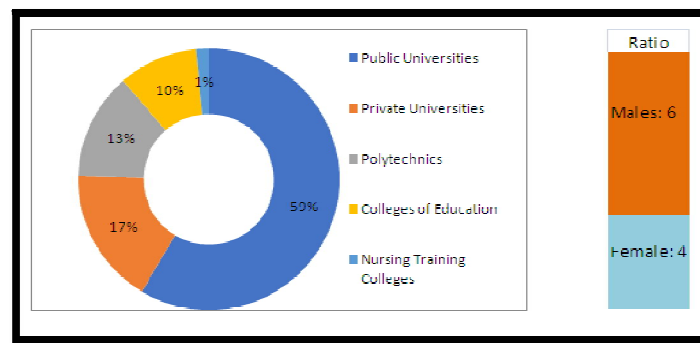


Figure 3: Student Enrolment

### 2.3. Strategic Direction

Following the Government of Ghana's decision to convert Polytechnics to Technical Universities, the Ministry of Education set up a Ten (10) Member Committee of Experts to develop a road map for the conversion process. The Committee determined that (Afeti et al., 2014)

- A polytechnic seeking to be granted technical university status should satisfy the existing norms, guidelines and standard requirements of accreditation for universities.
- The polytechnic should be capable of offering accredited Bachelor of Technology degree programmes in science and TVET.
- Ideally then (Afeti et al., 2014),
  - For a polytechnic to be granted technical university status, it should be offering a minimum of four (4) B. Tech degree programmes in Science and TVET based disciplines.
  - Any academic department seeking programme accreditation in the technical universities should be headed by at least a senior Lecturer with a Ph.D. or D. Tech, preferably, with some industrial experience.
  - In addition, the department must have at least three (3) full-time Lecturers with relevant master's degrees, at least one of whom must have industrial or work place related experience.
  - It should be required of the converted polytechnics as technical universities to provide evidence of training and partnership agreements or MOUs signed with collaborating partners.

### 2.4. Instrument for Assessment

The Committee further developed a checklist for evaluating the preparedness of the Polytechnics for Conversion into Technical Universities. All Ten (10) target institutions were then subjected to the assessment instrument by 4 separate teams of assessors.

The checklist included the following:

#### A: Institutional Standing

- Number of academic faculties
- Number of departments per faculty in (1)
- Number of Accredited B. Tech Programs
- Expertise level of key administrative staff
- Expertise level academic staff

#### B: Industrial Collaboration

- Institutional policy for industrial collaboration
- Policy on knowledge transfer and exchange with industry

#### C: Physical Infrastructural standing

- Laboratories
- Workshops

### 2.5. Summary of Institutional Performance Based on Assessment Criteria

Based on the checklist and the criteria as provided by expert committee, this is depicted in Table 2, as a summary of the institutions as they performed on the criteria. The conversion qualification benchmark was set at 70%.

SN	Criteria	Institutional Status Per Criterion (Indicated By YES/NO)									
		I	II	III	IV	V	VI	VII	VIII	IX	X
1	Full complement of Key Administrative Officers (qualified) in place	Yes	Yes	No	Yes	Yes	Yes	Yes	No	Yes	No
2	Relevant Policy Documents in Place (not expired)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
3	At least 3 technical/vocational faculties/schools	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
4	Minimum of 2 departments in each faculty/school	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
5	At least 2 programmes running in each department	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
6	Minimum of 4 B-Tech Programmes in Science and Technology based programmes in the Polytechnic	Yes	No	No	Yes	Yes	Yes	No	Yes	No	No
7	Minimum of 4 B-Tech Programmes headed by at least Senior Lecturers with PhD	Yes	No	Yes	No	Yes	Yes	Yes	Yes	No	No
8	Minimum of 3 full-time lecturers with relevant research Master's Degree	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
9	At least 40% programmes should be technical/vocational oriented	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
10	At least 30% of academic staff with terminal qualification in technical/vocational programmes (PhD/D-Tech or its equivalent)	No	No	No	No	No	No	No	No	No	No
11	At least 50% of academic staff with 2 years of industrial experience post Masters Research Degree in technical/vocational programmes	No	No	No	Yes	Yes	Yes	Yes	No	No	No
12	At least 5% of academic staff must be of Professorial rank	No	No	No	No	No	No	No	No	No	No
13	At least 10% of academic staff must be of Senior Lecturer rank or its equivalent in technical/vocational programmes	Yes	No	Yes	No	Yes	Yes	Yes	Yes	Yes	No
14	At least 40% of total students enrolled in technical/vocational programmes	Yes	Yes	No	Yes	No	Yes	No	Yes	Yes	Yes
15	Existence of a comprehensive industry-engagement policy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
16	Comprehensive industry experience linked assessment of students and staff for grading and promotion respectively	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Total of "Yes" Scores	13	09	10	12	13	14	11	12	11	08
	Percentage of performance	81.25	56.25	62.5	75	81.25	87.5	68.75	75	68.75	50

Table 2: Summary of Performance - Initial Assessment

In the original exercise, the performance of this table was not considered as providing equal weighted scores. But for the purposes of this paper, each is considered as having equal weight as a determinant of performance on the qualification scale.

### 3. Methodology

This paper seeks to apply the basic principles of strategic management in relation to decision making from a system thinking perspective. The assessment criteria developed ranked the institutions on a general 16 performance variable. A modified version of the Competing Values Frame work was used to evaluate the institutions based on a summary of raw scores obtained by the assessment criteria. Scoring was conducted by a committee of assessors with over 10years of evaluating and working within the higher education landscape. The minimum academic qualification was a Master's Degree and the highest was a Professor. They were drawn from diverse fields of Science, Arts, and Humanities. A comparative analysis will then be provided as per the performance of the institutions on the various scales and the initial 16-point criterion of assessment. A conclusion will then be deduced as to how well the initial assessment summary presents the performance of the institutions in relation to being determined to be conversion ready. Summarily, the institutions were scored as displayed in Table 4 below

Criteria	Weights (%)
Governance/Institutional Leadership	0.1
Academic leadership.	0.25
Number of B. Techprogrammes accredited and running in the Technical and Vocational oriented programmes.	0.15
State of Laboratories and workshops of the Technical and Vocational oriented disciplines were quite adequate for teaching and learning.	0.15
Infrastructural Capacity.	0.15
Location and Opportunity for growth.	0.1
Industry-academia linkage.	0.1
Total	1

Table 3: Weighted Scores per Criteria

Weighting was done in conformity with best practices and Times Higher Education Ranking weights of similar concepts. This was however reviewed and tweaked to acquire best fit with the current review. The qualifying weighted average was set at 10 or better

### 4. Results

Assessors were tasked to review institutions independently and score each institution on an individual basis. Table 4 served as a guide whilst further information was obtained using a questionnaire based on the checklist. The average scores per each criterion for all the assessors were recorded as the raw (rated) scores for each institution. Table 3 showcases the average scores.

Criteria	Average Raw (Rated) Scores									
	I	II	III	IV	V	VI	VII	VIII	IX	X
Governance/Institutional Leadership	7	7	5	7	7	7	7	5	7	3
Academic leadership.	8	5	10	8	15	23	19	20	10	6
Number of B. Techprogrammes accredited and running in the Technical and Vocational oriented programmes.	12	1	9	9	12	12	9	10	1	1
State of Laboratories and workshops of the Technical and Vocational oriented disciplines were quite adequate for teaching and learning.	11	6	7	9	12	12	10	13	9	5
Infrastructural Capacity.	10	5	8	11	9	8	8	7	6	6
Location and Opportunity for growth.	4	2	9	9	9	8	8	8	9	9
Industry-academia linkage.	7	1	5	7	8	9	9	9	7	3
Total	59	27	53	60	72	79	70	72	49	33

Table 4: Average Raw (Rated) Scores

The obtained averages were then scored against the weights per criteria and this is shown in Table 4.



Criteria	Weights	Average Weighted Scores									
		I	II	III	IV	V	VI	VII	VIII	IX	X
Governance/Institutional Leadership	0.1	0.012	0.026	0.009	0.012	0.010	0.009	0.010	0.007	0.014	0.009
Academic leadership.	0.25	0.034	0.046	0.047	0.033	0.052	0.073	0.068	0.069	0.051	0.045
Number of B. Tech programmes accredited and running in the Technical and Vocational oriented programmes.	0.15	0.031	0.006	0.025	0.023	0.025	0.023	0.019	0.021	0.003	0.005
State of Laboratories and workshops of the Technical and Vocational oriented disciplines were quite adequate for teaching and learning.	0.15	0.028	0.033	0.020	0.023	0.025	0.023	0.021	0.027	0.028	0.023
Infrastructural Capacity.	0.15	0.025	0.028	0.023	0.028	0.019	0.015	0.017	0.015	0.018	0.027
Location and Opportunity for growth.	0.1	0.007	0.007	0.017	0.015	0.013	0.010	0.011	0.011	0.018	0.027
Industry-academia linkage.	0.1	0.012	0.004	0.009	0.012	0.011	0.011	0.013	0.013	0.014	0.009
Total as a variable for "strengths"	1	0.148	0.150	0.151	0.144	0.154	0.164	0.160	0.163	0.147	0.145
Difference as a variable for "weakness"		0.852	0.850	-0.849	0.856	0.846	0.836	0.840	0.838	0.853	0.855

Table 5: Weighted Average Scores

4.1. Competing Values Framework

Public sector decision makers work in some of the most over-determined situations, whilst balancing scarce resources in often contradictory but strongly defined internal and external demands of society. Decisions made under such circumstances must therefore be well informed by a science of choice hinged for example on empirically tested models. Higher Education Manager are faced with similar challenges daily. Thus, as aptly put by Linquist (2009), public service executives must have a vast repertoire of leadership skills which should conform to democratic, professional, ethical and or people-based principles. Succinctly, he argued that in most instances, it is best to turn to empirically developed standards for informed decision making (Lindquist, 2009).

The decision to convert some institutions from Polytechnics to Technical Universities may have been under scored by a need to revamp a failing section of Tertiary Education in Ghana, however it gained roots via political proclamations and an over hyped wish for internal growth of and by the institutions. As governments needs and management fashions evolve, additional values and variations on old values get layered into the mix – few drops away – leading to considerable complexity in leading and assessing what constitutes good choices. Such complexity is often recognized in competency frameworks, which typically identify a host of skills and areas of expertise identified as important for institutional growth and development.

The Competitive Value Framework provides one of the stellar platforms for comparatively assessing higher education institutions within a specified frame and graphically showcasing performance in the same plane of analysis. The selection of this framework was based on its ability to offer an often-daunting list of competencies, implying that high-performing institutions must perform well in all elements of the competency wheel. This allows for stakeholders to consider choices based on such frames as empirical and reflective of organisational integrity and performance. Invariably potential for growth can also be inferred.

As shown in Table 3 and Table 4, raw scores were averaged and weighted against a predetermined value per strengths and weakness within the institutions. The average performance was then reviewed on a radar graph using excel. Figure 4a and 4b and by extension Appendix 1; showcases this. It is clear from the presentation that in all aspects of valuation, Institutions V, VI, VII and VIII presents evidence that merits their designation as conversion ready, thus placing them in pole position for consideration in relation to converting the institutions into Technical Universities.

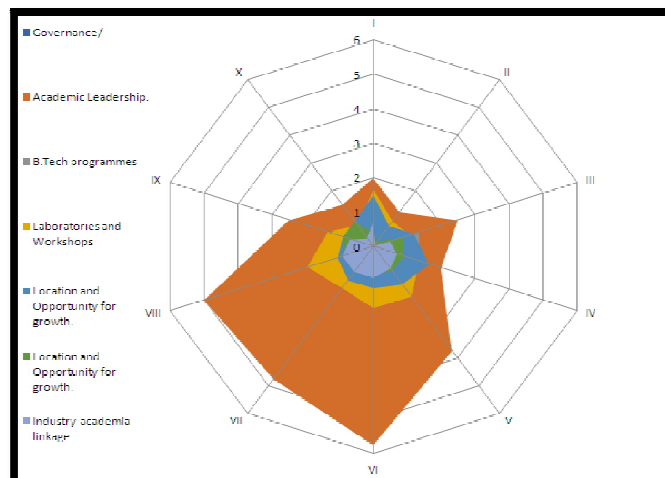


Figure 4: Radar Competency Wheel of Institutional Performance on Value Framed Criteria

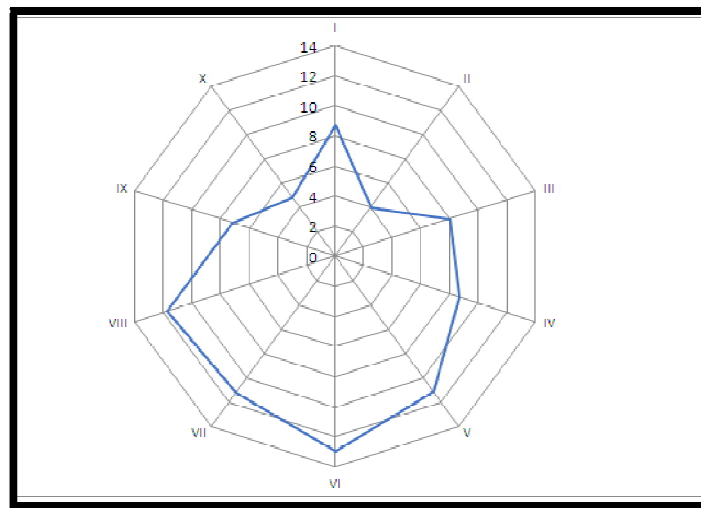


Figure 5: Total Average Performance on Criteria

4.2. Comparing Initial Selection and Strategic Selection

This paper set out to review initial work conducted on 10 institutions earmarked for conversion into technical universities. Invariably this exercise involves reallocation and realignment of funding as well as its indirect impact on stakeholder participation. This section will therefore compare the set benchmarks of selection and review the choices made. Given that the scores used by both reviews were from data set and internally homogenous in terms of the scorers, there is a strong confidence in the observed variations or similarities. The results that may be showcased will therefore find explanation only through an empirical presence of truth based on data strength not on subjectivity of the assessors.

Institution	Institutional Performance		
	Column 1	Column 2	Column 3
	General Criteria Performance (%)	Average Raw Scores (%)	Strategically Reviewed Performance (Weight Based Average Scores)
I	81.25	59	8.75
II	56.25	27	4.05
III	62.5	53	8
IV	75	60	8.65
V	81.25	72	11.1
VI	87.5	79	12.95
VII	68.75	70	11.7
VIII	75	72	11.2
IX	68.75	49	7.2
X	50	33	4.8

Table 6: Comparative Analysis of Scores

	Column 1	Column 2	Column 3
Column 1	1		
Column 2	0.863448	1	
Column 3	0.824575	0.990331	1

Table 7: Correlation Matrix of Performance

Institutions highlighted as green were considered in each component as having the best possibilities of succeeding as a Technical University. In Column 1 where the selection was based on a non-weighted (presumed equal weight) 16-point criteria, institutions I, IV, V, VI, VII were determined to be conversion ready. Column 2 provides average performance based on a synthesised version of the 16-point criteria, but built on information sourced from the assessment questionnaire in appendix 1. In this column as well, averages were not weighted, and institutions V, VI, VII, VIII were determined to be conversion ready.

The raw scores obtained from the questionnaire were then subjected to the same synthesised version of the 16-point criteria, as in Column 2, however these were on a weighted scale. Weights were assigned in relation to some key international best practices, especially with the characteristics of a Technical University as determined by the Afeti Report (2014). The results obtained affirmed the results of column 2 and varied significantly from that of Column 1.

The novelty of the results in Column 2 and 1, showcases the strength of choice when the variables of influence are expanded to include all possible considerations. The confirmation of results in Column 2 by Column 3 provides evidence to support the resilience of the data set as well as the synthesised criteria. From the results it is clear that irrespective of a narrowed (un-weighted) or synthesised (expanded and weighted) instrument of assessment used, institutions V, VI and VIII still qualify to be considered as conversion ready.

## 5. Conclusion: Significance of Results

The proper allocation of resources in a developing country must be informed by a singular drive, that it yields the highest and best possible results. Decision makers in public service are tasked with ensuring the judicious application of the public purse. Higher Education landscapes are diverse, ever changing and require in-depth analysis with all possible variables being involved in decision making. This not only renders choice making complex, but that this complexity finds emphasis in a system that is unpredictable. The only option for decision makers is to ensure that all decisions have a strong and scientific basis. From the analysis, it is clear that the initial assessment results were not strong enough to determine, given scarcity of national resources in Ghana, to convert the number of selected institutions to Technical Universities. Further analysis hinged on empirical assessment would have resulted in a narrowed down the list, and most likely yield better and desired results.

The adoption of strategic management tools in decision making is very critical and relevant to decision makers in such situations. The future holds a lot of possibilities if these tools are properly adopted and adapted to the dynamic field of decision making in a system thinking perspective.

## 6. References

- i. Aelker, J., Bauernhansl, T., & Ehm, H. (2013). Managing Complexity in Supply Chains: A Discussion of Current Approaches on the Example of the Semiconductor Industry. *Procedia CIRP*, 7, 79-84. doi: <http://dx.doi.org/10.1016/j.procir.2013.05.014>
- ii. Afeti, G., Afun, J. V. K., Aflakpui, G. K. S., Sunnu, K. A., Combey, J. A. C. C. R., Nkwantabisa, D. D., . . . Ankomah-Asare, T. E. (2014). Report of The Technical Committee on Conversion of The Polytechnics in Ghana to Technical Universities. Accra: National Council for Tertiary Education.
- iii. Arnold, R. D., & Wade, J. P. (2015). A Definition of Systems Thinking: A Systems Approach. *Procedia Computer Science*, 44, 669-678. doi: <http://dx.doi.org/10.1016/j.procs.2015.03.050>
- iv. Benjamin, R., & Carroll, S. J. (1998). *Breaking the Social Contract: The Fiscal Crisis in California Higher Education*. RAND: Council for Aid to Education
- v. Camerer, C. F. (2003). *Behavioral game theory: experiments in strategic interaction*. New Jersey: Princeton University Press.
- vi. Checkland, P. B. (1981). *Systems Thinking, Systems Practice*. Chichester: John Wiley.
- vii. Chinyere, N. A. (2013). Peace Education, Transformation of Higher Education and Youths Empowerment for Peace in Africa. *International Journal of Scientific and Technology Research*, 2(12).
- viii. Despres, R. B. (2004). Systemic Thinking and Education Leadership: Some Considerations. *International Electronic Journal of Leadership Learn*, 8(7).
- ix. Furst-Bowe, J. (2011). Systems Thinking: Critical to Quality Improvement in Higher Education. *Quality Approaches in Higher Education*, 2(2), 2-4.
- x. Goldfarb, A., Ho, T.-H., Amaldoss, W., Brown, A. L., Chen, Y., Cui, T. H., . . . Lim, N. (2012). Behavioral models of managerial decision-making. *Marketing Letters*, 23(2), 405-421.
- xi. Gorzeń-Mitka, I., & Okręglicka, M. (2014). Improving Decision Making in Complexity Environment. *Procedia Economics and Finance*, 16, 402-409. doi: [http://dx.doi.org/10.1016/S2212-5671\(14\)00819-3](http://dx.doi.org/10.1016/S2212-5671(14)00819-3)
- xii. Gregory, A. J. (2009). Strategic Development in Higher Education: A critical Systems Perspective. *Research and Behavioural Science, Systems Research*, 25, 605-614.
- xiii. Jackson, M. C. (2003). *Systems Thinking: Creative Holism for Managers*. Chichester: John Wiley and Sons.
- xiv. Lindquist, E. (2009). How Ottawa Assesses Department/Agency Performance: Treasury Board's Management Accountability Framework. In A. M. Maslove (Ed.), *How Ottawa Spends 2009-2010: Economic Upheaval and Political Dysfunction* (pp. 47-88): McGill-Queen's University Press.
- xv. Maani, K. E., & Maharaj, V. (2004). Links between systems thinking and complex decision making. *System Dynamics Review*, 20(1), 21-48. doi: 10.1002/sdr.281
- xvi. March, J. G., & Olsen, J. P. (1986). Garbage Can Models of Decision Making in Organizations. In K. G. March & R. Weissinger-Baylon (Eds.), *Ambiguity and Command* (pp. 11-35). USA: Longman Inc.
- xvii. N.A.B. (2014). *Tertiary Education Institutions Annual Statistical Report 2012/2013*. Accra: National Accreditation Board.
- xviii. Pagani, M., & Otto, P. (2013). Integrating strategic thinking and simulation in marketing strategy : Seeing the whole system. *Journal of Business Research*, 0.
- xix. Richmond, B. (1993). Systems Thinking: Critical Thinking Skills for the 1990s and Beyond. *System Dynamics Review*, 9(2), 113-133.
- xx. Snyder, S. (2013) *The Simple, the Complicated, and the Complex: Educational Reform Through the Lens of Complexity Theory*. OECD Education Working Papers: OECD Publishing.
- xxi. Spiegler, R. (2015). Choice complexity and market competition. *Annual Review of Economics*.

- xxii. Swami, S. (2013). Executive functions and decision making: A managerial review. IIMB Management Review, 25(4), 203-212. doi: <http://dx.doi.org/10.1016/j.iimb.2013.07.005>
- xxiii. Yurtseven, M. K., & Buchanan, W. (2016). Decision Making And Systems Thinking: Educational Issues. 2016, 7(1), 10. doi: 10.19030/ajee.v7i1.9682

**Appendix**

*Individual Institutional Performance*

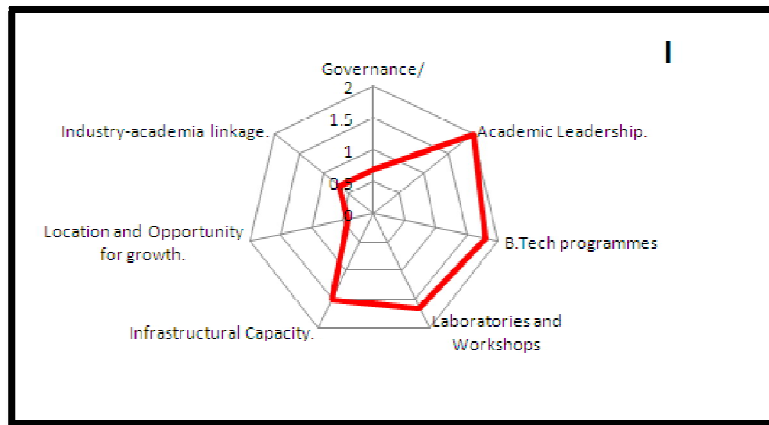


Figure 6

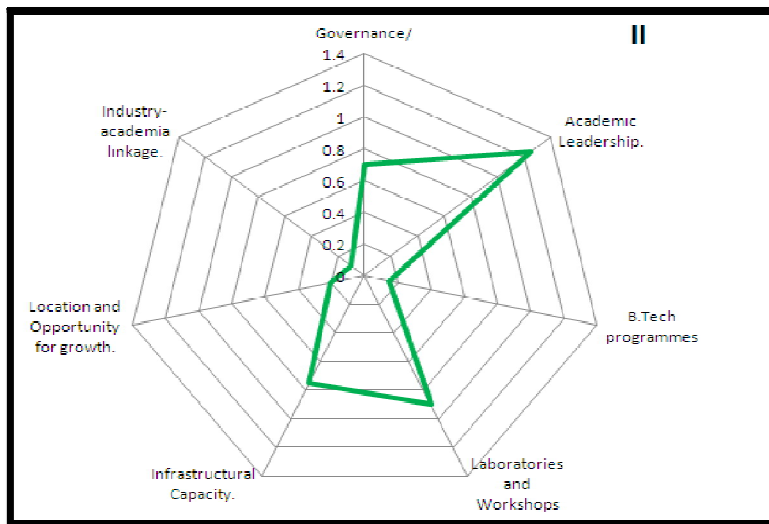


Figure 7

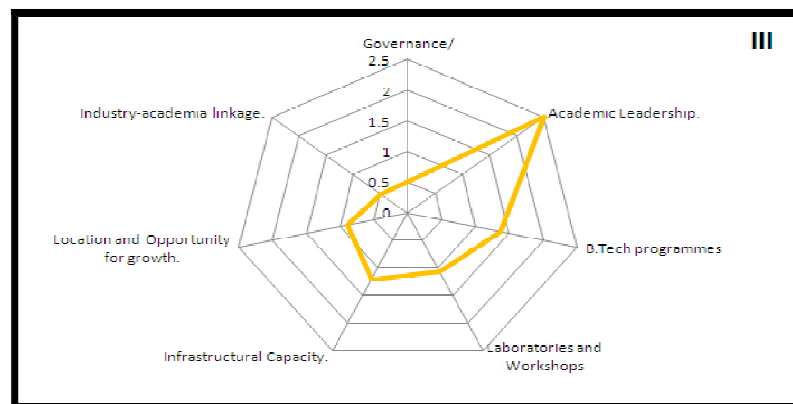


Figure 8

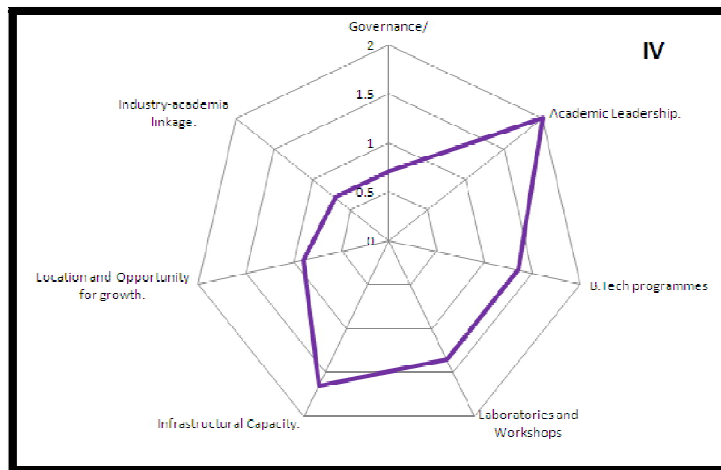


Figure 9

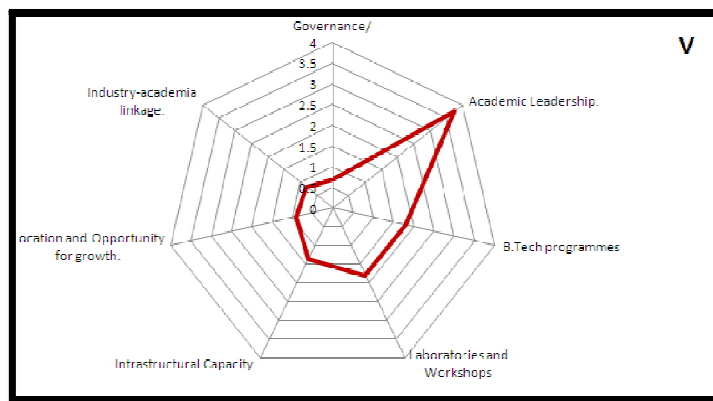


Figure 10

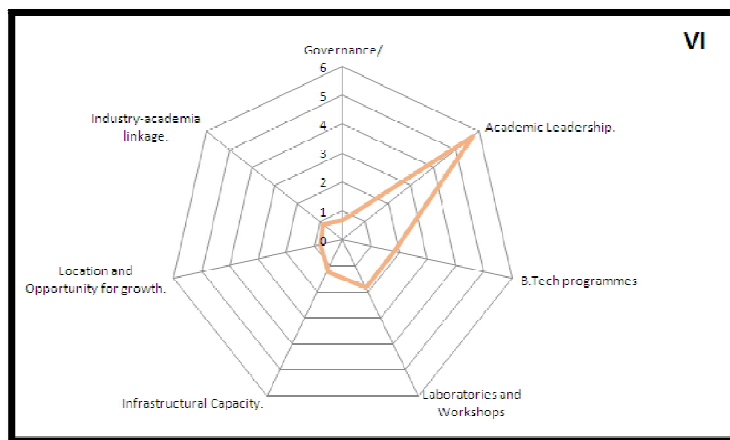


Figure 11

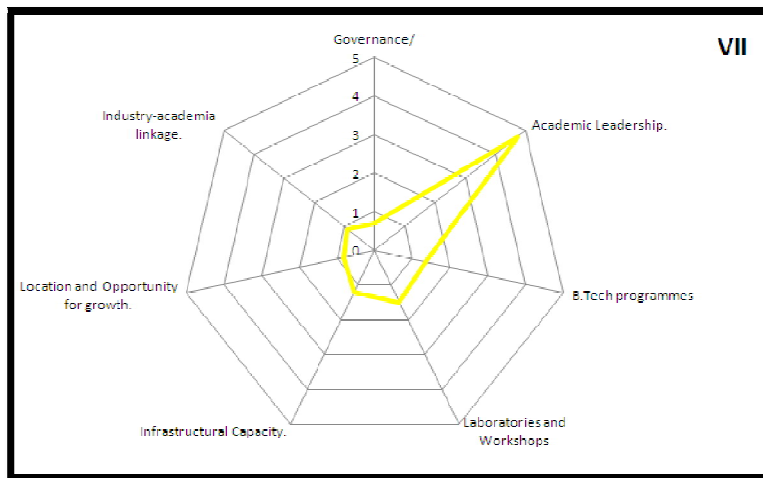


Figure 12

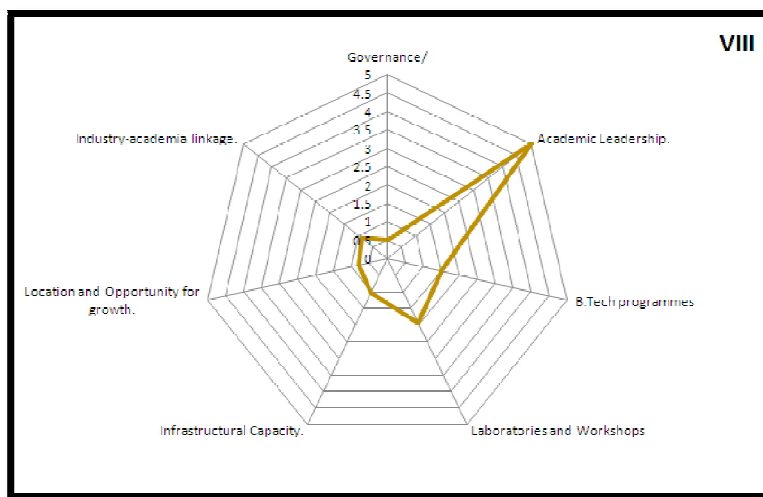


Figure 13

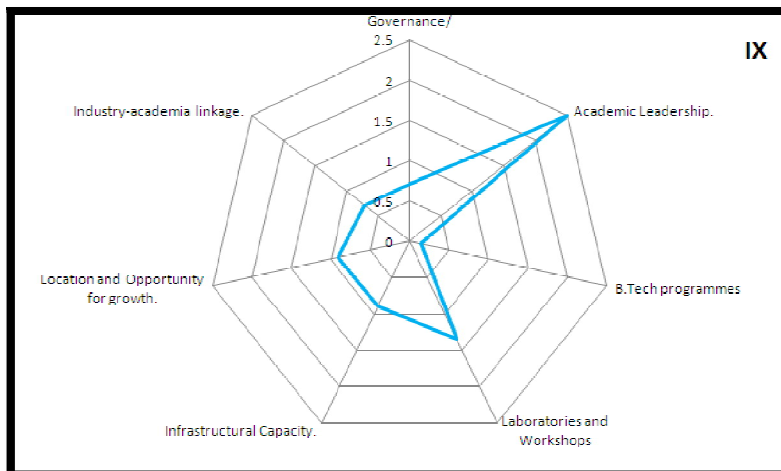


Figure 14

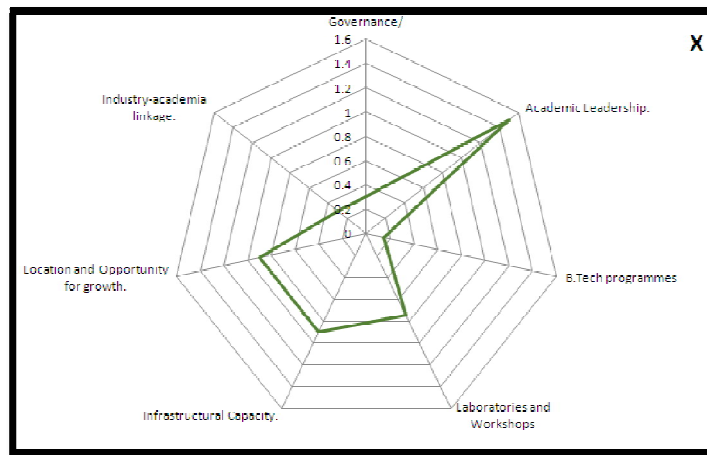


Figure 15