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A TESTBED FOR STUDYING VENTURE DESIGN TEAMS IN EMERGING MARKETS

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1. Introduction

Engineering design and product development is often conducted in teams. In engineering education as well, students are encouraged to work in teams on design projects and develop social skills relevant to engineering practice [Dym et al. 2005]. A number of researchers in the field of engineering design have contributed to our understanding of how engineers work together in teams. For example, researchers have studied team behaviors such as generation and development of ideas [Bergner 2006], [Van der Lugt 2003], negotiation [Brereton et al. 1996], [Minneman 1991], handling disagreement [Jung 2011], prototyping [Brereton and McGarry 2000], and have commented on the productivity [Goldschmidt 1995], benefits [Hargadon and Bechky 2006], [Sutton and Hargadon 1996] and drawbacks [Lempiala 2010] of teams in product development practice.

However, most of the research on design teams has involved technical teams in educational context or those engaged in product development within established organizations. Research on technical teams engaged in entrepreneurial activity is rare. There is little understanding of how technical teams that found ventures behave when they are engaged in both product development and venture creation. In this paper, we focus on technology based venture design and describe a testbed for studying venture founding teams in action.

We approach the study of entrepreneurial technical teams from a design perspective. [Simon 1969] defined design broadly as the activity of changing an existing situation into a preferred situation. We define venture design as the activity of developing ventures to transform a community from a present state to a prospective state in a way that leads to collective wealth creation. The guiding questions for our research are:

1. What do venture founding teams do when they do venture design?
2. How can we enable them to do it better?

The second question furthers our intention of not just studying entrepreneurial design teams, but also influencing the development of innovative technology ventures. Economists have recognized the role of technology entrepreneurship and innovation in sustaining economic growth in a given region [Wong et al. 2005]. Hence, we situate our research in the context of emerging market economies where sustained economic growth is needed.

2. Venture design in emerging market economies

Technology-based venture design in established market economies such as the US occurs through university-based entrepreneurship programs, spin-offs from professional research labs, or commercial incubators. Access to capital ranges from early stage government funding to commercial sources of funding such as angel investments and venture capital. Moreover it is observed that venture design is often concentrated in geographic regions that have a concentration of technical talent, access to capital and a culture of innovation that supports early stage venture creation [Bresnahan et al. 2001].

In emerging markets such as India, universities like the Indian Institutes of Technology excel in technical education and have associated incubators. There is also increasing attention paid by government bodies such as the Department of Science and Technology to promoting innovation. However, there are four conditions that hamper venture design.

1. Lack of hands-on practice orientation in higher education. Researchers such as [Froumin, Divakaran, Tan, & Savchenko 2007] point out that skills gained by students in higher education rarely prepare them for practice in industry. As a result while students gain theoretical and analytical thinking skills, these skills are not made relevant to industry and the market needs that are a crucial component in venture design.
2. Lack of a culture of innovation that encourages collaboration to take an idea to market is missing in emerging markets. [Saxenian 1996] points out the role of porous boundaries between firms and the role of regional networks in the success of Silicon Valley as a hub of venture design activity. In emerging economies such collaborative networks that would enable a flow of technical talent, ideas and capital towards new venture creation are largely absent.
3. Limited access to capital. Angel investment and venture capital while present, are not easily accessible to budding entrepreneurs. This could be attributed on one hand to lack of geographic concentrations of talent, capital and a culture of innovation, and on the other hand to high growth investment opportunities available in other areas such as real estate that make venture investments a less attractive and risky proposition.
4. An underlying lack of trust in society that increases the cost of interpersonal transactions. Venture design in its early stages relies on trust and openness among founding team members and stakeholders in terms of sharing ideas and capital. Emerging markets are characterized by higher transaction costs and lack of institutions that are needed for greater trust in the market [Khanna and Palepu 2010]. Low trust in society has been correlated with lower economic growth [Zak and Knack 2001].

How do venture founding teams operate in such an environment? How can we enable them to be more successful? In order to begin investigating these questions, we propose a testbed environment for studying venture founding teams in action.

The objective of our research is not just to study what venture founding teams do when they do design, but also to improve their venture design process. This dual focus on understanding the situation and changing it follows the reflective action paradigm proposed by [Schön 1983] and necessitates a design approach to research. The testbed environment enables us to observe, analyze and intervene into venture founding teams while they are working on their venture design.

3. Venture design testbeds for studying venture founding teams in action

Center for Design Research at Stanford University is collaborating with local partners in India and Nigeria to setup testbed environments to study venture founding teams engaged in early stages of venture design. The Institute for Venture Design in Nigeria is a testbed setup in collaboration with Fate Foundation. VentureStudio, Center for Innovative Business Design is a similar testbed setup in collaboration with Ahmedabad University in India. Both studios operate a six-month fellowship program. Individual aspiring entrepreneurs are recruited and formed into teams based on shared interests and complementary skills. These teams identify a critical market need, generate ideas, prototype product concepts, and develop business models to take the products to market. The four aspects of venture design testbeds are discussed below in terms of their role in addressing emerging market conditions.

1. Physical studio space,
2. Coaching from Stanford University and local institutes and businesses,
3. A product based learning approach that emphasizes delivering a concrete product through hands-on experience,
4. A network of local vendors, experts and investors that form the ecosystem for supporting venture design.

3.1 Physical space

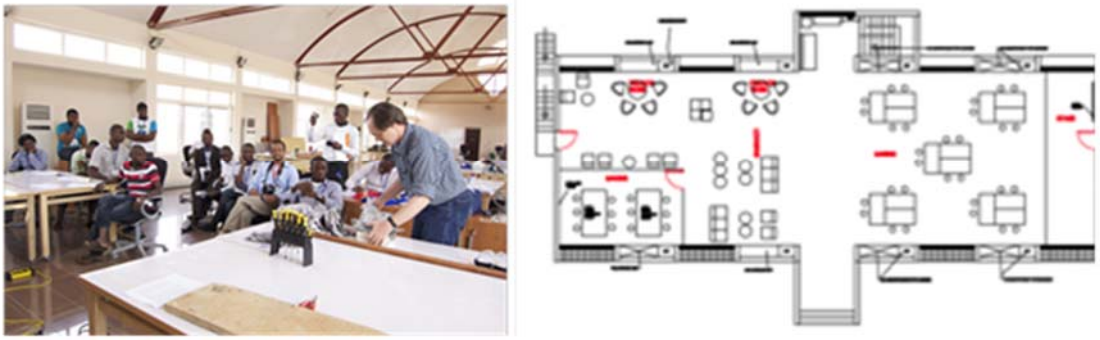

Figure 1. The photo on the left shows the studio space at the Institute for Venture Design in Nigeria. On the right is the layout of the studio

The Institute for Venture Design in Nigeria consists of an open studio space that includes a stage for presentation at one end and a small prototyping workshop at the other end. Venture founding teams have their team spaces in between. Figure 1 gives a layout sketch and a snapshot of the space. Besides the studio space, the institute also has dedicated lab spaces for mechatronics, woodworking, metalworking and for digital and software prototyping.

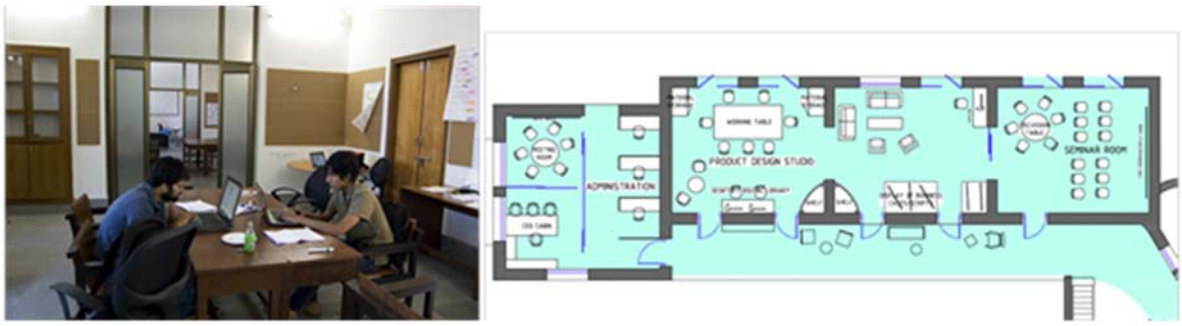

Figure 2. The photo on the left shows the studio space at VentureStudio in India. On the right is the layout of the studio

The Institute for Venture Design's studio was purposefully built for venture design. However at VentureStudio the India, the studio space was created by renovating an older school building. Two contiguous studio spaces were created on one of each of two floors by partially knocking down the separating walls. Figure 2 shows a layout of the first floor studio and a snapshot of the space that includes a product design studio, seminar room and administrative block. The second floor studio includes space for a library, visiting researchers and further team space for venture design. The main difference between the Institute for Venture Design space and VentureStudio space is that prototyping facilities at VentureStudio are in a neighboring cottage in the campus instead of in the studio space itself. See Figure 3.

The physical space is designed in such a way that a rapid transformation of ideas is possible through various media – speech, gestures, sketching on paper or whiteboard, physical mock-ups in paper or wood, digital prototypes and functioning prototypes. This enables a hands-on practice orientation that is missing in mainstream engineering education in both settings. The open layout enables easy reconfiguration of spaces to suit the changing needs of venture founding teams. It promotes interpersonal interaction as opposed to a fixed cubicle layout that promotes individual work. At any given time, multiple venture founding teams would be working on different industry domains. The open layout enables teams to visually see and talk about each other's workspaces and prototype models thus spurring a culture of sharing ideas and knowledge across domains. Hargadon and Sutton [1997] have identified such knowledge brokering across domains as a key element of continuous innovation.

The venture design space seems similar to a typical product design studio. This is because the key activities such as uncovering user needs, generating concepts, prototyping and sharing concepts with stakeholders remain the same. The difference is that these activities are no longer limited to a product focus. In a venture design space, venture concepts are generated, venture strategies are prototyped and business models are shared with stakeholders. The activities of design are extended into what has traditionally been a business domain. The physical space in a venture design testbed affords this extension.

Figure 3. The exterior and interior of the prototyping workshop at VentureStudio

3.2 Coaching paradigm

In the testbed environment for venture design, venture founding teams are supported in their activities through coaching. A coach in a product development team keeps an eye on the design processes of the team, resolves interpersonal issues between team members, and provides support in terms of resources, expert advice, tools and ideas [Reich et al. 2009]. Following the triple loop learning model proposed by [Eris and Leifer 2003], the role of a coach lies in the second learning loop between the formal channels of evaluation such as a course instructor in an educational setting or a manager in a professional setting, and the informal channels of learning such as team members and peers.

At the Institute for Venture Design and at VentureStudio, coaching is conducted by Stanford researchers who focus mainly on the venture design process and by local experts who focus on enabling cultural nuances and local content that is relevant to venture creation.

3.3 Product based learning approach

In product based learning, the focus is not on abstract thinking, but on experiencing design, learning relevant concepts through action, and delivering a concrete product. Venture Design testbeds follow a product based learning approach. The only difference being that the product to be delivered in a venture design testbed is the entire venture. This focus on ‘product’ goes beyond similar approaches like project based learning in that it emphasizes the creation of value for outsider stakeholders such as customers and investors [Leifer 1997].

The product based learning approach is operationalized through a series of flash ventures. A flash venture is the creation of venture involving a product prototype and a business model in a very short amount of time. The time for a flash venture can range from a few hours to a few days depending on the scope and the number of iterations. A flash venture has a similar purpose to a rapid prototype in product development. Participants go through the critical stages in venture formation process in a short period of time. This process raises more questions than gives answers and allows a team to quickly identify questions they need to answer, new areas of opportunities, and their areas of strength and weaknesses. They also learn to see a venture from multiple perspectives e.g. from a user's perspective or an investor's perspective.

This product based learning approach addresses the lack of a practical orientation in higher education by putting hands-on collaborative work at the fore.

3.4 Regional networks

Saxenian [1996] pointed out the importance of having a regional network that helps in diffusing ideas, knowledge and capital towards venture creation. In Ahmedabad (India) and Abeokuta (Nigeria) where the two testbeds are located, regional networks of vendors, domain experts and potential investors are being nurtured to support the ventures designed by the founding teams. Network connections are initiated through local partners as well as through participation in local events and conferences. Special emphasis is given to involving investors in the venture design process right from the beginning when product and business concepts are in the incipient stage This enables the investors to give their inputs early and develop trust in the team as they work together towards creating a viable venture.
Thus, the four aspects of physical space, coaching, product based learning approach, and regional networks together enable the founding teams to overcome the limitations that hamper venture design in emerging markets.

4. Research approach for venture design testbeds

The earlier section explained the design of the testbed environment. This section outlines the research approaches for studying the venture design activity conducted in such testbeds. Our research objective is to understand venture design as it is being practiced by venture founding teams, and to enable the founding teams to create successful ventures. The intention is to have both a "scholarship of merit" that leads to a thorough understanding of the situation, and a "scholarship of impact" that creates change in the situation [Lande et al. 2007]. This necessitates a multi-level approach to conducting research studies in the testbed environment.

4.1 Level 1: The reflective practitioner

The first level of research is that of the individuals in the founding team. Schön [1983] proposed a paradigm of design as a reflective conversation with a situation. Designers perceive or frame the situation, move or act to change it, appraise and reflect on the change through reflection-in-action and reframe the situation if need be. Through this perceiving, acting and reflecting they create theories-in-action about venture design and develop perceptual fields and action repertoires that comprise their skill of venture designing [Jung et al. 2011].
Research at this level implies asking questions such as:

- How do founders perceive their world while designing ventures?
- How do they act?
- What are their theories-in-action that guide their perception and action?

Founding team members are encouraged to reflect on their experiences through self-maintained diaries, conversations with coaches and group discussions that are recorded on video. Here the practitioners are researchers themselves. They reflect on their experiences and form theories-in-action that are tested and updated through their venture designing.

4.2 Level 2: The reflective coach

The second level of research is that of the coaches. It involves their reflections on both the founding team behaviors and their own interactions with the founding teams. Coaches collect the reflections of the practitioners through written notes and video documentation and analyze it to evaluate and guide founding teams. They become reflective practitioners themselves as they are engaged in their coaching interactions. Coaches maintain a written or audio/video log of their reflections, which constitutes data for research on coaching, and venture design processes.
Research at this level implies asking questions such as:

- Is the founding team missing something?
- How are they responding to the current situation?
- Are the interpersonal dynamics helping or hindering their progress?
- How can I as a coach intervene in this situation?

4.3 Level 3: The detached observer

The third level of research is that of detached observers who are not part of the situation of venture design. The detached observers could be external researchers who are not involved in coaching venture design teams, or they could be the coaches themselves who are analyzing data after the venture design activity is over and the opportunity to intervene has passed. External researchers could conduct field studies, interviews, experiments and capture and analyze video data, artifacts created by the founding team and other stakeholders in the venture design process. Coaches could analyze video data of venture founding teams or conduct experiments not directly related to the venture topic they are involved in.

Research at the level of the detached observer is aimed at understanding the situation and wherever possible to create generalizable insights into the process of venture design. Its aim is not to change or influence the ongoing activity in the testbed environments. However, it is possible that findings from such research could influence aspects of the testbed environment over a longer period of time.

Research at this level implies asking questions such as:

- How does founding team diversity correlate with future venture success?
- How do product ideas emerge and develop through founding team interactions in the early stages of venture design?
- How does a founding team deal with product and technology issues on one-hand and business issues on the other while designing a venture?

These three levels of research if conducted together in the testbed environment present us with a more nuanced understanding of venture design activity, while including the opportunity for the practitioners and coaches to influence the ongoing activity. We are in the early stages of the development of the testbed environments in India and Nigeria. Data collection following this multi-level approach is currently on-going in both the testbed environments.

5. Challenges to studying venture design in testbed environments

Studying venture design in the testbed environments presents the following challenges:

1. Balancing research with venture design activity – Since the Institute for Venture Design and VentureStudio are oriented towards training venture founding teams to create real ventures, the demands of developing and prototyping functioning products, creating business models and raising capital could overwhelm the research objectives if there are no dedicated personnel focused on research. The challenge then is to create a culture of research and practice that gives rise to what Schein called scholar-practitioners [Wasserman and Kram 2009].
2. Differentiating between the levels of research and the associated methodology – Conducting research at the level of the practitioners, the coaches and the detached observers involves different methodologies. At the level of the practitioner and the coach, we are dealing with first person experiences and second person observations. It is necessary then to understand the methodological factors that accompany introspection or phenomenological inquiry and differentiate them from methodological factors that accompany the third person inquiry of the detached observer [Varela and Shear 1999]. For researchers engaged in multiple levels of study in the testbed environments the challenge is to synthesize and correlate findings from the different levels in order to create a more nuanced understanding of the venture design process.

6. Conclusion

This paper presents the thinking behind the development of testbed environments to study the activity of venture design in emerging markets. Two operational testbed in India and Nigeria are described and the research approaches that are being followed to study technical venture founding teams in such testbed environments are outlined. The testbed environments open up a new avenue for practicing design theory and methodology research that lies at the intersection of design, entrepreneurship and the development of emerging economies.

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