31st
IASP WORLD
CONFERENCE
QNCC | 19th – 22nd October

ROLE OF UNIVERSITY SCIENCE PARK IN PREPARING GRADUATES FOR INDUSTRY: PLAYING THE ACADEMIC ROLE

PARALLEL SESSION 4

Universities making use of science parks

Author:
Abdulaziz N. Aldusari (PhD) Saudi Arabia
CEO, Riyadh Techno Valley, King Saud University, Riyadh,

IASP
International Association of Science Parks and Areas of Innovation

QATAR SCIENCE & TECHNOLOGY PARK
Member of Qatar Foundation

www.iasp2014doha.com

Role of University Science Park in preparing graduates for Industry: Playing the academic role

Abdulaziz N. Aldusari (PhD)
Riyadh Techno Valley, King Saud University, Riyadh, Saudi Arabia
adawsari@ksu.edu.sa, adusari2000@yahoo.com

Abstract:

The science parks play essential role in facilitating theuniversity industry collaborations in order to enhance and utilize knowledge transfers, IP exchange, technology transfers, joint research projects, creating spin-offs and internships for students. The purpose of this paper was to analyse the need of a dedicated academic institute with a specialized course that is conducted through an industry oriented procedure. Based on analysis of various existing models of programs conducted by a number of science parks around the world and assessment of the courses offered by King Saud University, where Riyadh Techno Valley is based, some discrepancies and limitations were found in programs at King Saud University and other institutions. More importantly, practical needs of the students have been identified and addressed in the proposed program by Riyadh Techno Valley Institute (RTVi).

Introduction:

An eco-system for the Knowledge based economy KBE is vital for Science Parks that strengthen the relationship among all Science Park's stakeholders for creating successful collaboration that can result in developing joint projects and sharing of knowledge and experiences. The innovation opportunities at the universities would be enhanced with the right collaboration and partnership between private research companies and government research institution nationally and internationally. This can be done through the establishment of science park eco-system which has the main role of coordination and synchronization among its stakeholders and the university research sectors as well as external private research companies and its tenants.

Enhancing the information sharing within university campus has a positive impact on the growth of knowledge content, and the innovative capabilities of the academic environment. It contributes also to increasing the opportunities and chances for new collaboratively improved and enriched basic and applied researches.It has been found that university related science parks are supposed to take several responsibilities in the form of an incubator, facilitate growth of small, large technology firms, transfer of technology to and fro between tenant companies and university and up gradation of innovative processes [1]. Besides educating the population and developing human resource of a country, the Universities are being given new roles of economic and social development [2]. The renovation of University-industry relations from paid consulting services to university's knowledge capitalization, direct participation in formation of new start-up and extension of university's faculty into industry makes it a leading contributor in economic development of its region giving a paradigm shift to the relations with industry [2]. As technology firms are competing with each other in advancing knowledge and new technologies, they depend on research institutions and universities where they would find knowledge and technical know-how as well as graduates and professionals to work with them as employees and consultants [3]. In fact, there is an increased interest in both academia and industry in transfer of knowledge, technology, practices as well as people from the University to industry which is catching the attention of leaders and policy makers [4]. With a proper mechanism and formal alliance between University and industry, mutual benefits are achieved where university can benefit from funding of research and job opportunities for students and the companies in turn receive the knowledge, expertise and fresh talent thereby achieving greater flexibility in their technology development efforts [5]. A need has been realized for a formal organization which provides an efficient link between the two entities. For the university it may be highly valuable in terms of bringing new curricula or renewed ways of training students [5]. Universities are willing to expose their students to practical industrial tasks and issues which may also create job opportunities and provide access to applied research areas [6]. Among the available mechanisms that strengthen the university-industry, Science Park is considered as an institution

that promotes exchange of ideas through formal and informal ways[7]. The Science parks are now considered as a tool of knowledge-economic development. Their responsibilities include creation of facilitating research, creation of new jobs and boosting technology businesses. In terms of creation of jobs, many science parks like Surrey Research Park offers training programs, involvement in projects with companies and recruitment facilities. The tenant companies sign and conduct joint researches with the faculty, hire students to work on real projects and provide the faculty access to their own R&D. In addition, some companies donate funds and capital to research in the University [6].
In this paper, we analyze how efficient are the mechanisms of in a number science parks, how do they link the students to industry by creating a win-win situation of exchanging job opportunities and utilizing talent available in universities. We underpin this analysis by proposing a new separate entity controlled by the science park itself that will closely link the industry with university for resolving foreseen issues in talent creation and management with the involvement of university.Section 2 covers the best practices in Science Technology Parks and their role to strengthen the collaboration between universities and industries. Then, analysis of KSU case has been done to emphasize on the existing programs and how they are used to link universities to industries, by identifying the optimum criteria for achieving the programs' goals and apply it to KSU case. This is followed by a section of SWOT analysis for KSU to determine the strength and weakness in KSU programs as well as the threat to provide the right solution for KSU which can lead for enhancing the opportunities for students in getting the right practical experience which assist them in their careers.Then the RTVI institute section is described and linked to previous section to provide the right solution to complement KSU programs that would result in enhancing and developing the right collaboration with industries and allowing students to gain relevant experiences for entering the job market and being innovative at the workplace. Finally a conclusion has been covered which emphasized of the role of Science Park in boosting the education level for students and improving their practical skills.

Best practices in STP, University and R&D collaboration

Graduate School Research Development Program – Lancaster University, UK
It is a tool for planning, promoting and supporting the personal, professional and career development of post-graduates. [8]
Four domains encompass what students need, to be effective in their research, when working with others, and in contributing to the wider society and environment. These are:
Domain A: Knowledge and intellectual abilities e.g. Scientific Research Method
Domain B: personal Effectiveness e.g. managing PhD
Domain C: research Governance and organization e.g. writing grant proposals and getting funding
Domain D: Engagement, influence and impact e.g. communicating research to non-specialists

Credits Associated: All Research Councils expect PhD students to achieve at least 10 days of skills training each year. PhD students in the Faculty of Science and Technology will be

1 credit = approximately half a day of training
All Research Development Programme (RDP) courses will have a credit score that are detailed on the course webpage. Any external course which is a half day or less would be counted as

It is important that you do not undertake training courses merely to gain enough credits. There are a number of different ways in which you may achieve 20 credits per year which include conferences, workshops, training courses, seminars etc. On arrival and during the course of your PhD, each PhD student should perform a Development Needs Analysis (DNA) with their supervisor(s) in order to identify their specific training needs and the best way to satisfy them. The DNA tool can be found in Lancaster's Student Portal.

Comment: Just a regular curriculum with mandatory training course for scoring 20 credits in one year. There is no involvement of the student directly with the industry to face real life scenarios.

Knowledge Transfer Partnerships – Bangor University, UK
Strategic business projects focused on transferring know-how from a University partner into a business or organization in order to improve performance. [9]
Provides recent graduates with the chance to gain relevant work experience while working on a project within a company or organization. It involves a three way partnership between the graduate (or Associate), the company and the University and can last from 10 weeks to 3 years, depending on the nature of the project.

Comment: Offers practical on-the-job training with real life experience within industry. However, the program does not provide opportunities of employment.

Knowledge Economy Skills Scholarships (KESS)
Projects form part of a one year Research Masters (MRes/MPhil) programme and incorporate a placement period with the company partner. Collaboration under the KESS programme gives a company the opportunity to be involved in research focused on specific areas of interest to the business, with access to the latest academic thinking relevant to their sector, industry or markets [9].

Access To Masters (ATM)
Master courses in collaboration with Businesses. The courses include a 1-2 month project placement in the collaborating company - a low cost way for businesses to access postgraduate expertise and develop links with the University[9].
Comment: Period too short for the students to acquire reasonable practical knowledge.

Kent Science Park – Knowledge Transfer Program (KTP)
The knowledge sought is embedded into the business through a project, or projects, undertaken by a recent graduate (known as the Associate) and specifically recruited to work on

KTPs can vary in length from 1 to 3 years (classic KTP) and from 10-40 weeks (shorter KTP), depending on the needs of the business and the desired outcomes. KTP is part-funded by a Government grant. The budget for any individual KTP, and a business contribution to it, depends on the details of the specific Partnership[10].
A small to medium-sized enterprise (SME) having less than 250 employees would be expected to contribute about a third of the costs involved in the project. A business that does not qualify as an SME or which has more than 250 employees would contribute around half of a long-term strategic project's costs and around two-thirds of a short-term tactical project's costs.
Comment: Job prospects not clarified after completion of the project.

Warwick Science Park: a joint venture company between the University / Research Centre and other Parties
The intrinsic significance of this strategy is that a separate legal entity is created to carry the Science Park project forward involving other parties in addition to the University. It provides a vehicle through which a University can exercise a significant measure of control and leadership while not necessarily having to contribute all (or even most) of the financial resources. The balance struck in these types of joint venture can vary. In this case no local Authority or Development Agency is involved and the interests of the parties were driven as much by profit as for economic development gains – the latter being the primary motivation for involvement of Public Authorities[11].
Comments: No consideration of recruiting fresh graduates from the University.

Keele University S&B Park
The Keele Distinctive Curriculum is a holistic programme incorporating a range of learning activities that support personal and professional development, enabling students to develop

The businesses at Keele University Science and Business Park play a pivotal role in supporting the Keele Distinctive Curriculum by enhancing student experience, either through lecturing on a degree course or giving sector specific career workshops. These types of business-led classes and workshops are becoming an increasingly important part of attracting students to the University, offering tangible experience for their CV and demonstrating how their newly found

Comments: OnlyTheoretical training provided. No project, research or practical

Kanagawa Science Park
KSP partners with Kanagawa Academy of Science and Technology (KAST) for promoting research in pioneering high level scientific fields. It is responsible for doing basic research, technology transfer, arranging measurement laboratories, development of human resources and education in science and technology[13].

KAST also introduces technological ideas emerging from universities and research institutions.
The Education and Information Center at KAST conducts various events and education seminars for science and technology that aim to promote professional development of workers who have scientific and technological roles. A wide range of positions and age groups is covered: elementary students, junior high students, high-school students, university students, people engaged in research, and the general public who are unfamiliar with science.

The Educational Training Operation offers educational seminars with specialized content for

The Science and Technology Comprehension Advancement Operation holds various events that present the latest scientific and technological advances in an easily accessible manner to the public.

Criteria for Designing the Academic Program at RTVi

Below is the set of the best practice parameters that constitute a curriculum meant for training and developing graduates at an optimum level. The parameters cover all aspects of a comprehensive curriculum including the duration, type of certification, level of industry involvement, level of participation in a project etc. Furthermore, the curriculum from RTVi has been proposed that closely match the best practices. The level attained by the parameters in RTVi curriculum is based on RTV's capabilities and experience.

The goals of the program:

a. Improving the practical skills and experiences
b. Working in real project that solves national problem and enhance people life
c. Improve the chance for getting new job
d. Improve the career prospective of participants
e. Motivate student to build expertise

Riyadh Techno Valley institute (RTVi) will prepare a program to best match the optimum practices in the industry. Following are the parameters based on which the RTVi will design its curriculum for the University students.

Mapping to the goals	Criteria	Optimum level for achieving the goal of the program	RTVi Proposed level	RTVi Score on Scale of 5
a.	Number of hours working in practical project	3 months full time equivalent to 120 hours or 6 months part time equivalent to 120 hours	6 months training of 120 hours	5
b.	Relevant practical experience by working in relevant tasks of real project	Type of project and tasks allocated for participants. 20% of engineering, scientific and medicine projects as the total no. of students	15% of engineering, scientific and medicine projects as the total no. of students	4
a, d	Duration of program	6 months full time or 1 year part time	1 year part time	5
a, b, c	Number of companies associated and supporting the program	Average of one company for 5 students in the program	Contract with one company per 5 students	5
A	No. of specialist staff involved	8 instructors for a class of 50 students	Employee 6 expert trainers	4
E	Incentives or bonus paid to participants	Medium salary (65% of a regular employee) for top students, and normal salary (50% of a regular employee) as beginner for regular students	RTVi proposes to pay 50% of a regular employee's salary	4
a, b, c, d, e	Output of program: certification, innovation, employment	One certification per student, 3 innovations out of 50 enrolments per year. More than 30 employments per 50 students in one year, remaining students to find job in second year after graduation.	RTVi will provide approved certification to all students involved. RTVi students will be given goals to innovate at least 2 products per 50 students. Also, a minimum of 20 jobs will be targeted for 50 students	3
b.	Development project	1-4 students to work in a project until completion	To employ up to 4 students on a project	5
a, d	Relevant supervision	Joint supervision between industries and university. 15 agreements signed	The RTVi will aim 6 agreements in the first year	2.5
e.	Number of students per year	30% of total final year students	The institute will reach 20% of the final year students	3.5
				Total 41/50

Table 1. The criteria of a suitable training program has been identified above defining the optimum level and RTVi proposed level along with the scoring on a scale of 5.

Based on the methodology here **Figure I** below presents the difference between the expected performance of RTVi and the optimum level.

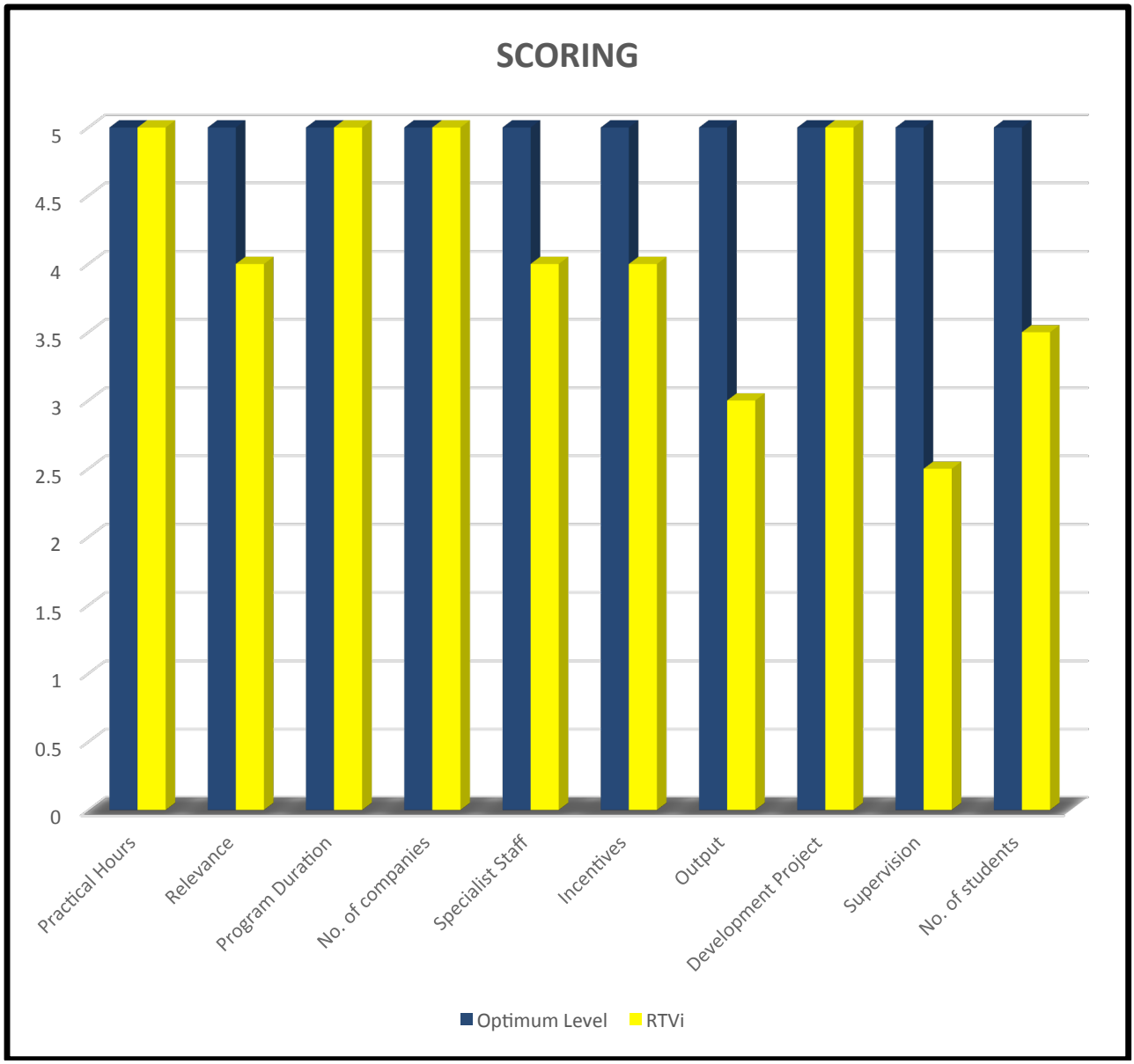

Figure I

RTVi will be able to attain the optimum level at 40% of the parameters defined above. These are No. of hours in practical projects, the Duration of the program, Number of companies associated and supporting the program and Project Development.

RTVi is still expected to lag in achieving excellence in the remaining parameters while implementing this program. The reasons for this occurrence and suggested solutions have been mentioned below:

a. **Specialist Staff:** King Saud University and Riyadh Techno Valley holds faculty and staff that is expert only in traditional academics, i.e. teaching pre-defined curriculums in classroom conditions, and conducting research with graduation students.
   There can be two ways to resolve this issue. New faculty can be recruited that is expert and experienced in designing and conducting these kind of curriculums and programs to provide professional experience while studying. Another method is to train the existing faculty holding industrial experience and enable them to work full time on these kind of programs.

b. **Output of Program**: Because of lack of focus of existing curriculums on innovation and acquirement of practical knowledge, students have not been able to develop a mindset of getting practical insights preparing them for industrial world.
   RTVi will have to motivate and support the students for inventing new products while pursuing their programs. In addition, some strategy will be needed to establish relations with the technology companies to hire students graduating from programs.

c. **Incentives**: Financial incentives are important to attract students to this new program where they can hesitate to join considering the program's immaturity and untested performance. RTV proposes to pay 50% of a regular employee's salary as per Saudi Arabian standards. The percentage is based on the financial strength of Riyadh Techno Valley in this regard.However, as the program gains recognition and succeeds in future more funds can be arranged from the University to provide more compensation to the enrolled students.

d. **Supervision:** For successful implementation of industrial training programs regular supervision is required from the technical point of view of the technology company and academically by University. At the highest performing level the program would need to sign 15 agreements with technology companies for enabling best program delivery. RTVi would target only 6 agreements for the first year of implementation utilizing Riyadh Techno Valley's existing relationships with the industry. As the program expands, RTV will attract new companies to involve in supervising the participation of students.

e. **No. of students**: According to the best practices, if this kind of training program can attract 30% of the total final year students in the university, it will be considered highly successful. RTVi will aim to admit 20% of the final year students. The target has been kept low from the best practice to make it convenient for the program managers, supervisors and students to conduct it effectively with minimal discrepancies and complications. However, RTVi will increase the intake from the following years by creating more attractive curriculums learning from its first year experience.

SWOT analysis of KSU

In order to analyze the status of KSU programs associated with practical experience for students, we have done SWOT analysis based on the annual reports of King Saud University and curriculums in the technical and scientific fields.The SWOT analysis is based on the capability of the curriculums in meeting the parameters identified in the previous section.

Strengths	Weaknesses
• Comprehensive curriculum covering all theoretical topics • Engagement of students in own research projects in some courses. • Support of RTV, Entrepreneurship Center and Nano Institute for managing practical trainings and providing technical, financial support through agreements. • Budget of SAR 205 million spent on projects in 2012-2013	• Little orNo provision of practical / on the job training • The training option in few curriculums is credits oriented not focused on inducing practical knowledge. • Many of the courses do not have any criteria at all. They just focus on theoretical study. • Not enough support from National program KACST for RTV and KSU Incubators • Issue in change in high level management and not clear structure that links university programs to Science park and incubator
Opportunities	Threats
• Foster RTV's relations with several technology companies including clients. • Offer new competence building curriculums to KSU for furthering its competence in practical knowledge delivery • High number of jobs can be created in incubators and science parks • Few anticipated jobs in small projects and new SMEs • Role of RTV through establishing RTVI • Better utilizing national fund to oriented toward supporting new practical programs for students • Establishing a proper eco-system that integrate well KSU departments with Science park and Incubators • Involve RTV science Park in developing strategic project for KSA which improve the opportunities in training students and creating more jobs.	• Competitors Badir incubator, Dhahran Techno Valley creating more jobs than Incubator at KSU • Other local universities could gain competitive advantage by introducing new curriculums. Need to be specific and give example or remove this sentence. • Several competitors in the regions namely Badir Incubator, Dhahran Techno Valley, Jeddah Bio Valley are gaining better reputation and support from KACST • Existing foreign universities will leverage by drawing Saudi students • Lack of motivation where Students can lag behind in gaining industry specific practical knowledge

RTV Institute (RTVi)
Riyadh Techno Valley institute proposes the following program meant for taking university's students in the industry before completing their degree. The curriculum described here also covers internal and external partners involved, evaluation techniques of the program and motivation techniques to attract maximum no. of students:

Innovative Graduate program to enhance Creativity and Innovation.

Establishment of Riyadh Techno Valley Institute (RTVI) to create innovative and creative

Program Objectives:

- To provide an eco-system and scientific research environment that promotes
- To support and sponsor innovators and creative person towards achieving
- To prepare for a creative and innovative graduate that is able to join the
- To make use of existing partnership agreements with public sectors and well-

Beneficiaries of the program:

- Students of scientific departments at KSU who are studying bachelor for last 2 years of their degrees.
- Master and PhD students, and researchers.

Duration of the program:

2 years part-Time study

Syllabus and topics to be covered:

- Course on Innovation concept
- Course on entrepreneurship
- Course about Incubation and IP

Plan of the announcement, definition and motivation to participate:

- Develop brochures, fliers for institute introduction.
- Presenting introductory presentation about the institute at KSU research departments and Institutes.
- Use of media.
- Develop an interactive website for the institute.
- Use of social media.
- Adding link to the institute website at KSU website.
- Announcing the activities of the institute in KSU newsletter.
- Allocate popup at different department locations at KSU.
- Inviting students and researchers to visit RTVI (Introductory visits).
- Reward the institute's students during the period of the program (and to be evaluated regularly every six months).
- Promote competition among candidates and offer good reward for best recognized research and registry of IP.
- International visits to foreign companies related to creativities and innovation for recognized best candidates.
- Meet with innovators and creative person locally and internationally.

Partners in the implementation of the program:

- Within University:
  - Innovation Centre.
  - Riyadh Incubation Centre.
  - Prince Salman Institute for Entrepreneurship.
  - King Abdullah Institute for Nano Technology.
  - Prince Sultan Institute for Advance Research Technology (PSATRI).
  - Sustainable Renewable Energy Center (SET).
  - Distinctive Information Security Center.
  - Start-up companies at RVC.

- Outside the University:
  - King Abdulaziz centre for Scientific and Technology (KACST).
  - King Abdullah centre for Atomic and renewable energy
  - King Abdul Aziz and his companions Foundation for giftedness and creativity.
  - International institutes and universities (MASDAR institute of science and technology - Kuwait Academy of innovation – Guchon University and KITECH Institute of Korea - Korea Institute of Science and Technology (KIST)- Massachusetts Institute of Technology (MIT)

Conclusion

The enhanced importance of preparing science and technical graduates for the industry has been recognized. It is increasingly the case that the university needs to train their fresh graduates for handling practical problems in the companies they are going to work for.
This paper has presented a relevant training program that can be conducted by the Science Park, Riyadh Techno Valley. The course designed here has been prepared by evaluating the offerings and capabilities of similar existing programs in other science and technology parks. Furthermore, the courses offered in the scientific and technical fields at King Saud University have been tested on a SWOT analysis. The graduate program proposed here by the RTVi addresses the limitations of the program offered in other science parks and fulfills the gaps between university and industry as identified in the courses at King Saud University.
The criteria used in section 4 covers all parameters important in designing an academic program. Section 4 evaluates the proposed RTVi curriculum against the optimum performance levels. RTVi curriculum when implemented is expected to bridge the gap between theoretical and practical knowledge of the graduating students which is expected to generate ample job opportunities by preparing the students to enter industry environment before completion of their graduation.

References

[1] Felsenstein, D. 1994. "University related science parks – 'seedbeds' or 'enclaves' of innovation?",*Technovation*, Vol. 14 no. 2, pp.93-110
[2] Etzkowitz, H. 1998."The norms of entrepreneurial science: cognitive effects of the new university-industry linkages",*Research Policy* Vol. 27, pp. 823-833.
[3] Santoro, M. and Chakrabarti, A. 2002."Firm size and technology centrality in industry-university interactions",*Research Policy* Vol. 31, pp. 1163-1180.
[4] Lee, Y. 1996."Technology transfer and the research university: a search for the boundaries of university-industry collaboration",*Research Policy* Vol. 25, pp. 843-863.
[5] Siegel, D et al. 2003. "Commercial knowledge transfers from universities to firms: improving the effectiveness of university-industry collaboration", *Journal of High Technology* Vol. 14, pp. 111-133
[6] Cyert, Richard M. and Goodman, Paul S. 1997."Creating Effective University-Industry Alliances: An Organizational Learning Perspective",*Tepper School of Business*, Paper 821.
[7] Lindelof, P. and Lofsten, H. 2004. "Proximity as a Resource Base for Competitive Advantage: University–Industry Links for Technology Transfer", *Journal of Technology Transfer*, Vol. 29, pp. 311–326

[8] Smith, J. 2014."Graduate School Research Development Programme (RDP)",*Lancaster University,* *http://www.lancaster.ac.uk/sci-tech/graduate_school/research_development_programme/* [Accessed on 25 March 2014]
[9] Bangor University – Web. 2014."Funding for Placements, Partnership and Collaborative Research",*Bangor University,* *http://www.bangor.ac.uk/research/grad_placements.php.en* [Accessed on 25 March 2014]
[10] Kent Science Park – Web. 2014."Graduate Placements - Knowledge Transfer Partnerships Undergraduate Placements - Shell Stop",*Kent Science Park,* *http://www.kentsciencepark.co.uk/EducationandTraining/studentplacements.aspx* [Accessed on 25 March 2014]
[11] Rowe, D. 2011."Universities and Science Park based Technology Incubators",*University of Warwick Science Park,* *http://www.warwicksciencepark.co.uk/wp-content/uploads/2011/03/UniversitiesandScienceParkbasedTechnologyIncubators.pdf* [Accessed on 25 March 2014]
[12] Keele Science and Business Park - Web 2014. Enhancing the student experience. *Keele Science and Business Park,* *http://www.kusbp.co.uk/3/business-success/post/54/enhancing-the-student-experience* [Accessed on 25 March 2014]