



# oward an Innovation Policy for Pakistan

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## Abstract

This policy paper aims to assist policy makers, as they develop the Pakistan Innovation Policy, with an independent assessment of where Pakistan stands now, an international perspective on policy priorities, a review of policy options and some implementation and institutional perspectives. The paper begins with a review of the key lessons of international experience together with a study of key international benchmarks. It takes a look at the ecosystem approach which maps the effectiveness of all the various players in innovation and also reviews progress against 12 “triple helix” critical success factors.<sup>1</sup> The possible policy options are then enumerated and evaluated for relevance. Finally, some perspectives are provided on how to move the innovation agenda forward.

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<sup>1</sup> Described as pillars in the Triple Helix Approach used by the Competitive Support Fund (CSF)

## **Toward an Innovation Policy for Pakistan**

**John Speakman, Kiran Afzal, Yasuhiko Yuge and James Hanna**

This paper was prepared by a core team comprising John Speakman, Kiran Afzal, Yasuhiko Yuge and James Hanna. Valuable advice was received from Mark Dutz, Jose Lopez Calix and Esperanza Lasagabaster.

## **Executive Summary**

1. Pushing the innovation agenda in Pakistan has the potential to be a game changer. Evidence shows much stronger productivity and competitiveness for the few Pakistani firms that eschew innovative behaviors such as developing new products, markets, investing in quality systems and research and development. The challenge therefore is to encourage vast majority of firms that do not exhibit these behaviors to do so. In most cases this means adopting practices and technologies that already exist in Pakistan (new to the firm); in other cases it is adapting practices and technologies that work well in other countries (new to the market) and occasionally it means original innovation that is new to the world. The Government's growth strategy recognizes this opportunity and emphasizes the role that innovation can play in improving productivity and thereby driving growth.

2. There are many important lessons Pakistan can learn from international experiences. Probably the most important finding is that while there are likely to be some benefits from encouraging commercialization of research the big pay off will come from encouraging firms to use existing technologies. In parallel the building blocks for a typical middle-income country innovation agenda, which often emphasizes research and development and academic business linkages, can be quietly worked on. However, neither of these agendas can be worked on in isolation.

3. The policy mix required to encourage firms to innovate more is a complex interaction of general business-enabling environment reforms, increased competitiveness, key infrastructure investments (mainly in ICT sector), appropriate firm-level support and establishing dynamic relationships between academia, firms and government. A detailed analysis using the triple helix model of 12 policy pillars identifies many areas of policy reform, capacity building and the design of supporting measures. These 12 pillars are: (i) fiscal policy, (ii) government procurement policies, (iii) infrastructure for innovation, (iv) small business entrepreneurship, (v) technology and business model acquisition, (vi) education, (vii) venture capital and commercialization, (viii) attitudes toward risk, (ix) encouragement of patents, (x) intellectual property protection, (xi) university-industry linkages and (xii) incubators and technical parks.

4. Combining this analysis with a detailed evaluation of the innovation ecosystem in Pakistan reveals that there is significant scope to strengthen the components of the innovation ecosystem. The following areas merit particular attention:

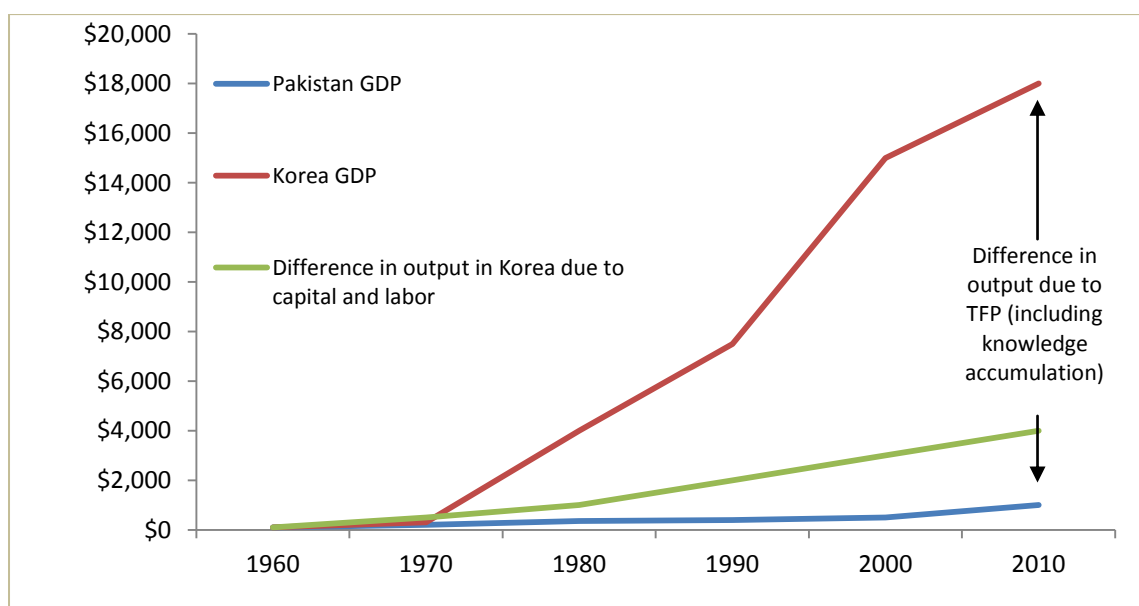
- There is a multiplicity of institutions engaged in trying to deliver and coordinate various aspects of innovation;
- Most of the key agencies involved in innovation lack adequate funding and can do little more than pay salaries of their staff;
- There is a lack of a champion as there is no "nodal" agency and there is no guiding policy or plan. At the straight coordination level there is National University of Science and Technology (NUST), the Competitive Support Fund (CSF) and others. It is surprising to note that there is no strong Ministerial lead on the topic; and
- There are very little resources allocated to innovation in Pakistan. While there are subsidies (mainly in the form of export subsidies) for the key productive sectors and significant resource allocations to knowledge providers in Pakistan, very little is oriented toward encouraging innovation.

5. Regarding the actions, among the most important one is to establish the overarching institutional framework—this could take several forms. International experience suggests: a formal cabinet appointment to task the managing, monitoring and implementing of the policy; meaningful coordination mechanisms by an interagency coordinating body, perhaps with the support of Memorandum of Understandings (performance contracts etc.) with implementing agencies; public-private dialogue mechanisms and continuous emphasis on this policy at the highest levels—i.e. in India the President has nominated this decade as “the Decade of Innovation.” Notice that only when the overall policy is agreed, the need, if any, for enabling legislation should be determined.

## Introduction

6. The Government's growth strategy<sup>2</sup> emphasizes the role that innovation can play in improving productivity and thereby driving growth. Pushing the innovation agenda in Pakistan has the potential to be a game changer. Innovations that can help unlock the inherent productivity of Pakistani firms can generate the needed jobs and levels of growth. It is certainly not an agenda in isolation. To be truly effective it needs to be part of a broader suite of reforms that are well captured by the "Pakistan: Framework for Economic Growth 2011". In particular the notions of vibrant markets and creative cities are central to the innovation agenda. Introducing innovation in a significant and systematic way when combined with an appetite for risk taking<sup>3</sup> (entrepreneurship) can drive Pakistan's growth rates to the targets it is aiming for. The contrast illustrated in Figure 1 between Pakistan and Korea is particularly telling and demonstrates the potential that innovation, as a critical component of Total Factor Productivity (TFP), has to offer. The international experience suggests that to make progress in this area a well calibrated innovation policy can be very helpful. Indeed this is recognized by policy makers and some important initial steps have been taken.<sup>4</sup>

**Figure 1** Pakistan GDP (per head) Compared with Korea (1960-2010)



Source: WBI and World Development Indicators

7. When one looks at international innovation benchmark indicators, Pakistan tends to fall in the bottom quartile. There are at least three internationally comparable indexes on innovation which are listed in Table 1 below. The benchmarks that look at innovation inputs and outputs, and as a result bring in external factors such as levels of human development and the business climate score Pakistan lower than the World Economic Forum index. The

<sup>2</sup> Government of Pakistan. 2011. "Pakistan: Framework for Economic Growth." Planning Commission, Islamabad.

<sup>3</sup> Ul Haque, Nadeem. 2006. "Entrepreneurship in Pakistan." PIDE Working Papers 2007:29

<sup>4</sup> The Competitiveness Support Fund (CSF) has begun facilitating the development of a National Innovation Strategy. The Planning Commission recently produced "A Study of Entrepreneurship and Innovation—Creating a Place for the Future" which outlined a number of important recommendations.

index uses perception measures rather than quantitative measures and looks at innovation systems as a subset of a broader competitiveness ranking. Not surprisingly with these differences there is a lot of debate on how to measure innovation.<sup>5</sup> If there is a bottom line it is clear whatever measure is used there is substantial room for improvement.

**Table 1** Innovation Rankings

Index	Ranking	Number of Countries	Source	Date
Global Innovation Index <sup>6</sup>	103	132	INSEAD	2010
Global Competitiveness Innovation Pillar <sup>7</sup>	75	139	World Economic Forum	2010
Innovation Capacity Index <sup>8</sup>	102	130	European Business School	2010

8. These findings of poor innovation performance are reinforced when firm-level data on Pakistan is examined. The 2007 Enterprise Survey reveals that Pakistani firms exhibit little in the way of innovative behavior. When one looks at how many firms introduced new products or technologies the score is significantly low (see Figure 2). This is particularly disturbing as this is where innovation counts—it is the innovation that takes place in firms that drive growth. Pakistan does not make it to Gartner’s top-30 countries for globally sourced activities, while India, Bangladesh and Sri Lanka do.

9. If there is good news, there are remarkable differences in allocative efficiency between firms in the same sector. As can be seen in Figure 3, there is significant variation in productivity with firms in the same country and Pakistan’s variability is almost double the next comparator—the Philippines. This means that some firms have figured it out and rank amongst the world’s most productive enterprises, but at the same time, most haven’t. For these firms that aren’t as productive, this presents a tremendous opportunity for growth.

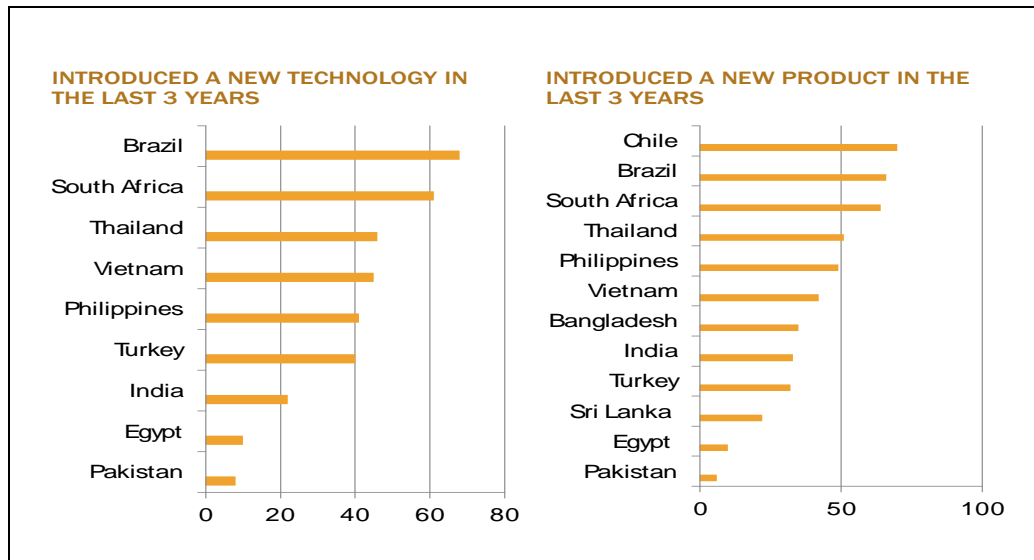
<sup>5</sup> Egils Milbergs and Nicholas Vonortas propose a set of metrics that capture the dynamics of the innovation Ecosystem (knowledge indicators, networks and conditions for innovation). See “Innovation Metrics Measurement and Insight.” <http://www.innovationtools.com/pdf/innovation-metrics-nii.pdf>

<sup>6</sup> The study measured both innovation inputs and outputs. Innovation inputs included government and fiscal policy, education policy and the innovation environment. Outputs included patents, technology transfer, and other R&D results; business performance, such as labor productivity and total shareholder returns, and; the impact of innovation on business migration and economic growth.

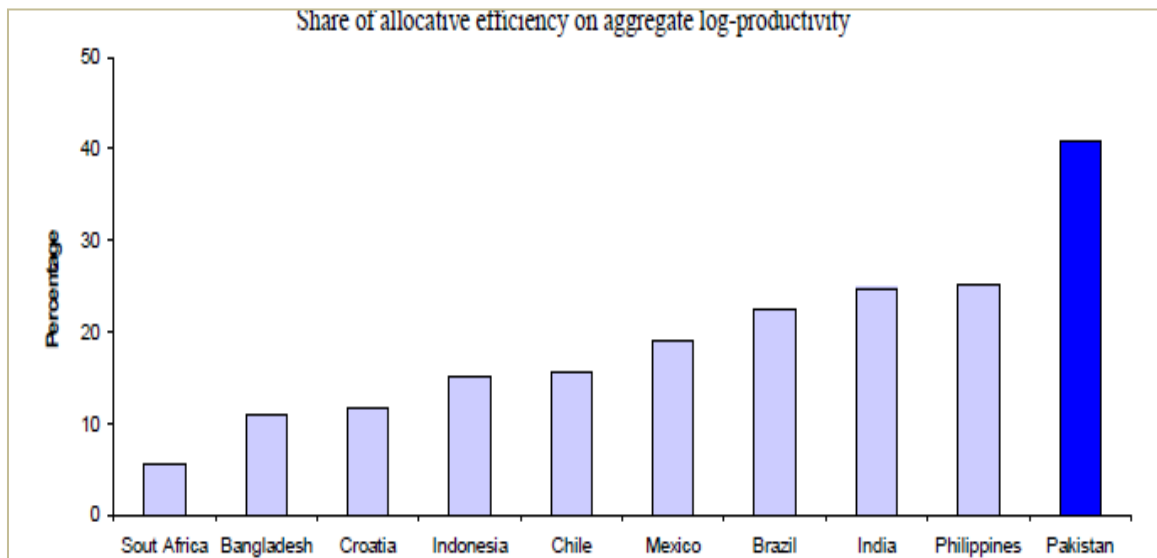
<sup>7</sup> Perception-based index on 7 different indicators. <http://www.weforum.org/issues/global-competitiveness>

<sup>8</sup> The index identifies over 60 factors that are seen to have a bearing on a country’s ability to create an environment that encourages innovation, such as a nation’s institutional environment, human capital endowment, the presence of social inclusion, the regulatory and legal framework, the infrastructure for research and development, and the adoption and use of information and communication technologies, among others. 90 percent of the variables used in the construction of the Index are “hard”—i.e. measuring directly some underlying factors, such as the budget deficit, expenditure in education or cumbersome regulations etc.—and, therefore, are not dependent on a survey instrument. See <http://www.innovationfordevelopmentreport.org>



**Figure 2** Share of Firms that have Introduced New Technology or Product

Source: Enterprise Survey 2007

**Figure 3** Variation in Productivity (Comparison of Allocative Efficiency)

Source: Estimates from Investment Climate Surveys

10. Innovation is a relative concept that refers to upgraded technological capabilities in a firm that lead to productivity improvements which in turn drive growth and employment.<sup>9</sup> These innovations can be new to the firm, new to the market (see Box 1) or new to the world (see Box 2). The channels by which this up-gradation occurs can be through original research and development (R&D), the adoption of existing technologies that have not yet been applied in a firm and through inputs that embody the innovation. In other words a new invention, introduction of a new product line or service, the development of a new market and the

<sup>9</sup> Technology includes improved business and organizational processes. Business development services support these kinds of processes.

acquisition of computer software that improves processes, are all innovations. Engagement in these innovation activities is one of the important factors to determine firm's performance. Firm-level data clearly indicates the difference of performance between the firms which have engaged in these innovation activities and the firms which have not (see Appendix).

#### **Box 1      New to Market Innovation: Coke Studio Brings Fame to Pakistan's Music**



An international franchise that started in Brazil, was picked up by a young Pakistani musician (Rohail Hyatt) and his Wife (Umbra) in year 2008. Ever since then, the four seasons of Coke Studio have brought international fame to Pakistan's musicians and singers, and has attracted over 400,000 fans on Facebook alone. Rohail and Umbra have worked very hard to manage a fusion of the diverse musical influences in Pakistan, including eastern classical, folk, and contemporary popular music. Therefore, this has turned out to be a remarkable opportunity for renowned as well as upcoming and less mainstream artists, from various genres and regions, to collaborate musically in live studio recording sessions. Commenting on the performance of a renowned folk singer in the show, Rohail says "What I have tried to do with this song is to present a modern Attaullah Esakhelvi (the singer) to his fans. We have carved the music around him as he would sing in any case. Even with experimentation, we have stayed true to form and tradition while including modern elements..." Coke Studio shows the promise that innovation has for diverse industries across the country. Thus, Coke Studio is an example of how an existing technology can be brought from Brazil, and then adapted and enhanced.

#### **Box 2      New to the World of Innovation: Gul Ahmed Brings in "ideas"**



Gul Ahmed, headquartered in Karachi, initiated textile trading business in early 1900s, and started manufacturing in 1953. After decades of experiences, Gul Ahmed has evolved into one of the largest composite textile houses in the world with a capacity of 130,000 spindles and 250 high-speed air-jet looms. In 2003, it launched a retail venture called "Ideas by Gul Ahmed" in Pakistan, offering a range of home textiles and apparel goods to the customers. As of 2010, Gul Ahmed has more than 30 retail outlets throughout Pakistan, and in 2010, Gul Ahmed achieved a sales record of more than US\$ 200 million (Export sales account for more than 50% of the entire sales record).



The success of Ideas lies in its simple but innovative business model which organically integrates all the manufacturing sections with very sophisticated quality control system which utilizes information and communications technology (ICT). This system has enabled Gul Ahmed to create high-quality unique products as well as increased efficiency in the process of designing, sewing, spinning and warehousing. It is also noteworthy that Gul Ahmed has invested in R&D, as opposed to a majority of Pakistani firms. Owing to this, domestic and international designers could produce approximately 1,000 designs with various fabrics including lawn, linen and chiffon each year. This has made it possible for Gul Ahmed to cater to various segments of customers in Europe, US, Middle East and South Asia around the year. In addition, its unique advertising strategy has elevated its brand image. Gul Ahmed issues a seasonal style magazine for the fashion conscious men and women. Available at all leading bookstores and at Gul Ahmed's boutiques in urban centers, this magazine has models sporting Gul Ahmed products (mostly apparel and accessories) in latest trends and cuts. Following suit, all leading brands of the country including Nishat Linen, Sana Safinas, Leisure Club, Cross Roads and more are now investing in their own fashion guides to attract more buyers. In year 2009, Gul Ahmed was awarded "Pakistan France Trade Performance Award". Thus, Gul Ahmed building from a platform of existing technologies was able to develop "new to the world" fashion designs.

11. The innovation agenda in Pakistan is confused. Not surprisingly given the foregoing findings, innovation means different things to different people. The emphasis is on research focusing on “new-to-the-world” opportunities. This is an important innovation opportunity where the greatest return lies in transferring existing technology to Pakistani firms.

12. Moreover innovation is the key to breaking the rent-seeking cycle which places a major brake on entrepreneurship in Pakistan. As Professor Auerswald argues in a recent study on entrepreneurship in Pakistan “... for business, creating a space for the future means seeking advantage not in regulatory protections that stifle social development but in market innovations that accelerate it.”<sup>10</sup>

### **Key International Lessons of Experience**

13. There are a number of important lessons from international experiences. Those that require little in the way of elaboration:

- Competition is the key driver of innovation. If there is little competition, there is little incentive to innovate.
- Innovation does not live in a vacuum<sup>11</sup>—strength of the regulatory environment and levels of infrastructure are particularly the great innovation enablers.
- Information and Communications Technology (ICT) plays a key role:
  - ICT deserves special attention given its impact within the firm, its connectivity and its ability to generate innovations in its own right (See Box 3)
  - ICT, especially e-business adoption and on-line business registration services, has a great potential for enhancing productivity and lowering barriers to market entry among Small and Medium Enterprises (SMEs). Besides, ICT could play an important role in promoting fair competition among firms by increasing the transparency of transaction and lowering room for administrative discretion.<sup>12</sup>
- The level of human development also determines the ability of a country to innovate. Countries that are at cutting edge of innovation have invested more in development of their human resource through more and better opportunities for education and research.
- Recent analysis of countries with a better Doing Business rank (both the overall rank and indicators on getting credit and registering property) show higher propensities for young entrepreneurial firms to innovate, in terms of new product or process innovations. Unfortunately for Pakistan there are very few young entrepreneurial firms—in the last four years, new firm registrations lie between 3,041 and 4,781 per annum<sup>13</sup>, which is merely 10% of the number of registrations in New Zealand—the

<sup>10</sup> Auerswald, Philip E., Elmira Baurasli, and Sara Shroff. 2011. “Creating a Place for the Future: A New Development Approach to the Islamic Republic of Pakistan.” Planning Commission. Government of Pakistan. <http://pc.gov.pk/feg/PDFs/entrepreneurship-and-markets.pdf>

<sup>11</sup> In “Competition and Inclusive Driven Growth”, Mark Dutz, Ioannis Kessides, Stephen O’Connell and Robert Willig identify that use of internet, access to other essential business services (ISO certification, formal worker training programs, membership of a business association) and collaboration with other firms (participation in a new foreign joint venture and entering into a new licensing agreement) have a positive impact on enterprise product and process innovation. <http://elibrary.worldbank.org/content/workingpaper/10.1596/1813-9450-5852>

<sup>12</sup> See examples in World Bank’s “Lowering Barriers to Market Entry via Online Entrepreneurship” (2004) and “En brave: Korea’s experience in promoting e-business adoption among micro and small enterprises” (2004).

<sup>13</sup> As reported by Securities and Exchange Commission of Pakistan

first ranked country for Doing Business and Starting a Business indicators, and a country whose population is 45 times smaller than Pakistan's population!

- Institutional capacity (monitoring and evaluation, coordination, policy development and financing) is needed to drive innovation development
- Innovation plays a big role in the development of the key economic sectors. In Pakistan's case, this is agriculture and major crops including cotton, rice and sugar cane. With an improved R&D and innovative solutions, the sector can benefit tremendously from better farm inputs and agro processing technologies. This would increase the shelf life and quality of the produce and strengthen the agricultural value chains thereby creating better market linkages and employment opportunities.

### Box 3 Ovex Technologies Pakistan: Both an Innovator and an Enabler of Innovation



The ICT sector is taking on increasing importance in today's economic society. It is not only emerging as an engine of economic growth but is also playing a vital role in fostering innovation among various firms and industries by providing them with a platform and infrastructure to promote innovation. The ICT industry in Pakistan started playing the role of an innovation enabler against a backdrop of a growing number of innovative enterprises in the sector, since the early 2000s. Pakistan's estimated domestic and export revenues for FY 2010 in the IT sector was more than US\$ 500 million (of which domestic revenues constitutes 30% of the total revenues).<sup>14</sup>

Among them, OVEX Technologies Pakistan Limited (with offices in Lahore, Islamabad and Karachi) has played a pioneering role in promoting innovation among various firms in Pakistan and overseas by providing BPO (Business Process Outsourcing), IT solutions and software services since its inception in 2003. As of 2010, OVEX had US\$ 1.5 million of revenues with approximately 300 employees. Its clients range from Ufone, Zong and SNGPL (Sui Northern Gas Pipelines Ltd) to other firms in US and Canada. In 2009, OVEX introduced state-of-the-art ICT infrastructure and communication system for SNGPL. After the implementation of the new information system, SNGPL has enabled its regions and sub-regions to gain access to national knowledge base including handling of emergency complaints in a timely fashion. It has also smoothened communication within SNGPL, which has enabled rapid service delivery to its customers. Owing to this innovative system, SNGPL could decrease operation cost significantly while enhancing customer satisfaction.

Currently, OVEX has been trying to establish innovative interactive communication system in Quaid-i-Azam International Hospital (QIH). With this information system, QIH would enable its doctors to gain access to global knowledge base including US based doctors at any time. Once this system is introduced, QIH could provide world-class medical services to its patients by taking advantage of global medical knowledge.

The CEO of OVEX Technologies Pakistan, Faisal Khan, mentioned that OVEX is a platform of growth, development and innovation. He described some innovative IT firms in Pakistan such as OVEX that have started to serve as a facilitator of innovation among various firms and industries by providing business enabling infrastructure and fostering knowledge sharing activities among them.

14. Lessons from international experiences that need a little more explanation:
  - A country's level of development matters—the distance a firm is from the frontier of what is technologically possible is a strong determinant of the effectiveness of R&D expenditures
  - There is often the need to create a culture that embraces and encourages innovation

<sup>14</sup> Government of Pakistan. 2010. "Pakistan IT Market Assessment-2010." Pakistan Software Export Board. Islamabad. [http://www.pseb.org.pk/images/study/pseb\\_it\\_market\\_review.pdf](http://www.pseb.org.pk/images/study/pseb_it_market_review.pdf)

- While policies should not pick winners, a granular examination from an innovation perspective of key sectors e.g. textiles can yield powerful insights
- It is important to make markets work for the private sector through appropriate interventions. Market failures can hinder innovation and therefore require the state to focus on elements that can address various constraints to the markets such as monopolies, subsidies, corruption and absence of well documented land records.

15. Why is that low income countries struggle to get returns on Research & Development (R&D)? Research shows that middle-income countries get high returns when it comes to R&D but low income countries don't. The reasons include: (i) very few firms in low income countries have the capacity to absorb state of the art R&D (for example less than 2% of Pakistani firms are formal) and (ii) linkages between firms and knowledge providers are weak so R&D is not demand oriented. Therefore there is little opportunity for spillovers in the absence of linkages and capabilities. Being on the cusp of low and middle income, Pakistan is at a point where there are likely to be returns from encouraging new-to-the-market and new-to-the-firm innovation.

16. How does one create an innovation culture? Steven Johnson the author of "Where good ideas come from: the Natural History of Innovation" argues this culture of innovation is achieved in three ways: (i) encouraging openness and diversity, (ii) allowing and supporting failure, and (iii) awareness of one's own limitations tied with a willingness to seek help. In Pakistan's case some simple questions point to the challenge ahead. How much Foreign Direct Investment (FDI) is there in core sectors like textiles—what does this say about openness? How easy is it for firms to exit if they fail? What are the consequences of failure? How much do large firms internalize their production processes—how much do they outsource? The answers to these questions are not encouraging and suggest a lot of work is required to move Pakistan from a few pockets of innovation (the kind of examples we have highlighted in this report) to a situation where an innovation culture is embedded throughout Pakistan.

17. But there are clues that suggest an innovation culture can happen. Pakistan has been able to deliver on its aspiration to be a nuclear power. The development of Pakistan's nuclear capacity is a dramatic example of what is possible on the innovation front in Pakistan. Most commentators cite a single-minded long-term focus that transcended political boundaries as the key. If similar focus can be brought to areas like bio-technology or ICT, the economic benefits can be tremendous.

18. Rather than trying to innovate across the whole economy some countries have taken a sectoral approach. By getting into the granular detail of firm-level productivity in critical sectors, particularly those such as textiles, which have had to adjust to major changes in international tariff and quota regimes, it has been possible to identify innovations that have enabled adaption. Colombia for example moved from producer of low value-added generic textiles to a producer of higher value-added differentiated products. It is however important to note, that in this approach, institutions have played a very important role in providing the desired hand-holding to the firms, and in seeking the buy-in from the public sector, thereby achieving the desired regulatory reforms, and finding representation in the policy making. The Pakistan Stone Development Company (PASDEC) described in the Box 4 is illustrative

of the impact of technological upgrading in a sector, made possible by an institution focused on the development of a private sector.

#### Box 4 Innovation at the Firm Level: The Pakistan Stone Development Company



PASDEC is a not-for-profit organization, focused on achieving one goal, introducing the extraction of “Square Blocks” technology to the marble and gypsum sector. This reduces the wastage factor from 85% to 45% and would have trickle down effects throughout the value chain of the Industry, achieving tremendous transformational impact. In the long run, the PASDEC vision for industry is to emerge as a globally competitive dimensional stone industry. The potential has been set as an export target of US\$ 2.4 billion in 2017. Already exports of US\$ 70 million have been achieved starting from a very low base. PASDEC has the following innovation enhancing initiatives:

- Raising Value Chain Productivity
- Investment in Workforce Development
- Export Marketing
- Promoting Strategic Partnerships (Joint Ventures & Foreign Direct Investment)
- Developing Industrial database & gathering information on markets

19. As innovation has such significant potential to impact economic growth, it is an attractive target for subsidies. Indeed many of the countries that have been very successful on the innovation front have used subsidies well. As with all subsidies they need to be well designed, managed well and dropped if they don't work. In an influential paper on industrial policy Dani Rodrik articulated the following three principles in subsidy design: (i) embeddedness (or strategic collaboration and coordination between the public and private sectors), (ii) carrots and sticks—the willingness to invest but also withdraw from subsidies that are not working, and (iii) accountability. Unfortunately in Pakistan very little of these principles are in play. Subsidies once they are granted tend to stay. There is little accountability for subsidies and monitoring and evaluation systems are rare.

### Innovation Ecosystem

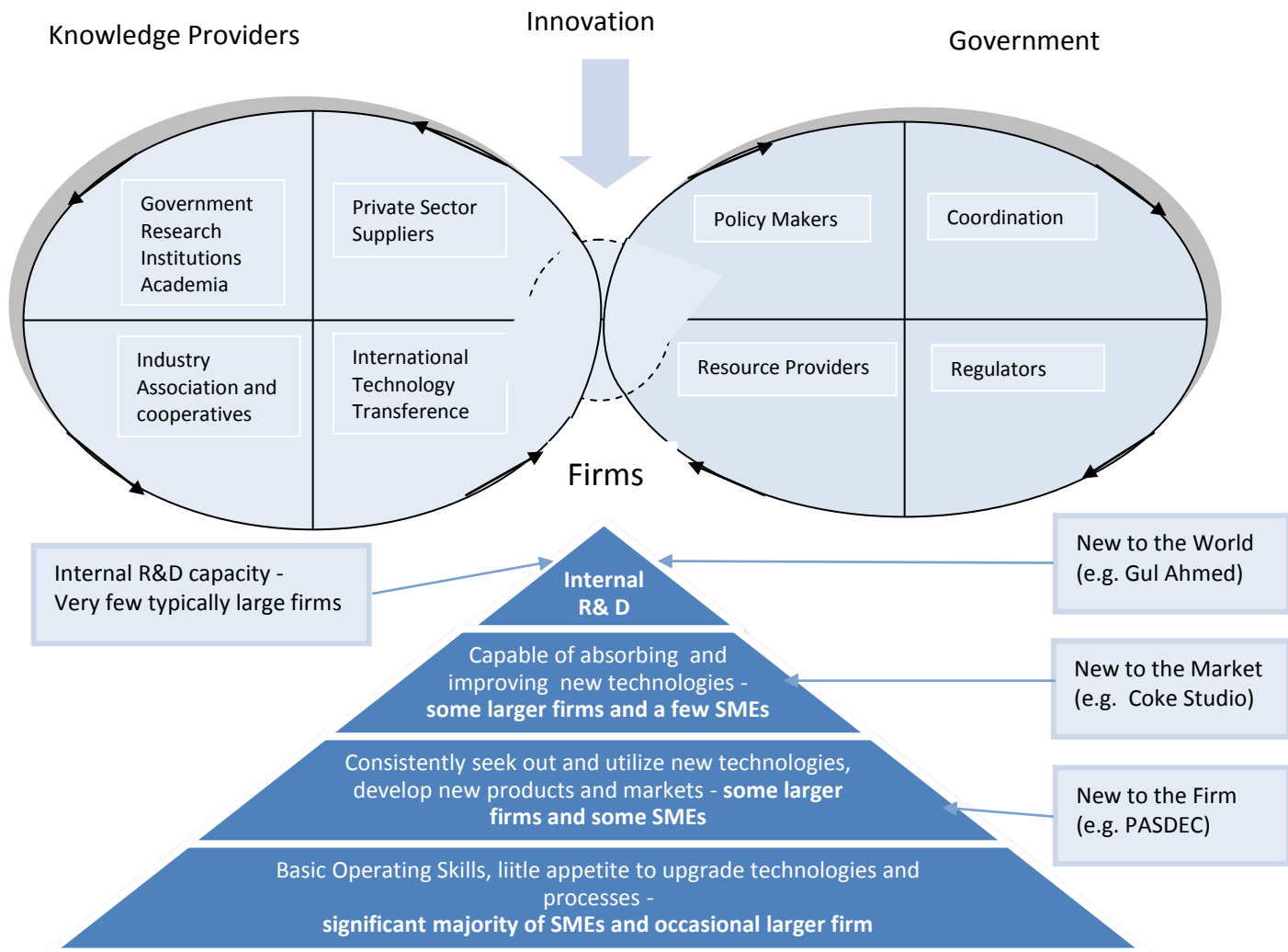
20. There is significant scope to strengthen the components of the innovation ecosystem in Pakistan. The Pakistan ecosystem is presented in Figure 4. The key components are firms, government and knowledge providers. While all these components are represented, there is a need to accelerate connections and strengthen critical capacities. When one reviews this ecosystem, following observations can be made:

1. A multiplicity of institutions engaged in trying to deliver and coordinate various aspects of innovation. There are many relatively insignificant players in Pakistan's innovation ecosystem. At the firm level, National Productivity Organization (NPO), Small and Medium Enterprise Development Authority (SMEDA), Technology Upgradation and Skill Development Company (TUSDEC), SME Business Support Fund (BSF), Competitiveness Support Fund (CSF), PASDEC, industry associations, and others all promote innovation in a modest way
2. A lack of funding for many key players—most of these agencies lack adequate funding, and can do little more than pay salaries of their staff. In a recent report on SMEDA it was noted “the current budget which is less than US\$ 2 million, does not allow it (SMEDA) to mobilize enough resources in the form of facilities, trained and



specialist staff and outsourcing partners, thus undermining its functions and outreach”.<sup>15</sup>

**Figure 4** The Pakistan Innovation Ecosystem



3. A lack of a champion, as there is no “nodal” agency and there is no guiding policy or plan. At the straight coordination level there is National University of Science and Technology (NUST), CSF and others. It is surprising to note that there is no strong ministerial lead on the topic. There are elements in the Planning Commission, the Ministry of Industries and the Ministry of Education, but unfortunately, there is no clear champion in the government. What is required is that an existing Ministry be charged with this responsibility which includes the delivery of a clear policy and an accountable implementation plan for cabinet-level approval. For example in Malaysia the Ministry of Science Technology and Innovation has this responsibility.
4. There are very little resources allocated to innovation in Pakistan. While there are subsidies (mainly in the form of export subsidies), for the key productive sectors and significant resource allocations to knowledge providers in Pakistan, very little is

<sup>15</sup> Shah, Salman. 2010. “Independent Organizational Evaluation of SMEDA.” Ministry of Industries and Production. Islamabad. <http://www.moip.gov.pk/IOE%20SMEDA-FirstDraftFinalReport.pdf>

oriented toward encouraging innovation. The big message from countries like Korea is they used their subsidies very wisely and consistently in support of innovation. A key challenge for policy makers is to find ways to: (i) reorient these existing firm-level subsidies so they move away from encouraging rent seeking to supporting competitiveness and innovation, and (ii) encourage stronger links between knowledge providers and firms.

## **The Triple Helix**

21. One way of looking at the innovation system is through the Triple Helix approach which identifies 12 pillars of innovation policy engagement. This approach looks at the interactions between the three principal actors in an innovation ecosystem<sup>16</sup>: knowledge providers, firms and government. The 12 policy pillars, or as we describe above as critical success factors, are: (i) fiscal policy, (ii) government procurement policies, (iii) infrastructure for innovation, (iv) small business entrepreneurship, (v) technology and business model acquisition, (vi) education, (vii) venture capital and commercialization, (viii) attitudes toward risk, (ix) encouragement of patents, (x) intellectual property protection, (xi) university-industry linkages, and (xii) incubators and technical parks. For each of these pillars, Table 2 looks at their importance, appraises Pakistan's current situation and explores the way forward.

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<sup>16</sup> The Triple Helix (TH) model emerged from a workshop on "Evolutionary Economics and Chaos Theory: New Directions in Technology Studies" (Leydesdorff & Van den Besselaar, 1994). Organized with the intention of crossing the boundaries between institutional analysis of the knowledge infrastructure, on one hand (Etzkowitz, 1994), and evolutionary analysis of the knowledge base of an economy, on the other (David & Foray, 1994; Nelson, 1994).



**Table 2** Triple Helix–Pakistan: Current Situation & Way Forward

Why is it Important?	Current situation	Way Forward
<b>Fiscal Policy<sup>17</sup></b>		
<ul style="list-style-type: none"> <li>Fiscal policy can encourage R&amp;D, technology acquisition, and other innovative behaviors.</li> </ul>	<ul style="list-style-type: none"> <li>High tariffs on imported technology (embodied in capital equipment) limit the acquisition of new technology.</li> </ul>	<ul style="list-style-type: none"> <li>Fiscal disincentives for the importation of technology should be removed (e.g. import duties on machinery in the textile and garment sector in Bangladesh is set lower to attract investment in the sector).</li> </ul>
<ul style="list-style-type: none"> <li>It impacts on competitiveness as favorable fiscal regimes can impact the location of some innovation expenditures.</li> </ul>	<ul style="list-style-type: none"> <li>There are no fiscal incentives for R&amp;D. Overall Pakistan's tax policies for R&amp;D are not competitive.</li> </ul>	<ul style="list-style-type: none"> <li>Fiscal policy in the innovation area should be aligned with best practice countries (i.e. tax exemption policies in Singapore).</li> </ul>
<b>Government Procurement Policies<sup>18</sup></b>		
<ul style="list-style-type: none"> <li>The significant purchasing power of government can be used to support the uptake of innovative products, works and services, and the creation of new markets, particularly in areas of public interest.</li> </ul>	<ul style="list-style-type: none"> <li>A significant modernization of public procurement has been underway over the last decade. Unfortunately, these processes are slow and not used in any systematic way, discouraging innovative proposal from the prospective firms.</li> </ul>	<ul style="list-style-type: none"> <li>Innovation at the firm level can be encouraged by: (i) setting ISO type quality standards<sup>19</sup> for a bidding prerequisite and (ii) creating new markets for firms by adopting new products or technologies in the bidding outcomes (e.g. the supply of energy efficient light bulbs)</li> </ul>
<b>ICT (Infrastructure for Innovation)<sup>20</sup></b>		
<ul style="list-style-type: none"> <li>Innovative products and business models</li> </ul>	<ul style="list-style-type: none"> <li>As in most countries, the ICT sector is</li> </ul>	<ul style="list-style-type: none"> <li>Development of ICT infrastructure should be given</li> </ul>

<sup>17</sup> This analysis is based on a report by KPMG “R&D incentives and services—adding value across ASPAC.”

<http://www.kpmg.com/AU/en/IssuesAndInsights/ArticlesPublications/Documents/RD-incentives-and-services-adding-value-across-ASPAC.pdf>

<sup>18</sup> This analysis draws on a paper by Dr Farrukh Kamran “Government Procurement Policies and Innovation”, which contains a number of additional recommendations.

[http://www.competitiveness.org.pk/pii/research/\\_Government%20Procurement%20Policies%20and%20Innovation\\_%20by%20Dr.%20Farrukh%20Kamran%20\(CASE%20&%20CARE\).pdf](http://www.competitiveness.org.pk/pii/research/_Government%20Procurement%20Policies%20and%20Innovation_%20by%20Dr.%20Farrukh%20Kamran%20(CASE%20&%20CARE).pdf)

<sup>19</sup> Adoption of quality standards will often require firms to upgrade management and production processes (which will be innovation at the firm level)

<sup>20</sup> This analysis draws on a paper by Qasim Sheikh and John Shumaker “Infrastructure for Innovation”

[http://www.competitiveness.org.pk/pii/research/\\_Infrastructure%20for%20Innovation\\_%20by%20Qasim%20Sheikh%20and%20John%20Shumaker.pdf](http://www.competitiveness.org.pk/pii/research/_Infrastructure%20for%20Innovation_%20by%20Qasim%20Sheikh%20and%20John%20Shumaker.pdf)

Why is it Important?	Current situation	Way Forward
often come into being through exchange of ideas and information between people. Development of ICT infrastructure promotes connectivity between people and facilitates this process.	developing rapidly in Pakistan. Nevertheless Pakistan remains behind comparator countries in internet usage and broadband availability. For example, Pakistan has 43 bits of international bandwidth per second compared with an average of 153 bits per second.	<p>priority through investments and appropriate regulatory interventions<sup>21</sup> (e.g. Ireland and South Korea)</p> <ul style="list-style-type: none"> <li>Where the private sector is not willing to make critical investments on its own, PPPs (Public Private Partnerships) should be encouraged.</li> </ul>
<b>Small Business Entrepreneurship<sup>22</sup></b>		
<ul style="list-style-type: none"> <li>SMEs tend to take risks, introduce new ideas, and adapt new technology. In the US, small firms generate 13-14 times more patents per employee than large firms. SMEs are a key driver of innovation.</li> </ul>	<ul style="list-style-type: none"> <li>SMEs are struggling in Pakistan. They suffer from a weak governance environment, poor infrastructure (especially power and transport), and limited access to finance and skills</li> </ul>	<ul style="list-style-type: none"> <li>General reforms of the business climate outlined in the “Pakistan: Framework for Economic Growth 2011”</li> <li>Encouragement of Business Development Services (BDS) through matching grant programs and expansion of the IFC’s Business Edge program across Pakistan.</li> </ul>
<b>Technology and Business Models Acquisition (from Abroad)</b>		
<ul style="list-style-type: none"> <li>New technology and new business models from abroad have potentials to enhance firm’s productivity if the technology is carefully selected and assimilated in the recipient countries.</li> </ul>	<ul style="list-style-type: none"> <li>In general, Pakistani firms do not seek out new technologies and processes. This is particularly true for smaller firms.<sup>23</sup></li> </ul>	<ul style="list-style-type: none"> <li>Encourage the upgrading of technologies (such as advanced machinery in the dimension stone sector) among firms through NPO and TUSDEC</li> <li>Facilitate FDI—a key strategy Bangladesh has employed to upgrade their technology in the textile sector. Diaspora linkages (primarily in the Middle East, UK and the USA)<sup>24</sup> can facilitate the introduction of new technology among Pakistani firms and industries. (This is one of the reasons why the ICT sector in Pakistan has developed quite rapidly in recent years)</li> </ul>

<sup>21</sup> This could be granting of a license, the granting of a regulatory freedom or better enforcement of existing regulations

<sup>22</sup> This analysis draws on a paper by Dr Iqbal Khan “Technology and Business Acquisition from Abroad”.

[http://www.competitiveness.org.pk/pii/research/Technology%20and%20Business%20Model%20Acquisition%20from%20Abroad\\_.pdf](http://www.competitiveness.org.pk/pii/research/Technology%20and%20Business%20Model%20Acquisition%20from%20Abroad_.pdf)

<sup>23</sup> Larger older firms have a better record of acquiring these technologies (Enterprise Survey 2007, World Bank)

<sup>24</sup> See [http://en.wikipedia.org/wiki/Pakistani\\_diaspora](http://en.wikipedia.org/wiki/Pakistani_diaspora)

Why is it Important?	Current situation	Way Forward
	<ul style="list-style-type: none"> <li>While organizations such as SMEDA, National Productivity Organization (NPO), Business Support Fund (BSF) and Technology Upgradation &amp; Skill Development Company (TUSDEC) can play an important role in introducing technology among Pakistani firms, their resources and scope of work is very limited at present.</li> </ul>	<ul style="list-style-type: none"> <li>Launch the Centers of Excellence (COE) scheme mentioned below.</li> <li>Amalgamate the present institutional arrangements for business development services into one focused entity.</li> <li>Support the entity with additional resources where there are strong benefit-to-cost ratio and strict subsidy governance mechanisms (monitoring and evaluation, transparency and sunset/guillotine provisions).</li> </ul>
<b>Education</b>		
<ul style="list-style-type: none"> <li>Education at all levels is critical to innovation. It provides potential entrepreneurs with basic business skills such as reading, writing, calculation and communication.</li> </ul>	<ul style="list-style-type: none"> <li>In Pakistan, the quality of education system is poor at all levels (Primary, Secondary and Tertiary). Because of this, access to basic skills (such as writing, reading and calculation) and practical skills (such as vocational skills and entrepreneurship) are limited to only a few young people.</li> </ul>	<ul style="list-style-type: none"> <li>While in general, education reforms are beyond the scope of this topic, reforms at all education levels (Primary, Secondary and Tertiary) are essential to provide basic skills for younger generation in Pakistan.</li> </ul>
<ul style="list-style-type: none"> <li>At tertiary levels, there are specific interventions that can encourage innovation and entrepreneurship</li> </ul>	<ul style="list-style-type: none"> <li>There is very little in the way of entrepreneurial training and mentoring / financial support for young entrepreneurs.</li> </ul>	<ul style="list-style-type: none"> <li>Practical curriculum and entrepreneurship education should be introduced to secondary and tertiary education (e.g. vocational education in Germany and Singapore, and entrepreneurship education in high schools, colleges and universities in Israel and USA).</li> <li>See Venture Capital Recommendations noted below.</li> </ul>
<b>Venture Capital and Commercialization</b>		
<ul style="list-style-type: none"> <li>The venture capital (VC) fund usually invests in high-risk high-potential firms at an early stage. These firms often develop new technologies and new business models. Conventional financial organizations such as commercial banks are not inclined to invest in these high-risk firms</li> </ul>	<ul style="list-style-type: none"> <li>Although some efforts have been made to establish venture capital (VC) fund in Pakistan, there have been no successful results to date. This is in part a fiscal rules problem (Treatment of tax losses does not allow offsets which means venture capitalists cannot offset profits made in one company with losses in another)</li> </ul>	<ul style="list-style-type: none"> <li>At initial stage, the enabling environment for VC needs to be addressed (treatment of tax losses, a more debtor-friendly insolvency regime and an overall business environment that is more conducive to growth)</li> <li>When this is in place, an Innovation Fund that can catalyze private sector investment can be considered</li> </ul>

Why is it Important?	Current situation	Way Forward
	and a lack of capable fund manager.	(e.g. The Korea Venture Capital Investment Corp or KVC <sup>25</sup> ) <ul style="list-style-type: none"> <li>New initiatives such as the “Technology Angels Network (TAN)” which has started to provide mentoring and match-making services (with high net-worth angels) for entrepreneurs in recent years should be encouraged.</li> </ul>
<b>Attitudes toward risk</b>		
<ul style="list-style-type: none"> <li>For an innovation culture to develop within a country risk taking needs to be encouraged and failure needs to be accepted and managed.</li> </ul>	<ul style="list-style-type: none"> <li>There have been efforts to move toward creditor-friendly laws which make it difficult for debtors to rehabilitate or close their business.<sup>26</sup></li> </ul>	<ul style="list-style-type: none"> <li>An Introduction of debtor-friendly bankruptcy and insolvency laws is an important step to promote risk-taking attitude among firms in Pakistan.</li> <li>Apart from revising the regulations, it is important to educate the public to recognize that entrepreneurship and risk-taking attitude are beneficial to economic growth and advancement of society.</li> </ul>
<b>Encouragement of Patents</b>		
<ul style="list-style-type: none"> <li>Possession of patents and high productivity has a strong positive correlation at firm and country level. Patent is the shape of someone’s idea and invention into a set of exclusive rights authorized by the government, and often embodies high utility and productivity of the products and services. Thus, it could be inferred that the more patents firms or countries possess, the more productive or innovative these entities are.</li> </ul>	<ul style="list-style-type: none"> <li>The base of patents is small. Very few patents are registered in Pakistan—in number terms, Pakistan records about 2% of what India registers in patents. This speaks very weak incentive system and low overall levels of research.</li> </ul>	<ul style="list-style-type: none"> <li>It is important to nurture quality researchers who could turn their knowledge and research outcomes into patent and other IP. Hundreds of Pakistani students have been sent abroad (arranged by Higher Education Commission) so that they could accumulate solid research experience in excellent research institutions. This is expected to increase the number of patent holders in the future. Such efforts should be further encouraged to facilitate more Pakistanis to acquire patents abroad as well as in Pakistan.</li> <li>Key measures also include the ones described below under intellectual property protection.</li> </ul>

<sup>25</sup> Global Partnership for Financial Inclusion. 2011. “Scaling-Up SME Access to Financial Services in the Developing World.”

[http://www.gpfi.org/sites/default/files/documents/G20\\_Stocktaking\\_Report\\_0.pdf](http://www.gpfi.org/sites/default/files/documents/G20_Stocktaking_Report_0.pdf)

<sup>26</sup> Ghumman, Mushtaq. 2011. “Potentially Viable Entities: Finance Shelves Plan for Corporate Rehabilitation.” *Business Recorder*. August 6, 2011.

Why is it Important?	Current situation	Way Forward
<b>Intellectual Property (IP) Protection<sup>27</sup></b>		
<ul style="list-style-type: none"> <li>With a proper environment to protect Intellectual Property (IP), firms are motivated to create new products, services, and new ways of business.</li> </ul>	<ul style="list-style-type: none"> <li>Enforcement of intellectual protection is weak.<sup>28</sup> It has been observed that many innovators choose to register their intellectual property abroad because of weak protection of these rights.</li> </ul>	<ul style="list-style-type: none"> <li>Capacity of Intellectual Property Organization (IPO) and Federal Investigation Agency (FIA) should be enhanced to tighten the control over infringement of IP.</li> <li>Awareness should be raised among potential IP producers such as firms, R&amp;D institutions and universities. It would not only facilitate them to produce IP strategically, but also help them take measurements to counteract the violation of intellectual property rights.</li> </ul>
<b>University-Industry Linkages<sup>29</sup></b>		
<ul style="list-style-type: none"> <li>University-Industry linkages connect a key source of knowledge provision with firms.</li> </ul>	<ul style="list-style-type: none"> <li>Over the decades, Pakistan has gradually established and improved the university-industry linkages (such as NUST and University of Agriculture Faisalabad). However, universities have only been able to achieve limited commercialization of their research outcomes.</li> </ul>	<ul style="list-style-type: none"> <li>R&amp;D skills of universities and firms (such as marketing, patenting and financing) should be improved to turn their research outcomes into new marketable products or commodities.</li> <li>Institutional capacity of universities should be enhanced by establishing legal and commercial advisory offices (e.g. universities in US)</li> </ul>
	<ul style="list-style-type: none"> <li>There is no internet-based system for managing and organizing innovation.</li> </ul>	<ul style="list-style-type: none"> <li>The Competitiveness Support Fund (CSF) proposal to establish Centers of Excellence (COE) to promote the real time interchange of ideas around key value chains in Pakistan has merit.<sup>30</sup></li> </ul>

<sup>27</sup> This analysis draws on a paper by Ali Salman and Khalil Ahmed Arbi, "Intellectual Property Rights in Pakistan a Brief Situation Analysis".

[http://www.competitiveness.org.pk/pii/research/Intellectual%20Property%20Rights%20in%20Pakistan%20A%20Brief%20Situation%20Analysis%20by%20Ali%20Salman%20Khalil%20Ahmed%20Arbi%20\(Development%20Pool\).pdf](http://www.competitiveness.org.pk/pii/research/Intellectual%20Property%20Rights%20in%20Pakistan%20A%20Brief%20Situation%20Analysis%20by%20Ali%20Salman%20Khalil%20Ahmed%20Arbi%20(Development%20Pool).pdf)

<sup>28</sup> Intellectual Property Organization of Pakistan. <http://www.ipo.gov.pk/>

<sup>29</sup> The analysis draws on a paper by Prof S. Riazuddin "University-Industry Linkages". [http://www.competitiveness.org.pk/pii/research/University-Industry%20Linkage%20by%20Professor%20S.%20Riazuddin%20\(National%20Center%20of%20Excellence%20in%20Molecular%20Biology\).pdf](http://www.competitiveness.org.pk/pii/research/University-Industry%20Linkage%20by%20Professor%20S.%20Riazuddin%20(National%20Center%20of%20Excellence%20in%20Molecular%20Biology).pdf)

<sup>30</sup> "Centers of Excellence" (COE) is the suggested concept in which innovation-driven research and development activities in key areas of national and global interest should be pursued through the selection and concentration of existing resources. This scheme focuses on linkages between academia, industries and other entities through various ICT channels to facilitate exchange of ideas and development of new products and business models. [http://www.competitiveness.org.pk/downloads/SPCR2009\\_FINAL.pdf](http://www.competitiveness.org.pk/downloads/SPCR2009_FINAL.pdf)

Why is it Important?	Current situation	Way Forward
<b>Incubator and Technology Parks<sup>31</sup></b>		
<ul style="list-style-type: none"> <li>Incubators and technology parks can play an important role in fostering entrepreneurs and innovation by providing information, Business Development services, capital and office spaces to start-up or early stage businesses (such as IT and biotechnology firms). These facilities can also promote the formation of industrial clusters.</li> </ul>	<ul style="list-style-type: none"> <li>Pakistan has already established a limited number of incubators and technology parks including a “Technology Incubation Center (TIC)” and the “Software Technology Park ” in Islamabad.</li> </ul>	<ul style="list-style-type: none"> <li>Pakistan needs to encourage entrepreneurs by facilitating (and revitalizing) more incubators and technology parks through public-private partnerships in close collaboration with existing knowledge providers. Private sector should take a lead in facilitation (e.g. Hitec City, Hyderabad, India<sup>32</sup> and Bhutan Technology Park)</li> </ul>

<sup>31</sup> The analysis draws on a paper by Dr Iqar Khan “Current Status of Technology Incubation and Parks in Pakistan”.

[http://www.competitiveness.org.pk/pii/research/Current%20Status%20of%20Technology%20Incubators%20and%20Parks%20in%20Pakistan\\_.pdf](http://www.competitiveness.org.pk/pii/research/Current%20Status%20of%20Technology%20Incubators%20and%20Parks%20in%20Pakistan_.pdf)

<sup>32</sup> *infoDev*. “International Good Practice For Establishment of Sustainable IT Parks. See <http://www.infodev.org/en/Publication.557.html>

## Development of an Innovation Policy

22. An effective national innovation policy facilitates the creation of conducive conditions for innovation across various sectors and institutions. The policy mobilizes and engages various stakeholder groups and institutions within the innovation system while defining their roles and providing direction. It has to be tailored to country-specific conditions and the priorities that a country assigns to various economic sectors. Additionally, an innovation policy should also be sensitive to the environmental and social implications of innovation and more importantly, it has to be receptive to the role that informal sector plays in innovation.<sup>33</sup>

23. To start with, Pakistan's innovation policy needs to focus on the areas of greatest return. As has been shown from Enterprise Survey data most Pakistani firms (upwards of 95% of firms), which tend to be small, make little effort to upgrade capabilities. Changing this behavior is a policy imperative. Three other general categories of capabilities can also be identified: firms that willingly acquire new technologies, firms that acquire and adapt new technologies (e.g. Coke Studio discussed earlier) and firms that carry out original R&D in their own right. While policies also are needed to help these firms, the bulk of the effort and the big pay off will come from getting weaker firms to upgrade.

24. A holistic policy is required. The policy needs to include measures that (i) establish an overarching institutional framework, (ii) strengthen the innovation ecosystem, (iii) encourage firm-level innovation, and (iv) support knowledge provision. For Pakistan some work has been proposed by the Planning Commission (see Box 5). While this is all helpful it is not sufficient. It is clear the institutional side needs significant work and much more can be done to increase firm level innovation.

### Box 5 Measures Identified by Planning Commission

A number of measures have been identified by the Planning Commission of Pakistan. These are enumerated below:

- Establish bankruptcy laws consistent with international norms
- Revisit tax laws that hinder investment particularly with respect to venture capital firms
- Encourage entrepreneurs to form networks of business angels
- Strengthen enforcement of intellectual property and related rights
- Provide effective support mechanisms (business development services) including mentoring, and skill building, to those who want to establish innovative ventures in a community setting

25. An overarching institutional framework is needed to drive innovation. To resolve the “how it gets done” question, international experience suggests several key actions are needed to make this happen;

- As is proposed earlier, a formal cabinet endorsed innovation policy is needed that builds on the significant body of existing work. Once the policy is agreed the need if any for enabling legislation will be determined.<sup>34</sup>

<sup>33</sup> Roseboom, Johannes. “Creating an Enabling Environment for Agricultural Innovation.” In *Agricultural Innovation Systems: An Investment Sourcebook*. World Bank. 2012.

<sup>34</sup> Enabling legislation would be required if, for example, it was determined a new institution needed to be established.

- A cabinet level appointment needs to be made to task the managing, monitoring and implementing of the policy.
- Policy implementation presents a significant coordination challenge and an interagency coordinating body will be needed. One measure that has worked in other jurisdictions is to establish MOU's with implementing agencies.
- Innovation needs to be emphasized at the highest levels, with an accompanying level of accountability. In India the President has nominated this decade as the decade of innovation.
- Public-private dialogue mechanisms need to be incorporated as the policy is developed, implemented and monitored. This mechanism would include Government, business and knowledge providers. A recent example in South Asia is Bangladesh (see Box 6) which has a broader mandate than innovation.

**Box 6 Bangladesh Private Sector Development Policy Coordination Committee**

The Prime Minister's Office (PMO) recently established a Private Sector Development (PSD) Policy Coordination Committee, chaired by the Principal Secretary and comprising 9 Secretaries of private sector-related ministries and agencies, and 3 private sector representatives. This new PSD platform has been established with the objective of ensuring greater coordination within the government on private sector development and to offer the private sector a much-needed nodal counterpart for interaction on policy and processes affecting the government-to-business relationships.

In Bangladesh there exists a multiplicity of government agencies that the private sector must deal with in setting up and operating its businesses; as a result, reforms of many laws, regulations, and processes affecting the private sector require inter-ministerial coordination. Before this committee was established, there was no mechanism for such coordination, which further meant that complex reforms often got stalled in the implementation process. It is expected that this Committee will be able to play a key role in implementing many such reforms in the coming years. It is mandated to make recommendations to improve the overall investment climate and remove constraints to business.

26. The triple helix review highlights a vast range of measures that can be taken to develop the innovation ecosystem. Clearly implementing all these measures will be too much at once and some prioritization and sequencing will be required. The public-private dialogue process outlined above will be a good starting point to identify priorities based on a suggested criteria of (i) short- and long-term direct economic impact, (ii) ease of implementation, (iii) signaling to the market that innovation is important, and (iv) potential for spillovers.

27. There is a need to come up with prioritization programs that support firm-level innovation and provide a “win-win” in terms of pushing innovation with its attendant productivity benefits as well as generating jobs fairly quickly. There are three initiatives that the triple helix analysis identified based on what has worked well in other countries that stand out as strong candidates for Government support:

- An innovation fund structured as a public-private partnership that provides matching grants to firms and industry associations for business development services (software) that encourages market and product development, use of standards and the acquisition of new technologies. These kinds of funds have been a key driver of innovation in Latin America.



- Technology parks built by public-private partnerships that are affiliated with knowledge providers (universities, state researchers etc). These parks will provide the economic space needed for firms to push biotechnology and ICT options.
- ICT-based knowledge platforms that harness civil society's amazing ability to develop ingenious applications to not only drive growth but provide all manner of services to the people. This is an emerging area in a number of countries, including some near neighbors.

28. In designing these programs there are some important lessons learnt including those related to subsidy design as discussed earlier. In addition, the governance of the proposed intervention is critical, reputable private sector involvement in the management of the entities that manage subsidies and private sector accountability are key success factors.

## **Appendix**

### **Innovation at firm-level: Does innovation matter for firms in Pakistan?**

It is often said that innovative firms show better performance compared with non-innovative firms which have persisted in conventional business model and not introduced new products or services. Although this argument is widely accepted, it has not been supported by rigorous data analysis. The World Bank Enterprise Survey conducted in Pakistan in 2007 has shed light on this issue by providing substantial amount of data at firm level (more than 1,100 manufacturing firms were covered in this survey). According to this survey, manufacturing firms which have introduced new products, services and business processes during the last three fiscal years tend to demonstrate better performance compared with firms which have not introduced such products and services for the same period.

The regression analysis was conducted based on the survey data which covers 1,124 manufacturing firms throughout Pakistan. The log of firm's sales (*lnsales*) was set as a dependant variable, and various independent variables (such as "firm size", "firm history", "location of firms", "education level of top management", "target market" and "existence of new products and business processes for the last three fiscal years") were created to measure their effect on firms' sales records. By using log of the firm's sales as a dependent variable, it is possible to estimate the effect of independent variables on dependent variable (sales) by percentages. Because percentages are "units free", it is easier to draw conclusions about whether the size of an estimated coefficient is economically significant or not (See Table A).

The result of the analysis was quite substantial. The regression of this model indicates that average total annual sales of manufacturing firms which have improved products or production processes (during the last three fiscal years) would be 32% higher than those without these new products or processes for the same period, holding other independent variables constant (See "IntroNew" variable in Table A). It suggests that average manufacturing firms with innovation activities could generate 32% more sales than ordinary firms which have not promoted innovation. Because absolute value of "t" is above 2 ( $|t|=2.33$ ), the result of the regression is statistically significant (at 95% level). Although this regression model does not exactly describe innovation itself, it could serve as a proxy to describe and compare firm-level innovation. At the same time, it should be noted that regression analysis only shows the correlation of the variables and not the causality between them.

This analysis demonstrates that the difference of performance between firms in Pakistan is (partly) attributed to whether they have promoted innovation. It implies that the concept of innovation is significantly important even in developing countries like Pakistan. It indicates that there are considerable benefits that will arise from encouraging significantly greater levels of innovation in Pakistani economy.

In addition to the correlation between firm-level attempt to promote innovation and their sales record, this regression model indicates interesting implications about correlations between firms' sales record and some other independent variables such as "location of firms", "existence of quality certification" and "education level of top management" (see Table A). In this model, firms located in the industrial zone (or park) are likely to generate more sales than those firms which are not located in the industrial zone. Likewise, firms with

internationally-recognized quality certification (such as ISO 9000 and ISO 14000) tend to achieve more sales record compared with those without these certifications. In addition, firms whose top management has received a higher education (especially college and graduate level) seem to perform better compared with the firms whose top management is less educated.

This analysis suggests that government policies such as industrial policies, introduction of quality control systems and development of proper education system could have a significant impact on the improvement of sales records among firms. In other words, proper industrial policies and the well-developed education system, coupled with the firm-level attempt to promote innovation, could contribute to higher productivity of firms in Pakistan.

**Table A** Data analysis of 2007 World Bank Enterprise Survey

Source	SS	df	MS	Number of obs = 1124		
Model	3567.77347	13	274.444113	F( 13, 1110) = 113.05		
Residual	2694.56046	1110	2.42753195	Prob > F = 0.0000		
Total	6262.33393	1123	5.57643271	R-squared = 0.5697		
				Adj R-squared = 0.5647		
				Root MSE = 1.5581		

lnsales	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
Medium	1.314776	.1169641	11.24	0.000	1.08528	1.544271
Large	2.167074	.1588666	13.64	0.000	1.855362	2.478787
FirmHistory	-.0002354	.0007697	-0.31	0.760	-.0017456	.0012748
Experience	.0136418	.0040739	3.35	0.001	.0056485	.0216351
IndusZone	.6787657	.1114308	6.09	0.000	.4601269	.8974045
Secondary	.3444872	.152747	2.26	0.024	.0447818	.6441926
College	.6720851	.1667605	4.03	0.000	.3448837	.9992866
Graduate	1.278965	.1910023	6.70	0.000	.9041986	1.653731
Certificate	.8659638	.1355545	6.39	0.000	.5999918	1.131936
National	.0207977	.1240814	0.17	0.867	-.2226629	.2642583
International	.4777968	.1279701	3.73	0.000	.2267062	.7288873
Govsupport	-.2153269	.4358836	-0.49	0.621	-1.070576	.6399218
IntroNew	.3186953	.1366938	2.33	0.020	.0504878	.5869028
_cons	13.78656	.1647869	83.66	0.000	13.46323	14.10989