

The Future of ICT Innovation in India Consequence for Policy

Rai, Sudhanshu; Kühn Pedersen, Mogens

Document Version

Final published version

Publication date:

2010

License

CC BY-NC-ND

Citation for published version (APA):

Rai, S., & Kühn Pedersen, M. (2010). *The Future of ICT Innovation in India: Consequence for Policy*. Department of Informatics INF, Copenhagen Business School. Working Paper / Institut for Informatik. Handelshøjskolen i København No. 01-2010

[Link to publication in CBS Research Portal](#)

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

Take down policy

If you believe that this document breaches copyright please contact us (research.lib@cbs.dk) providing details, and we will remove access to the work immediately and investigate your claim.

Download date: 02. Mar. 2024





**Copenhagen
Business School**
HANDELSHØJSKOLEN

The future of ICT Innovation in India, consequence for policy

by

Sudhanshu Rai and Mogens Kuhn Pedersen

Department of Informatics

Howitzvej 60

DK - 2000 Frederiksberg

Working Paper No. 01-2010

The future of ICT Innovation in India, consequence for policy

By

Sudhanshu Rai and Mogens Kuhn Pedersen

Introduction

The purpose of this chapter is to address two questions: 1) What is the future of Indian ICT innovation? And 2) what will drive ICT Innovation in India? We aim to address these questions through a Delphi study, The Delphi study will be designed to elucidate the responses from 64 experts all over India and. In section 2 we will discuss the methodology, in section 3 we will discuss the justification of the questions. In section 4 we will analyse the statements where there was a consensus. In section 5 we will discuss and analyze the dissonance among our experts. In section 6 we will develop a framework to better understand what the study is telling us. In section 7 we will conclude this chapter.

2 The Methodology

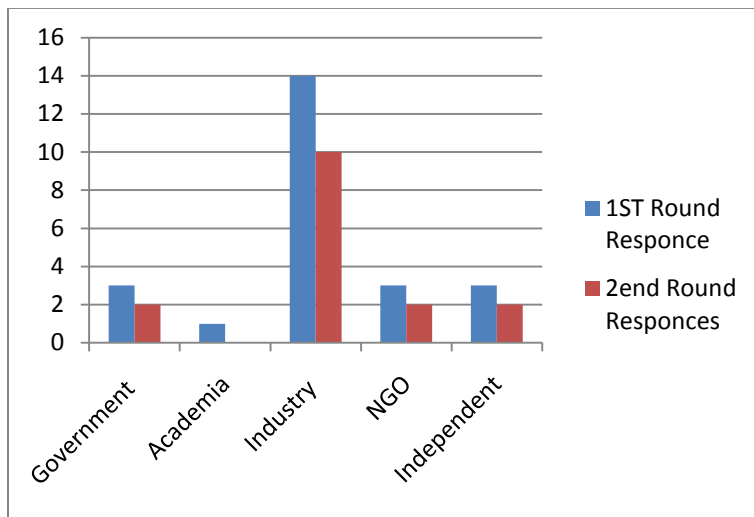
Since the above questions fall more into the realm of perception we decided on a Delphi study to explore them. The Delphi study we designed and conducted was part of a modular methodological research design we formulated to help us conduct the knowledge mapping study to discover the innovative landscape of India. Our research design had four modules, each designed to address specific aspects of the innovation discover process. These modules were the historical module, the survey module, the interview module and the Delphi module. In this chapter we will focus on the results from the Delphi module.

We designed the Delphi study to take into account three steps. The first we call as the landscaping mode. This implied conducting several workshops in different regions of India to elucidate the issues that we might want to include in our perception study. We also used the experts we had engaged in vetting the validity of the results from the historical module. These experts identified issues relating to IT innovation in their region, these issues were collected regionally to help us develop the survey and the interview modules and also enabled the design of the Delphi study. The participants for the workshops were chosen for their knowledge of the IT sector in India regionally. This enabled us to get a broad regional understanding of issues related to IT innovation. In addition to the vetting experts we also collected insights from the survey and the interviews modules that preceded the Delphi study. Cumulatively this formed our landscaping. Landscaping meaning we determined the critical issues that we wanted to ask our experts during the first round of the Delphi study. The landscaping exercise took approximately 11 months, from March of 2008 to December of 2008. During this period we conducted two workshops and engaged with 25 regional experts. The workshops were on invitation only and we had 15 participants representing software development, systems integration, Non-government organisation, government representatives, managers and educationist.

The first step of the Delphi study was built around six sets of questions. These sets reflected questions related to innovation, conditions for its engagement, manner of its impact, the nature of the business models that enable innovation to take place, experience relating to policy on innovation and the role of innovation for future competitiveness of Indian IT companies.

The first round of the Delphi study was conducted from October to November 2009 and was web enabled. We identified 64 regionally distributed experts and invited them to take part in the Delphi study. These experts were largely independent individuals and were given 6 sections of questions with instructions, (see appendix 1 and 2 for an illustration of the Delphi study). The first round of responses to the web enabled Delphi questions revealed a remarkable degree of agreement leaving 20 out of 65 statements for a second round of consensus building based on information of the overall response and comments from the participating experts. The response rate was 40% in the first round where we had 24 responses and of these 16 responded in the second round of the Delphi. The expert distribution on sectors and responses show a preponderance of industry experts responding while academia did not respond to our requests, refer to figures 1 below.

Figure 1, Total number of responses to our Delphi Questionnaire



3 Grounding the question; Issues and hypothesis

We will now engage the reader in indicating why these questions are relevant in a perception study and what we aim to gain from them. Before addressing the specific reasoning behind each group of questions represented by tables 1 to 6, it is useful to discuss the common motivation behind such a construction. In a Delphi study the objective is to capture opinions of experts having a deep knowledge and understanding of Information technology and its direction in India. This we do deliberately to engage our experts in a consensus building mode to understand the future of Indian IT Innovation. Since we are talking of the future and projections, we need to keep in mind three key issues. First, the Delphi study is a perception study. The results are presented as a aggregation of consensus among the group of experts. Thus our interpretation will

have all the weaknesses that are inherent in any interpretations through aggregation. Second, the interpretation is based on a limited number of experts, consequently: how useful can the data be in supporting our interpretation? As a counter argument, we encourage the reader not to see the Delphi study as a singular exercise but as a methodological system embedded in a multi modular research design, of which the Delphi is the fourth having a very specific purpose i.e.; to understand the trajectory of Indian ICT innovation Third, like all Delphi study the results can only indicate, hence any interpretation should be seen as merely an indicative understanding of a collective opinion to the trajectory IT innovation is taking in India and not a fact that this trajectory indeed exists.

3.1 Justification for the question: “India is moving towards an innovative society”

What is the key premise in asking the question in Table 1? For us to understand Indian IT Innovation trajectory we thought it prudent to initiate our exploration with a broader view of innovation, those that is perceived to be impacting the society. The sets of questions are critical as it lays the foundation of innovators in a society to think of innovation as a way to address challenges. For instance if the society appreciates innovators and supports them institutionally then we conjecture that innovation would be build into the fabric of that society. Innovation will be encouraged and appreciated over time the society will justify and find a way to reward innovation.

Hence the way a society perceives innovation is reflected in the institutions, beliefs, norms and conventions they create to support innovation: because innovators inhabit the environment which is important to our understanding of the future of IT innovation in India. Thus we conjecture that societal perceptions of positive value being derived from Innovation get translated to the companies that inhabit the society. In effect we believe that societies that move towards encouraging innovation will influence its firms to adopt similar processes.

Table 1 Section A; India is moving towards an innovative society

Statement
..because the most elite institutions in India engage with industry to promote innovations
because diversity - as a pillar of Indian culture - is good for innovation
along with a cultural appreciation for innovators
because rapid ICT innovation leads to a wealthy society

3.2 Justification for the question “Innovation in India is increasingly becoming a priority amongst ICT firms”

Moving down from a societal level perspective of innovation supportiveness, we engaged firms level perspective on innovative supportiveness. The reasoning behind this being there should be a societal influence of values associated to innovation translated at the firm level. So in effect if we were to discover from the Delphi study that India as a society is moving towards an innovative one, it would follow that its companies should also be moving towards developing

innovative businesses and products. These two are co-related because we take the society as a large microcosm where broad trends and patterns of beliefs, values and norms can be identified; thus firms that inhabit the microcosm would reflect some elements of that belief, norms and values. Thus if the societal values and beliefs value innovation we would also be able to pick up similar values and beliefs in its firms that inhabit that microcosm. Consequently, we conjecture that firm level understanding of innovation and believe in investing in innovation has a potential to influence the societal level understanding of innovation.

Table 2 Section B Innovation in India is increasingly becoming a priority amongst ICT firms

Statement
because rapid nature of technological change
because Indian firms want to remain competitive
future technologies demand Indian firms to innovate
because Indian firms want to move up the value chain

3.3 Justification for the question “in some sectors in India ICT has had an impact more than in others”

This question was designed to look at the industrial spread where IT has made a lasting impact. We asked this question having an underlining conjecture, we believe that IT is an innovative set of technologies and practices, so we wanted to explore whether IT has an equal affect across Industries or is there a granulated level of impact, meaning some industries showing a greater level of induction of IT technologies and processes than other industries. If there is indeed a granulated impact then are those industries that have witnessed an IT invasion more innovative than other industries that have not yet had an IT invasion? If this is so, then what is the consequence for innovation in the future? The key thinking in this line of causal argumentation was the increasing co-relationship between innovativeness of a industry to the amount of IT it uses in its operation. The general findings for a large body of study indicated that the larger the induction of IT technology and processes in the industry the higher the chances of that industry being innovative. We conjecture that in India such a co-relation does not hold for two reasons; First, Indian IT Innovativeness is associated more with business processes than industrial processes and second that IT innovation in India affects dynamic knowledge skill based industries rather than brick and mutter industries. We believe this to be the case because we argue that IT relies on a different set of knowledge base and it has the potential to influence those industries that have a similar knowledge base in the first instance. Over a longer period of time we expect the innovative nature of IT technology and processes to have an impact across the economy.

Table 3, Section C; in some sectors in India ICT has had an impact more than in others; In particularly the following sectors ICT have obtained a strong *presence*

Statement
Telecommunications
Business, financial and SW engineering &

consulting
Media and entertainment
These are the sectors where Indian ICT will be the most competitive vendor in the <i>next decade</i>
Telecommunications, business, financial and SW engineering and consulting, media and entertainment
Education and training

3.4 Justification for the question “Choice of business model has been a driver for the ICT industry in India”

Here we explore the micro dynamics of the IT industry from a process perspective and focus on the business model. We believe unlike other industries IT’s success is as much in aid of the innovative business models as its success is related to innovative technologies. A case in point is India. Several researchers have argued that with the commoditisation of the technology the countries success relies on its ability to innovate in the process domain and business models are one critical aspects of the process domain. While we agree that outsourcing as a business model has played an important role we wonder if the outsourcing as a business model has being instrumental in enabling the country to become more innovative. Consequently can we add new insights to the outsourcing debate in the process refining it from considering outsourcing as a generic model perceived to add profitability to companies to a more granulated understanding of outsourcing that distinguishes those business models that do service delivery from those models focus on innovation while working on service delivery models? We conjecture that there is a move away from the pure service delivery price dependent models to a more innovative value based service relationships between contracting parties.

Table4, Section D: Choice of business model has been a driver for the ICT industry in India; though debatable, reason for the success of outsourcing seems to be the following

Statement
Indian managers consider the bottom line
the technologies have been prescribed by customers
because innovation has not sidetracked the delivery
Business model innovation will be an important part of Indian ICT landscape
as it moves from process contracts to package contracts
as price based contracts are under stress, Indians need to innovate business models
Indian ICT industry will continue to have a global impact
due to the volume of skilled people in the industry
due to forward linkages to international markets

3.5 Justification for the question “Policy development for ICT in India”

There consistently appears to be a lack of enthusiasm to the benevolent role of policy makers and to the understanding of how much impact they can have in enabling the emergence of an Innovative IT industry in India. Often the critique forwarded by policy analysts appear to be more in line with misunderstanding of the IT industry and its unique knowledge base as opposed to a good understanding of the impact and role of policy. The IT industry we conjecture is slightly different from generic industries. We will propose three features to make a starting illustration to substantiate the core of our argument. The first is that the IT industry is far more knowledge dependent than previous industrial expansions. Knowledge intensive meaning that a person employed in the IT industry has three common characteristics. A) A high level of education and more of them bear these characteristics than in other industries, b) Coping with rapidly changing technology and skill base. c) The IT artefact is never final but always in a state of flux.

We believed that we need to reconsider policy intent, instrument and targets differently if we are referring to the IT industry as opposed to generic policy making. In effect we are arguing an innovation in the policy making conception itself. Intent means the purpose of policy; if the nature of IT innovation is confused or complex the intent can be marred in misdirected intentions leading to the wrong instrument being employed. The problem with clearly identifying intent or purpose for the policy instrument in the IT sector can sometimes be confused due to the interconnectedness of the IT knowledge base. Thus policy makers need to understand how the IT community is networked and to what extent a policy intervention directly is likely to have an impact. Thus intent is not likely to be clearly identified in the ICT sector. Consequently we conjecture that policy in the IT sector would not be able to distinguish between intent and instrument. An indicator of this would be a policy bias towards technology and infrastructure improvement without understanding the consequence of such policy intervention on society.

Policy instrument is another casualty of the misunderstanding of the IT industry. Instrument in this case implies the design of a tool for addressing a specific challenge. For instance tax exemption is a fiscal instrument that governments employ to affect growth. We argue that an innovation in policy instrument would be better targeted for instance instead of a blanket tax exemption policy which was the case in India, a policy with specific instrumental elements would enable better innovation and growth. This can be done through the specific targeting of sub sectors in the IT landscape for instance education, training program etc

Our argumentation is couched in the nature of IT technology and process, If we argue that IT is an enabling industry and process. Then we need to also conjecture that with IT government policy formulation need not be the same as we have perceived policy generically. We make the mistake of equating our general understanding of policy intent, application and process from other experiences for the role of policy. Believing IT to be the same industrial landscape as previously policy makers might have experienced. They develop a similar role and intent for policy as their prior experience might indicates. Leading to policy makers thinking of IT industry as yet another Industry without looking into the nuanced knowledge base, the result being policy design, formulation and projection becomes ineffective not irrelevant.

We conjecture this kind of policy formulation is not only un-innovative but counterproductive.

IT policy we conceptualise should be designed to work at the background because of two reasons

First, IT is knowledge and skill base, governments in their emphasis on generality finds it challenging to understand and design policy to target specific technology or process enablers for a differentiated and specialised subgroup for IT Innovation. We conjecture that government in its benevolence cannot influence the IT industry directly because of the fragmented and nuanced knowledge base required to succeed in that specific field. We therefore expect to see government role limited by default not by design, by lack of understanding not by deliberate choice.

Second, the core driver of IT innovation is value. This means that policy makers who are not able to visualise value as different from a pricing business model are likely to misunderstand the nature of the industry. Value as opposed to price is an important distinction to why policy makers should emphasise policy making in the background and not at the forefront of technical and process. Whereas policy makers may have revenue as a sub objective of their policy intervention and an industry that thrives on value has a potential to be misunderstood when implementing policy for innovation.

Table 5, Section E: Policy development for ICT in India: In the debate it is often stated that policy makers do not understand the value proposition of ICT industry.

Statement
because they know too little about ICT
ICT is seen as a technology and not as a platform for development
In the debate, some see government as proactively developing policy for support to ICT industry innovativeness
because government is actively investing in ICT infrastructure

3.6 Justification of the question “Indian ICT industry continues to grow and develop with new technical development”

In these sets of questions we intended to capture other forces that might be influencing the innovativeness of the Indian IT Industry. Indian IT is well interlinked with the Innovative industries of other countries primarily Silicon Valley in the US. We expect that this linkage to be strong through the Indian Diaspora. We recognise that this linkage has had an important positive impact on the Indian IT industry and continues to develop deeper linkages between the two regions. We expected this question to tell us about the other indirect effects that the Indian IT industry might be benefiting from. We believe that the Indian IT industry has to a large extent been directly impacted by silicon valley and that that deep linkages continues to drive the Indian IT Innovation.

Table 6, Section F; Indian ICT industry continues to grow and develop with new technical development because Indian ICT industry takes advantage of global technology alliances

Statement
because of the Indian diasporas
because of the customer requirements
Indian ICT industry has the capacity to pick the appropriate technologies for sustaining its competitiveness
because Indian ICT industry is well networked globally
because Indian ICT industry attracts foreign companies to develop their technologies in India

4 An analysis: A search for a future trajectory of IT Innovation

The analysis of the study will be in three sections. The first section will discuss those questions that had a high level of consensus. We will explore the reasoning behind the consensus and then discuss this in the context of the future of Indian IT Innovation. We will also visit the conjectures represented by the consensus and explore the potential trajectory of IT innovation for the future in India. The second part of this analysis will focus on the strong disagreements. We will explore the basis of this disagreement and discuss the implications of the disagreement on the future of Indian IT Innovation. The third section will aim to develop a singular picture to what the Delphi study is indicating, while highlighting the contradictions that we acknowledge as well. In each of the sections we will draw some conclusions to the emerging picture.

4.1 The emerging consensus, Innovation a priority

In this section we will interpret the results and discuss its implications for the future of Indian IT innovation. From table 7, which refers to the behaviour of firms in a competitive market, there appears to be a general agreement regarding the importance of innovation. Two key features can be correlated to the consensus.

First there is a perception among our experts that innovation will drive firms up the value chain. This would imply that firms would want to develop systems and processes that will help them move up the value chain. This also implies, all things remaining equal, that firms may no longer settle for any revenue opportunity but may determine opportunities based on their ability to maximise their value through their innovative potential. This can provide yet another insight, implying that Indian firms according to our experts are no longer dependent on only one revenue model.

Second, our experts think technical change and innovation are linked. Firms that can handle changing technology also have a greater propensity to be innovative. There are two implications if this causality is to hold, a) Indian firms are investing in a diverse range of technical as well as process skills. This would give them a broader knowledge base from where to understand and plot the technical change for maximum exploitation and b) For them to remain innovative Indian firms may be engaging in global technology alliance to enable them to be at the cutting edge of IT Innovation.

Now let's consider the conjectures stated in an earlier section. We argued that we expected to see

a co-relation between the emphases on innovation at the firm level reflected in the societal values related to innovation. Our conjecture was multidimensional. We speculated on the linkage between a innovative society and innovative firms, as we conjectured that an innovative society would influence the firms that inhabit its sphere of influence. Of course we made an unrealistic assumption in our conjecture. We assumed a closed society. What the experts are indicating is that Indian firms understand the value of innovation that does not me that Indian society gives value to IT innovation per say because they do not see much interaction between academia and the industry. Academia in India being a publically funded institution projects the society's ambitions relating to knowledge acquisition and innovation. Thus they do not agree on the statement that India is moving towards an innovative society. Our conjecture that societal patronisation of innovation and innovative firms in India seem to have no co-relation in the opinions of our experts. However they maintain that Indian firms continue to innovate. This provides two further insights a) the innovation taking place in India are largely market driven and not research based b) Indian firms are able to sustain a high rate of technical diffusion because of the large pool of semi skilled knowledge workers who can be quickly re-tooled for the new technology. Thus our experts show a consensus on the potential for markets to drive innovation among Indian firms but show little enthusiasm for domestic research and the society at large to affect innovation in India.

There seems to be a contradiction in their consensus, if the society does not affect values and has not affected value of the Indian ICT industry then how is it that highly skilled people continue to be employed at high tech institutions. From my perspective there is a problem, Indian society places high value on education and skills this is translated in larger numbers of people seeking higher education. Thus clearly the value given by society on education has influenced the production of educated people in India.

Table 7; Section B: Innovation in India is increasingly becoming a priority;

Statements	Average	Standard Deviation
Innovation in India is becoming a priority also amongst ICT firms		
.. because rapid nature of technological change	4.3	0.6
.. because Indian firms want to remain competitive	4.0	0.6
..future technologies demand Indian firms to innovate	4.4	0.6
..because Indian firms want to move up the value chain	4.4	0.6

4.2 ICT impacts knowledge based industries more than others

From table 8; three issues are worth discussing. First, IT seems to have an affinity for impact on industries that rely on in-depth knowledge and are service dependent. IT itself is a knowledge dependent set of technologies and processes thus it is not farfetched to expect to see what type of industries they impact most. One of the key features of their consensus appears to rely on the ability for the knowledge base to be extended rapidly. In an industry that relies on a changing knowledge base requiring training and re-training, this can only be possible if the pool of new

talent is flexible pool of talent that is trainable rapidly. This implies that IT best impacts knowledge intensive industry as the consensus shows. Two implications relating to the knowledge base can be highlighted. a) Training is key to sustaining the innovative potential of India. b) Assistive technologies such as communication technology are a key enabler for innovation.

Second, a related insight from the consensus among our experts indicates that IT innovation appears to influence industries that predicate their operation on the generative and the instructive aspect of the knowledge economy. This we can deduce from the consensus regarding the growth sectors that are impacted by IT. We notice besides being knowledge intensive the objective of the knowledge is to generate new and novel ways of doing things, thus the consensus relating to consultancy, financial, business and software engineering as the growth area for the future. These we identify as generative aspects of IT innovation. Implying that IT firms engage other firms that are able to enable innovation through the creation of solutions that can help the firm move up the value chain, a critical aspect of the Indian IT firms innovative strategy, as we have discussed before. There are two implications; a) firms will continue to focus on new types of training both in the realm of technology as well as processes, b) There is likely to be a proliferation of tool kit approach to training as different companies demand specialization and specificity in the training programs.

Three, we also see a consensus among our experts in their understanding of media related innovations. We refer to this type of innovation as instructive as it plays an important role in enabling the smooth functioning of markets, be it for products, innovation or services. The central argumentation in the instructive fold applies to the creation of an information space, The experts consensus indicate a projection of such firms that maintain market space by creating efficiencies in the flow of information, reducing search cost etc. If this is to be the case then it has two critical implications on the future of IT innovation; a) media firms will localise their information to support local entrepreneurs, there would be a high likelihood for IT augmented localised innovation, b) An increase in the innovation will see a rise in information segmentation and differentiated media products.

In our justification section we developed several conjectures that we wanted to address from the data generated by the Delphi study. One of the key issues we wanted clarification on was whether IT has an equal effect across industries, if not why? From the consensus reached by our experts it appears that there are preferred industries that IT seems to have an impact on. This means not all industries take on board IT technology and process at the same time. There could be several reasons for the diversity in the uptake of IT technology and process; we highlight two reasons here to why this is the case; first, IT technology and process are pervasive in those industries where the nature of the IT industry is analogous to the nature of the IT adopting Industry. Meaning, the knowledge centric requirement of the IT industry is likely to defuse in a knowledge centric non IT industry because it is easier to calibrate the knowledge base to address the differentiated knowledge needs as opposed to a non knowledge centric Industry. Second, it is easier for IT technology to defuse in services centric industries because the key resource is human capital as opposed to others where the key requirement may be others. This implies that particular knowledge and service centric industries are more prone to IT technologies and processes than non knowledge base firms.

The next conjecture we put forward was to ask whether those industries where IT has defused rapidly are more innovative than non IT defusing industries. We would expect the Industries that use IT to be more innovative; from our expert survey we witness the identification of those industries as financial and consulting industries and media along with training. This is an important indication as it strengthens the understanding of our knowledge base argument. The consequence of a granulated diffusion based on knowledge alignment is obvious, some sectors Industries will transform rapidly into an innovative Industry while others will slowly follow. The rapidly growing industries supported by technology will demand higher skill sets and will help in the redistribution of knowledge and wealth over a longer time horizon.

Table 8: Section C, “in some sectors in India ICT has had an impact more than in others”,

Statement	Average	Standard Deviation
particularly the following sectors ICT have obtained a strong presence		
Telecommunications	4.7	0.5
Business, financial and SW engineering & consulting	4.4	1.1
Media and entertainment	4.2	0.6
These are the sectors where Indian ICT will be the most competitive vendor in the next decade		
Education and training	4.5	0.7
Telecommunications	4.6	0.7
Business, financial and SW engineering & Consulting	4.3	1.1
Media and entertainment	4.4	0.6

4.3 Business model a key success factor for IT innovation

In table 9: Our experts have demonstrated a consensus over business model innovation and indicated that Indian IT companies have come to prominence primarily due to their ability to engage with a diversity of business models. This is clearly indicated by the general agreements on how according to them the IT industry is shifting from process to package contract, here too there is a general consensus that the knowledge base of the captive population is enabling the rapid adoption to business model innovation. Furthermore our experts believe in the Indian Innovative ability because of its strong linkages to the innovative centres of the world, such as the Silicon Valley. These perceptions of our expert panel enable two key interpretations about the potential of IT to continue to enable innovation.

First, business model innovation is likely to influence the rate of technical innovation. This is

due to the generative aspects of the business model. Generative implying the ability to create new and novel way to combine technologies and provide a mechanism for value creation, the provision of the mechanism draws the technology and business processes together and syncs it, in doing so the business models create new markets and fulfil new needs, needs that may not have existed before. Two implications can be clearly witnessed: a) business models are likely to lead to technical innovation and b) business models are likely to get more diverse and localised as the IT industry shifts its focus on the domestic market.

Second; as the focus on the domestic market increases, innovation in the business model will become more localised and more IT firms focus their energies on the domestic market. This would lead to a proliferation and differentiation of business models that would cater to specific sectors of the economy driven by IT. The diversity and specificity in the business model innovation is likely to create a competitive advantage for localised companies and would be rather hard to replicate. Thus Innovative Indian firms will exact a premium from external counterparts wanting to enter the market because of the domestic firms differentiated and localised knowledge and product base.

We have several conjectures to address in this section; first we speculated whether business model innovation has an impact on the general level of technical innovation. Our experts believed in this causality. This was indicated in them broadly agreeing to the link between the impacts of innovative firms who have also developed innovative business models. The other issue we raised was the link between the proliferation of localised business models and its use. From the consensus we are not able to demonstrate that increasing localisation of busies models will lead to better use of innovation. Can we see the emergence of diversity with special focus, those that enable IT innovation from those business models that are focused on IT innovation? We are unable to explicitly address this conjecture.

Table 9, Section D; "Choice of business model has been a driver for the ICT industry in India"

Statement	Average	Standard Deviation
Business mode innovation will be an important part of Indian ICT landscape		
...as it moves from process contracts to package contracts	4.3	0.5
.. as price based contracts are under stress, Indians need to innovate business models	4.4	0.5
Indian ICT industry will continue to have a global impact		
.. due to the volume of skilled people in the industry	4.5	0.6
.. due to forward linkages to international markets	4.0	0.6

4.4 India an attractive destination for Innovative firms

From table 10 below: Two key insights can be highlighted. First there seems to be a consensus

that firms from outside India will continue to set up shop because of their ability to be competitive and innovative in India. This implies that foreign firms continue to believe that the Indian IT landscape is innovative and their presence in that innovative market will only be beneficial. In addition to the perceived innovative pool of talent that foreign firms want to tap they also believe that this pool of talented young people can be rapidly trained. The key assumption in our experts appears to be that Indian ICT Industry will continue to be innovative because they not only attract new ideas from abroad but they also provide a large pool of talented and well educated individuals for scaling up activity. Hence the Indian ICT industries flexibility in adjusting to demand conditions is indicative of the potential growth according to our experts.

The second insight is counterintuitive; because technical development is predicated on the depth of foreign involvement in the Indian ICT sector. Counterintuitive because Indian ICT industry will have a less potential to consistently growth they foreign firms are not closely linked to the innovative activity. So far the consensus among our experts has indicated that there exists a strength emanating from the pool of human capital which is large, highly skilled and easily scalable. Hence Indian ICT will continue to grow if we only predicate this growth on the soft aspects of technology. However technology development that feeds into growth needs a hardware component and which through assumptions our expert committee think will come from abroad. The consensus seems to predicate the agreement of the growth of Indian ICT Industry on foreign firms introducing or developing new technologies locally. The key distinction to be aware of here is the issue of the driving idea, the assumption among our experts seems to align towards a lack of technical development and thus they believe that technical development and technical innovation may be dependent on foreign firms who own the idea and then establish a working framework for converting the idea into a reality by investing in India. It are these new ideas that foreign firms bring to the country that appears to drive ICT industrial growth. The counterintuitive argument here is that if foreign firms do not come to India than will Indian industries not grow. This seems to be the underbelly of the more aggressive assumption linking ICT Industry growth to foreign knowledge base for generative purposes relying on the Indian talent pool for the constructive aspects of the innovation process. To key implications can be discussed as a result of this counterintuitive insight: a) Technology development in India is not a priority among Indian Innovative ICT firms b) The talent pool in India is less likely to be engaged in generative activity where they are creating new products but are likely to be employed in constructive environment where they are told the idea and they need to construct how the idea works. Thus we anticipate that the Indian ICT industry will continue to innovate in the realm of technology calibration and not technology generation.

We conjectured that the innovativeness and the growth of Indian ICT industry is largely predicated on its linkages with foreign centres of innovation, this expectation is largely borne out by our counterintuitive argument embedded in our assumptions of our pool of consensus builders. In effect their consensus is more about the inability of Indian ICT Industry to engage in technology develop on its own as it is predicated on new technologies developed by forming firms in India. These foreign firms spur ICT innovation among other Indian ICT enterprises. In effect our expectation that there will be an indirect effect, indirect meaning non entry of foreign firms may not affect the skill up gradation of the talent pool but it is likely to effect the induction of new ideas, technologies and thus growth of ICT innovation over a longer period of time.

Table 10, Section F: Indian ICT industry continues to grow and develop with new technology development

Statement	Average	Standard Deviation
Indian ICT industry has the capacity to pick the appropriate technologies for sustaining its competitiveness		
..because Indian ICT industry is well networked globally	4.0	0.8
..because Indian ICT industry attracts foreign companies to develop their technologies in India	4.0	0.8

5 Divergent views, most contested statements

In this section we will discuss at length the discord between our experts and explore the reasons to why this might be the case. We will discuss any insights that might emerge from this disagreement finally we will put this insight in context to our conjectures. We look at overall consensus and part discord. If we notice that within a section having five questions, if three have consensus and two have discord we then use the same section number and place the question that has a discord in this section of the paper. Two major sections of discord seem to appear from the two rounds of questioning. The statement that India is moving towards an innovative society is strongly contested and so is the role of policy makers in enabling ICT Innovation in India. However the role of the business model in enabling the sustenance of ICT growth in India has a part consensus and part discord. We address the discord sections here within the same section of the overarching conjecture for that section There aren't many section with internal micro contradictions but section C relating to the impact of the choice of business models needs a special interpretive frame.

5.1 Indian society not supportive of innovators

While discussing section A, in terms of its contribution to our understanding of the conjectures we argued that a society values should be able to translate into the micro-foundations of how firms structure and reward behaviour in that society. From the table below we get less than convincing consensus on the issue of the role of the Indian society to impact the level of ICT Innovation. Two key insights can be discussed here.

First, If according to our experts the societies value is not being transmitted to its companies, then how is the Indian ICT innovative potential continuing to sustain itself?. Two key contradictions in our data needs to be highlighted, A) There is a general consensus that the Indian ICT industry will continue to be innovative and grow. B) That Indian ICT industry will persist in keeping its talent pool trained and highly competitive. The contradiction arises from the role of society which is seen as irrelevant because the consensus indicates there not to be a link between society's values and the transmission of those values to firms. Further on we get

consensus on the potential of Indian ICT industry to grow and one of the elements of that growth is high skill and a large talent pool. If on one hand there is a high unequivocal emphasis on higher education and on the other a perception that the Indian ICT industry will continue to grow driven by a increasing pool of highly skilled people. I would make the argument that the belief in higher education to deliver quality of life in India is a firmly rooted societal belief and that the translation of that belief has been seen in the transformation of the Indian ICT industry through the emphasis on high quality of high education. Consequently, social values I believe are linked to influencing ICT Innovation in India.

Second, why did our expert committee not see a link between belief in education and high skill level of the Indian populous? I propose two explanations to why the committee did not make the link; 1) Because Indian society is technically biased, placing technical innovation as real innovation and any other subsequent innovation as secondary. The consequence of this thinking would translate itself into believing that whatever technology is imported impacts on the ability to innovate in the domestic market and that human skills are merely translation agents and not transformers, which they think squarely, sits with technology. Technology is used to develop artefacts and the skill is an operational requirement, meaning needing to operate or use the technology. The extension of this argument is that it is the technology that creates the artefact. 2) The general role of English education, while enabling a common level of understanding also has an impact on social beliefs. The working language in the ICT industry is English in line with the international language of the industry. This can lead to the values and thinking embedded of a larger global society to take precedence over the transmission of the local value system as it gets crowded out by the global language and its values. My argument is not couched in right or wrongs, but trying to explain why our committee did not see the values linked to education in Indian society influencing ICT innovation values in a firms. Simply stated, while the Indians work in English they are more often than not being exposed to the values that are embedded in the language of work. This has a tendency to displace the local value system that is not core to the person, like belief in higher education. Perhaps it is this society that our experts had in mind, the society of a modern talented person and not the society at large.

What about our conjectures? We asked the question whether Indian societal values can be seen to influence the ICT innovativeness of India. The answer to this question appears to be most likely, if we take the large societal value of giving importance to education, but when we look at the more instrumental value of relying on researchers to translate their research into practical application for the market to be unsupported by our committee leading to a high discord. The issue of a cultural influence on the appreciation of innovation does not have a clear consensus and so does the role of diversity.

Summing up;

Three key conclusive statements can be articulated

- 1) Traditional Indian appears to play a secondary role in transforming India into an innovative society.
- 2) Indian institutions are failing to translate their research into industry innovation
- 3) Diversity in India is not such a critical requirement as everyone is expected to adopt English language and a common value system transmitted by the adoption of English which is likely to

crowd out the local value systems embedded in the local languages.

4) Societal culture seems not to be that critical to ICT innovation as firm's culture take precedence over social culture when valuing ICT innovation.

Table 11 Section A: India is moving towards an innovative society

Statement	Average	Standard Deviation
..because the most elite institutions in India engage with industry to promote innovations	3.7	
.. because diversity - as a pillar of Indian culture - is good for innovation	3.9	
..along with a cultural appreciation for innovators	3.6	
..because rapid ICT innovation leads to a wealthy society	3.8	
..because academics have incentives to pursue new business opportunities based on their research:	2.5	1.1

5.2 Policy not very critical to ICT innovation

We frame a policy as a benevolent set of instruments legislated and targeted to help a countries Industry in specific ways. IT policy specifically has a mixed history of success as our experts bear testimony to with their lack of conviction. The issue to why this may be the case can be articulated in from two perspectives. First, Policy in India has always been generic so IT policy was considered to be an extension of the generic policy instrument when applicable. The less than conviction on the part of our experts indicates that policy might have a precise role but has not been conceived as such.

The Indian experience does not appear to fall into this frame thus we believe that policy has played a limited role in the past. In this respect India is rather unique for it stands out as a policy neutral country. Policy neutral meaning that government policy in the ICT sector has had little or no effect in creating the size of the industry. However the policy makers took a deliberate policy decision to continue a policy neutral strategy with respect to the Indian ICT Industry. Consequently a deliberate decision on the part of the policy to stay neutral can be identified as a policy choice, in which case policy has influenced the Indian ICT Industry be in indirectly.

From the table below two key insights can be articulated, First, An understanding of policy in retrospect, Second and understanding of policy for the future.

The consensus among our committee appears not to have a clear indication to the policy impact of the government in the ICT area, while the consensus seems to hover between 3 to 3.6 as an average; it is an indication of less conviction to the role of policy retrospectively. From a retrospective perspective two insights can be articulated.

1) The target for policy is confusing. In the IT sector there are many inputs and infrastructure does not play such a critical role predicated on the government to help the industry. In the ICT sector infrastructure can be put together with reasonable cost and ease thus policymakers who understand infrastructure driven policy may not have understood at the onset what was actually the key driver. Was it technology, was it skill or was it general infrastructure. As the Industry flourished policy makers confusion was compounded with a rapidly changing Industry. The relative policy vacuum was likely a result of not being able to develop the instruments to help the IT industry rather than lack of understanding.

2) Due to the lack of targeted policy instruments towards the ICT sector, elementary mistakes emerged aligning itself to the inherent supply constraint thinking. Which assumes things are not efficient as it should be so policy is designed to intervene to make things efficient and work? This thinking has had a lasting impression on the ICT industry. Retrospectively policy makers started thinking of ICT as a set of technologies, which was in line with their infrastructure bias. The result was policy instrument that were created targeted technology not understanding the dynamic nature of technology. The consequence was the definition of the ICT sector in terms of sets of technologies and its application areas, so we saw e-health, e-government etc Instead of directing instruments that looks at ICT as a platform needing a combination of technology, hardware, software and application areas. While technologies are critical a policy instrument cannot only target one set of technologies but needs to conceive of a platform which is a more holistic engagement, then policy can be devise to target a growth platform. In the absence of such thinking our expert group was unclear on the experience of policy in the past.

Second, the understanding of policy for the future, here our experts are clearer about the limitations of the policy maker's role to impact the future of ICT innovation in India. As the focus shifts from technology to platform, policy making will become that more complex with many more stakeholders wanting to have a say in instrument development. One set of stakeholders would complement the policy makers in identifying IT instrument for policy targets. These stakeholders are consultants. Consultants with their specific knowledge of the platform would increasingly play an important role in instrument identification and targeting. This is likely to be the shape of policy making to come in the future.

Summing up:

- 1) Policy makers need to shift their understanding of ICT from a technology to a platform perspective
- 2) Policy should target human skill development and not only infrastructure
- 3) Key policy stakeholders are consultants and not policy makers because platform instruments are better understood by consultants and not policy makers.

Section E: Policy development for ICT in India

Statement	Average	Standard Deviation
In the debate it is often stated that policy makers do not understand the value proposition of ICT industry		
.. because they know too little about ICT	3.6	
.. ICT is seen as a technology and not as a platform for development	3.6	

In the debate, some see government as proactively developing policy for support to ICT industry innovativeness		
.. because government is actively investing in ICT infrastructure	3.6	
There continues to be a disconnect between Indian ICT policy and ICT industry development .. because ICT policy making is not a career defining issue (a lack of incentives)	3.2	1.4

6 Features and a framework for policy in the future

From the insights instantiated above we need now to collect the overall insight into a framework that will describe relatively accurately the future of Indian ICT innovation. We conceptualise the six sections for which consensus was reached and dissonance recorded into three explanatory constructs. These constructs are a) the generative mode, b) the constructive mode and c) the instructive mode. The generative fold describes how companies perceive new strategies, use technologies and knowledge to create new artefacts and services. The focus of the generative fold is about the creation of novel ideas, frameworks and business processes. This section is about creating the framework for addressing the challenge. We will see how important the generative aspects of ICT Innovation are and to what extent can we speculate about the future of ICT innovation in India using the generative mode. The constructive mode is where the knowledge, technology and target area are combined to develop an artefact. The instructive mode is where the knowledge and training is imparted for enabling the constructive and the generative mode to perform affectively.

The future of ICT Innovation, the generative mode

In the generative mode we see consensus regarding the impact of some aspects of the business model to spur ICT innovation, we notice the role society is playing although there exist a discord among our experts to the role of society and we are reminded about the role skill and talent plays in the process of generation. Specifically there seems to be a general consensus that there are three sets of important drivers that will continue to keep India innovative. The first is the ability for the knowledge base in India to renew itself. It is generative because the knowledge base is an important input in the creations of new frameworks for artefact development. Second, strong generative role played by the Indian Diaspora, and third continue to attract new firms and platforms to India for generating new technologies, products and services.

In summery the generative emphasis among our consensus creating experts seems to be on the lower side. Their expectation that generative mode will help develop the Indian ICT market into an innovative one is limited. This means they do not see a critical role for generative elements in society and industry to have an impact on ICT Innovation. Specifically, they are not able to project a convincing role for creative problem solving, for constructing new frameworks for technology development as critical to Indian ICT growth. The consequence for this kind of thinking could be two fold; First, India will continue to be at the receiving end of technology and

will not be able to develop its own platforms and populate it with its own technology. Second limited support for forward thinking strategy would result in short sidedness and focus technology augmentation. Summing up. The lack of support for generative aspects in our Delphi study indicates that according to our experts India is likely to continue on its present technology specific trajectory and may not be able to develop technological platforms for the future. Indian ICT Innovation will therefore will be limited to specific aspects of technology. In effect the Indian Innovative potential will be focused on more constructive than generative.

A technology bias, the constructive mode

From our experts it is amply clear that the direction of Indian innovation is likely to be driven by the construction of new technology. These technologies are specialised tools to cater to a specific need. The emphasis on the constructive elements of the consensus indicates that the technology is seen as the end game, meaning being Innovative is developing technology. To important outcome for ICT innovation can be articulated, first the constructive aspects of ICT innovation will dominate the Indian Innovative landscape and second, Innovative solutions will likely to be a technology solution to perceived challenge. In summary the consequence for ICT innovation is predicated on technology development.

Focus on training: the instructive mode

From our study the instructive mode seems to have a high consensus. Our panellists seem to agree that knowledge based industries will continue to be the most innovative. They also agree that training and development will be a key aspect of the Indian Innovative landscape. There are three implications; first that training and development will have a domestic focus, this would imply that more skilled individuals will come from non English speaking background but able to speak some English. The consequence being the ICT industry will be less anglicized and is likely to reflect the social values that are embedded in the Indian society. This would have a positive impact on the instructive and innovative aspects of the Indian landscape. Implying greater value will be given to the generative and instructive aspects as opposed to an over emphasis on the constructive aspects of innovation. Second, with increasing involvement of non anglicized talent a recalibration towards focusing on the domestic sector is likely to take place. Third, there is a greater possibility for thinking in terms of platform creation to address a problem instead of technical solutions when the challenge is domestic. This is due to the holistic philosophy of the Indian hinterland.

In summary, the instructive aspects of Innovation has the potential to recalibrate the Indian innovative potential from technology and solution focused towards platform and framework focused, The consequence being an increased innovative activity among companies that have a domestic focus. The future trajectory of Indian ICT Innovation has a domestic story. The innovative potential of India is likely to be recalibrated towards domestic solutions and away from international markets dominated by the instructive mode. The consequence will be a greater emphasis on the generative mode and less emphasis on technology development resulting in holistic solutions and investment in platform development and not technical solutions to singular challenges. This would mean that the future of ICT Innovation is likely to have a domestic

flavour and there is where India's innovation will be sustained and can be witnessed having a real impact.

7 Discussion and conclusion

The central problem of this chapter was to answer two questions. 1) What is the future of Indian ICT innovation? And 2) what will drive ICT Innovation in India? To address these issues we started with six main sections, each section has a statement and a number of supporting statements. We then created a Delphi study using the six sections and identified 64 experts all over India to help us understand the future trajectory of ICT Innovation in India. We then held a number of workshops to arrive on a set of questions relevant for addressing the questions, we then sent out the questionnaire to our group of experts in the attempt to get their first set of responses. We conducted the second round with 25 people and arrived at fairly clear sets of consensus and dissonances.

Our analysis of their responses is in-depth and to develop a understanding of where Indian ICT innovation is right now and going in the future we develop a conceptual framework identifying the generative fold, the constructive and the instructive fold. From the analysis it appears that there is little emphasis on the generative fold. A larger emphasis appears to be on the constructive fold and an increasing emphasis is on the instructive fold.

What does this mean in terms of our questions: first what is the future of Indian ICT innovation? The answer to this question is embedded in how the important the instructive aspects of the Indian ICT industry dominate how the industry applies its knowledge base. We think that increasingly with the instructive elements of the industry focussing on the domestic market we believe that Innovation will increasingly have a domestic focus. This would imply Indian ICT innovation will be dominated by the instructive mode and the generative mode. This will translate into emphasis on holistic solutions supported by the constructive aspects that focus on Technology. Indian ICT innovation in the future will be dedicated to the domestic market and there is where the Indian ICT innovation will be sustained. Second what will drive ICT innovation in India? The focus on addressing domestic challenges will drive ICT innovation in India