

The logo for SMART Innovation Centre. The word "SMART" is written in white, bold, uppercase letters, with each letter contained within a separate dark red square. Below this, the words "INNOVATION CENTRE" are written in a smaller, black, bold, uppercase sans-serif font.

SMART
INNOVATION CENTRE

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Implementation of the Deshpande Center in the Singapore Ecosystem: A preliminary roadmap for the SMART Innovation Centre

The Singapore government has a strategic initiative to develop Singapore as a leading hub in the “Knowledge-based economy”. It has invested significantly in developing world class universities, research institutes and establishing strategic international research alliances. It must now foster an entrepreneurial ecosystem around these research assets to realize significant gain. Since the next wave of economic growth globally will be led by innovation and entrepreneurship, this is a key economic driver for Singapore.

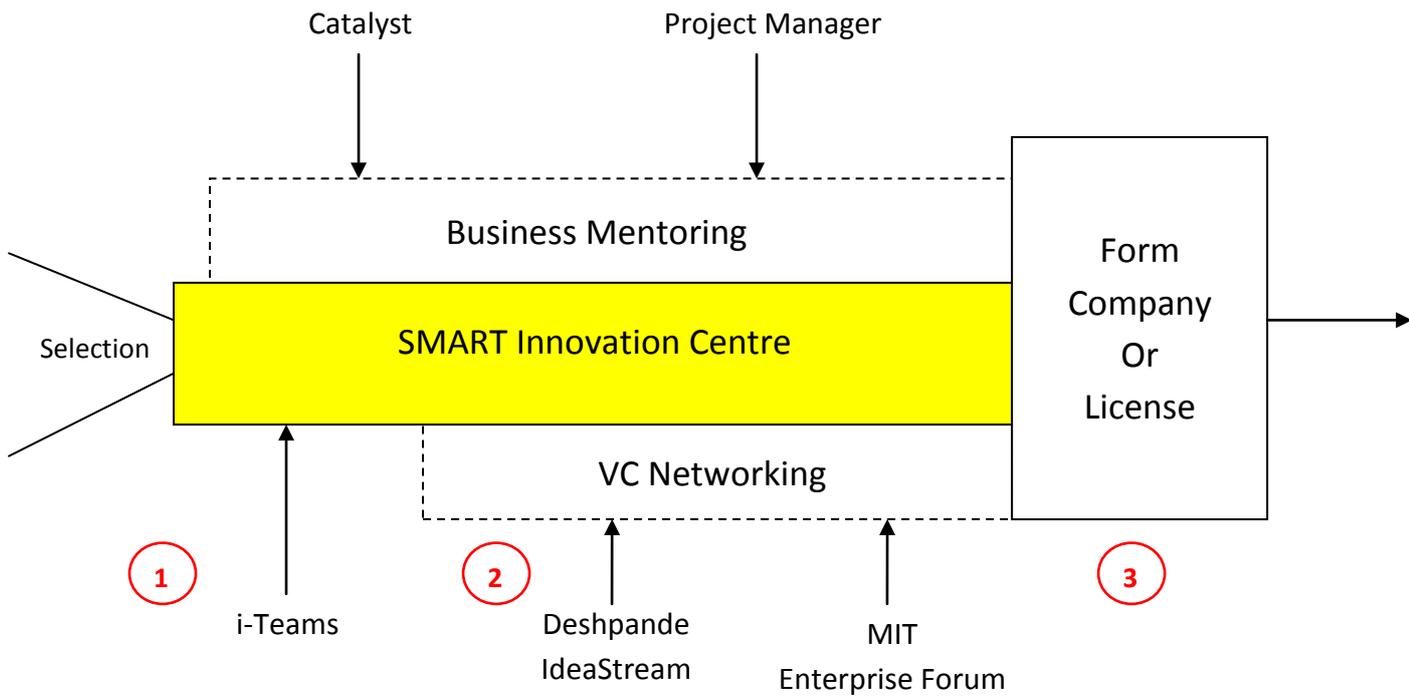
One important element of this entrepreneurial ecosystem is the encouragement of faculty/student research driven entrepreneurship. The Deshpande Center of MIT is a proven leader in identifying and nurturing emerging technologies and accelerating their migration from the laboratory to the marketplace. The SMART Innovation Centre will be modeled after the Deshpande Center but will be modified to suit the existing Singapore ecosystem. It is envisioned that the SMART Innovation Centre will act as a catalyst to: create a fertile environment for faculty and student entrepreneurship to grow; accelerate product development from the laboratory to the marketplace; increase connectivity between the Singapore and MIT Cambridge entrepreneurial communities to build global venture investment opportunities; and, provide entrepreneurial learning and mentoring initiatives. This paper outlines the proposed goals for the SMART Innovation Centre and describes the Centre’s initial programs.

Section 1: The Centre's Acceleration of Emerging Technology and Cultivation of Entrepreneurial Scientists and Engineers

The SMART Innovation Centre will have to accelerate Projects further than currently occurs in the Deshpande Center in Boston. This will be needed to lower risk so that the Projects are more likely to attract blue ribbon Singaporean and international venture investors and management, or potential licensees. Projects and the faculty PI will be selected and funded pursuant to a Grant process outlined in Section 2. Once a Project is selected, the Centre Director will facilitate the formation of an Oversight Board for each Project, which includes the faculty PI, assigned Catalyst (i.e. volunteer business expert) and in some instances a Project Manager hired by the Centre Director. The Project will be managed to meet milestones established in the Grant approval process to de-risk the technology, produce prototypes, conduct proof-of-concept experiments and devise a go-to-market strategy. The Centre will create a “safe” environment for faculty entrepreneurs and their postdocs/graduate students to accelerate the product development, with business assistance from the Catalyst and Centre Director. Much of the research will occur at the faculty PI's laboratory but where appropriate prototyping and other aspects of product development may be contracted to third parties. Funds may be used to support expert consultants or to perform market studies. The Centre may utilize the resources and capability of the Polytechnics to produce prototype devices.

Figure 1 is a functional diagram showing the flow of project development within the Centre. First **(item 1)**, the Project and PI (with his/her technical team) is selected (Section 2 describes the selection process for Innovation Grants).

Figure 1: Accelerator Of Innovation



The Project is then operated as a business unit within the Centre with the PI, Catalyst and in some instances the Centre Director forming the Oversight Board **(item 2)**. The Catalyst is selected from a pool of volunteers established by the Centre who has expert business knowledge in the particular technological area (see, Section 6 for selection of Catalysts). (Specific guidelines will be followed by the Catalyst to avoid conflicts-of-interest) The Catalyst works with the PI and his research team to define the go-to-market strategy. For some Projects, an i-Team of students (see, Section 3) assists in defining the go-to-market strategy. The PI and his/her technical team utilize the Grant funds to meet technical milestones to de-risk the technology. The Centre Director, aided in some instances by a Project Manager, will oversee this process. The Oversight Board for each Project will meet monthly and review the Projects progress; progress will be reported to the Centre Director. When appropriate, other networking will be promoted with the MIT Entrepreneurial Cluster (possible presentation at the Deshpande “IdeaStream” event, or participate in discussion at the MIT Enterprise Forum, or be mentored by the MIT Venture Mentoring Service). The local VC community will also be introduced to the Project and semi-annual reports will be provided to the Centre’s Advisory Board/Selection Committee.

The National Research Foundation (NRF) has a POC Grant Scheme, which may be used to further incubate emerging technology in the University/Institute environment. Certain Projects managed by the Centre may need additional funding to bring the technology to the point of commercialization, and these Projects may be eligible for NRF POC funding. In such instances, the Centre and PI will apply for the POC funding and the Project if funded will be managed pursuant to NRF rules, as a Centre Project. During this phase, the business mentoring will continue and networking will be facilitated with the Boston/MIT and Singapore venture community. The Project will continue to have access to the Deshpande “IdeaStream” event for presentation and to the MIT Enterprise Forum.

The plan is to accelerate the Project to the stage of maturity where a company can be formed or a licensee identified (**item 3**). With ample networking opportunities fostered by the Centre in both Boston and Singapore, it is hoped that a lead VC can be identified and a candidate CEO identified. The lead VC and CEO will work together to form and finance the company under mentorship from the Centre. (The candidate CEO may be resident for a short time in the Centre waiting for the Company to be formed, see Section 6 for further discussion).

The time within the Centre for each Project will vary from a minimum of one year to a maximum of three years, if the NRF POC is awarded. The Centre Grants will vary from S\$50,000 to S\$250,000. These resources will be managed carefully by the Centre and the allocated resources and outcomes will be reported twice a year to the SMART Governing Board. During this process, the Centre will enhance the successful commercialization of emerging technology and cultivate the entrepreneurial scientists/engineers in Singapore.

Section 2: Grant Process

The Deshpande Center uses a US\$50,000 Ignition Grant to fund the very early proof-of-principle development and a second larger Grant of up to US\$250,000 called the Innovation Grant to fund proof-of-concept development. The Ignition Grant is used primarily to get experience with the PI and technical group and rewrite the proposal with the Catalyst for a more complete go-to-market strategy before the larger Innovation Grant is awarded (however, in many cases, if the Project is more mature, an Innovation Grant will be rewarded from the start with certain funds allocated for each of the two 12 month funding periods). The Grant is used to pay for postdoc and graduate student salary, consultants, outside technical and market experts and research expenses, but will generally not cover equipment or the PI's salary. Usually US\$5,000 to US\$10,000 is set aside for expert marketing, consultants or market studies. For each 12 month period of the Grant, the funds must be spent in that period or revert back to the Centre.

The Centre will be allocated certain funding from the larger NRF Grant to SMART, which will be used to fund the Innovation Grants. The Centre will follow the Deshpande model and will call for Grant applications to be submitted twice a year. The primary Grant will be the Innovation Grant of up to S\$250,000 covering a two (2) year development cycle. However, for Projects deemed too early, where the go-to-market strategy is not clearly understood or the technology is at a very early stage, an Ignition Grant of up to S\$50,000 will be rewarded covering a 6 to 12 month period of early development. The Grant funds will be allocated by the SMART Centre finance office and third party contracts (ie. consultants, market studies, 3rd party research contracts) will be contracted directly by the Centre. (The Grants may cover a small portion of the PI's salary during the summer or for certain circumstances if approved on a case by case basis).

For approved Projects, the Centre Director will work with the PI to develop a yearly budget and developmental milestones. Adherence to the budget and research objectives are reviewed monthly by the Project Oversight Board made up of the PI, assigned Catalyst and in some instances

the Centre Director. Progress reports on each Project and on the number and type of Grants awarded will be presented by the Centre Director to the SMART Centre's Governing Board.

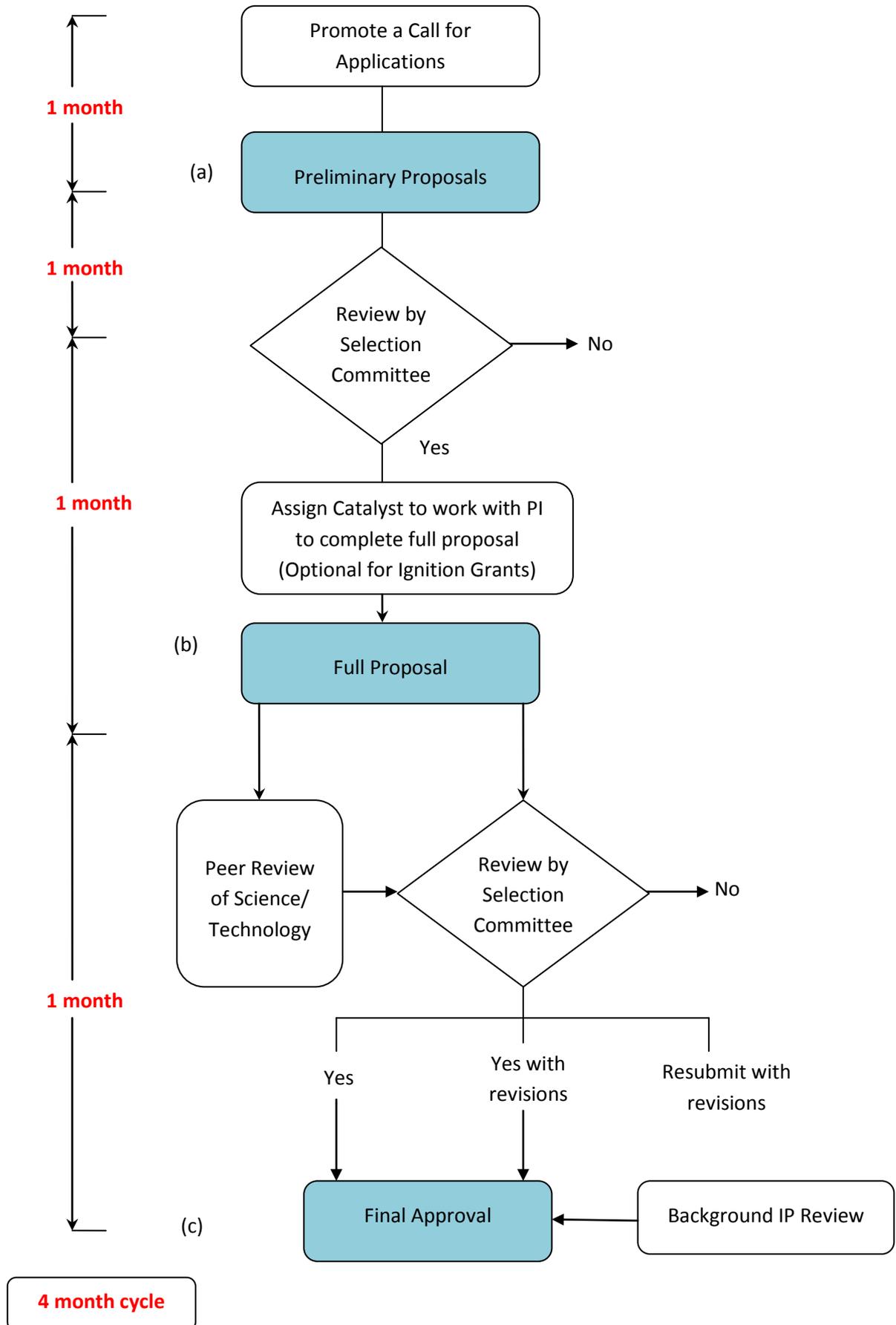
The Centre proposes to follow the Grant Application and Award Process shown in Figure 2. The entire Grant cycle will require four (4) months, making two Grant cycles per year feasible. The Centre will announce widely within NTU, NUS, SMU, SIM, SUTD, SMART, Polytechnics and MIT (Cambridge) the call for Grant Applications. All academic faculties in Singapore will be eligible to apply for the Grants. Some promotional events will be used to focus attention on the Innovation Grant. From launch of promotional activities, we will allow a month period to close the collection of Preliminary Proposals.

The Preliminary Proposals will use the Deshpande application template (Smart Centre Technological Innovation Grant Pre-Proposal) and will be a 2 to 3 page summary of the proposed Project. The idea is to allow the PI and the PI's technical team to engage in the process with a small upfront expenditure of time. The Preliminary Proposals are reviewed by the Selection Committee at one sitting and a "Yes" or "No" decision is made for each proposal with feedback provided to the PI. For proposals approved, a Catalyst (business expert volunteering with the Centre) may be assigned to the Project and will give the PI advice in preparing the Full Proposal; generally this involves scoping the critical proof-of-concept development and outlining a go-to-market strategy. We shall allow up to one (1) month for the Full Proposal to be prepared (again, we will utilize the Deshpande Center's application template - SMART Centre Technological Innovation Grant Full Proposal). The Full Proposal is then sent for the science/technology portion of the Proposal to be peer reviewed at MIT or SMART by independent investigators.

The peer review report and the Full Proposal are provided to the Selection Committee and the PI and his team will make a powerpoint presentation of up to 30 minutes, followed by a Q&A session. The Selection Committee will then decide either to: approve, approve with revisions, ask the PI to resubmit on the next Grant cycle with proposed revisions, or reject the Proposal. Prior to final approval, the Proposal is reviewed for

clearance of Background IP and the PI prepares an annual budget and milestones for final administrative approval by the Centre Director.

Figure 2: Grant Application And Award Process



Student Focused Grant Program

The SMART Innovation Centre will establish a new student focused grant program not currently available at the Deshpande Centre. This grant will follow the same procedures as the Innovation Grant but will differ in that: 1) the applicants will be Singapore undergraduate or graduate students with his/her faculty mentor, 2) will be a maximum amount of S\$75,000 and 3) will be limited to specific areas, such as: Technology for Education, Digital Media, Information and Technology and Technology for Developing Countries. Once awarded, the Grant will be administered by the SMART Innovation Centre using its normal procedures.

Section 3: Educational Initiatives

The Deshpande Center's activities in nurturing and accelerating emerging technology provide an excellent classroom to teach innovation and entrepreneurship to a broader community of faculty and students. The SMART Innovation Centre will follow this model in developing educational programs.

The Centre would propose to establish the following programs:

1) Joint i-Teams Project with one or more local business schools

Like the Sloan School of Management on the MIT campus, INSEAD has established an MBA focused program for entrepreneurship. We are developing an i-Team Project jointly run by one or more local business schools (INSEAD, SMU, NUS) and SMART. We are relying on expertise from the Deshpande Center for syllabus design and guidance in operation of the Project. The i-Teams are part of a class on Entrepreneurship and Innovation and comprised a multidisciplinary team of technical and business students. Each i-Team is made up of 4 to 5 students and their assignment is to develop a go-to-market strategy (not a business plan) for an assigned Project. Their final product is to present a powerpoint presentation that summarizes the go-to-market proposal. The

team meets twice a week in three (3) hour session during the semester and will be guided by a professor, and the Catalyst who is assigned to the same Project. (Some of the instruction could be provided by MIT faculty associated with the Deshpande Center under a teleconference distance learning scenario). Collaboration between MIT, SMART Innovation Centre and one or more local business schools would provide an exciting cross institutional, cross disciplinary study program on entrepreneurship and emerging technologies.

2) Short course on “Innovation Leadership”

The Deshpande Center has established an intensive two (2) weeks course on innovation leadership that was funded by the Portuguese government. The eight (8) hour per day course uses the morning session for traditional teaching of business topics and the afternoon session for action-based learning. The course is aimed at faculty who are interested in being a leader in innovation and developing emerging technology. We would require expertise and consulting from the Deshpande Center. This course could be offered to local Singapore faculty or students (graduate or post-docs) and could be offered to foreign and regional faculty – continuing to establish Singapore as a regional knowledge hub. This could be the Asian version of the Global Innovation Course being established by Deshpande and I³ (the International Innovation Initiative being established by Deshpande and Professor Yue of the MIT Engineering School).

3) Course and Competition in Gaming and Digital Media

As part of its initiative to establish a Student Focused Grant Program (see, Section 2), the Centre would like to explore establishing a program for students (graduate and undergraduate) to encourage innovation and entrepreneurship. We would propose to piggy back on the successful MIT/Singapore Game Lab. Each year during the summer, students from Singapore spend eight (8) weeks at MIT (Boston) and explore advanced game development. A team of students are required to develop an innovative game by the end of the course. The course encourages

bottom up innovation, and is sponsored by MDA (Media Development Authority).

The Centre would propose to offer a modification of its Innovation Leadership Course to students in Singapore with a focus on Digital Media. The course would be opened to graduates from the MIT/Singapore Game Lab, and to other interested students in Singapore. The course would give them the tools to write a business plan, go-to-market strategy and product development plan. At the end of the course, the students would have the opportunity to further develop their business plan and to enter into a Digital Media Business Plan Competition sponsored by the Centre. The Competition would follow similar procedures used to award the Innovation Grant (see, Section 2). A S\$50,000 grant would be awarded to the student team. With an assigned Catalyst, it would become a Project under the Centre, with the goal to launch a Company around the innovation in the Digital Media space.

Section 4: Connectivity to MIT (Boston) Business and Venture Investment Community

It is important for the SMART Innovation Centre to be strongly connected to the entrepreneurial ecosystem around MIT, tapping onto the expertise and programs offered at MIT. The starting point of this connectivity will be with the Deshpande Centre followed by linkages to the MIT Enterprise Forum, Venture Mentoring Service and I³ (International Innovation Initiatives). Equally important is involving the established venture community in the Boston area in the new business opportunities that will be created by the Innovation Centre. The Deshpande Center offered to assist us with a study to determine: 1) Boston VCs interested in Singapore and Asian Projects, and 2) how to structure the deal to draw in overseas (Boston-based) investors. It is important for the Centre Director to develop ties for the Centre with the MIT/Boston entrepreneurial community.

We would propose the following:

a) Establish strong linkages with the Deshpande Center

Charles Cooney and Leon Sandler are members of the Centre's Advisory Board/Selection Committee. Seek consultation and assistance with course design for the Centre's educational program (see, Section 3) possibly providing distance learning teaching modules. In consultation with Deshpande Center, identify VCs in Boston interested in Singapore deals, and then establish relationships with these VC groups (maybe as "Collaborating Catalysts") via teleconference or on the Advisory Board/Selection Committee. (This could be an effective low cost introduction for a few "select" VC's to gain access to the Singapore ecosystem and opportunity with some hand holding at MIT. One might also have an annual event in Singapore for this group).

b) Sponsor a portion of the "IdeaStream" event

Would allow PIs and lead technical team members to have a section in the Agenda (or poster sessions) to present the new Projects in Singapore. This enables one-on-one links to be established. (The cost of transport to the USA will have to be considered and teleconference links, if practical should be optimized, but some direct face-to-face linkage is needed). This activity could be funded through the individual Innovation Grants.

c) Utilize the MIT Enterprise Forum

The MIT Enterprise Forum (Cambridge Chapter), has excellent courses and networking sessions. When Projects at the Centre reach a mature phase and a start-up is contemplated, PIs and selected graduate students should attend "Start-up Clinics" offered by the MIT Enterprise Forum. This would be financed through the Innovation Grant.

d) Linkages with the Boston VC Community

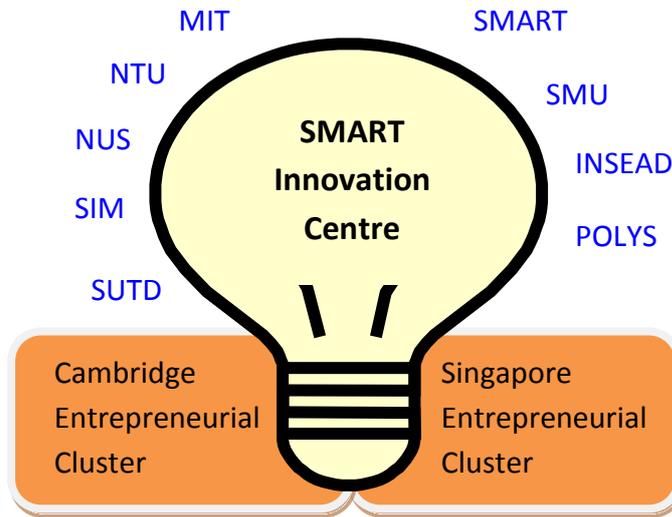
Again, developing linkages with the Boston-based VC community is key. After we have identified parties serious about investing in Singapore companies (with USA linkage via MIT), we need to establish relationships with the SMART Innovation Centre and the local Singapore VC community particularly the VCs funded via the NRF Early Stage Venture Fund Scheme.

It is critical for the Centre Director to establish these linkages, and advocate for the Centre's new ventures and whenever possible involve this community as part of the Advisory Board/Selection Committee or as "Collaborating Catalysts" having involvement with multiple Projects and working alongside the main local Catalyst. (We could start with a "workshop on SMART innovation to be run in Cambridge with invitation to the VC community thru the Deshpande Center to create a forum for 1) Introduction of SMART Innovation Centre and, 2) Brainstorming to seek ways to collaborate).

Section 5: Convening Power and Networking Events

The SMART Innovation Centre is in a unique position to draw together diverse groups in Singapore as well as linking the entrepreneurial ecosystems in Singapore and Boston. As an accelerator of emerging technology, it will broadly collaborate with NUS, NTU, INSEAD, SIM, SMU, SUTD, MIT (funded via the SMART Grant) and the Polytechnics.

The Centre will build strong ties to the polytechnics, which can provide resources and expertise in product prototyping and may provide some students for the i-Teams.



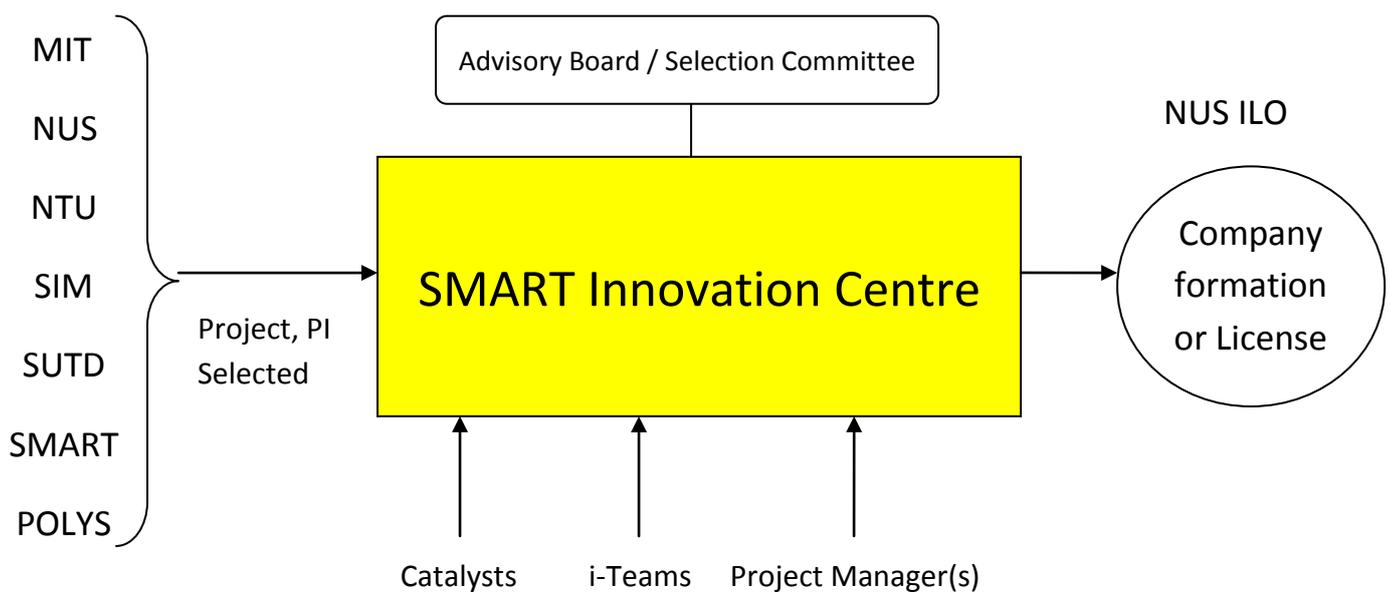
Using this “Convening Power”, the Centre would like to organize two networking and showcase events per year. These events would occur at the beginning of the promotional phase for each Innovation Grant cycle. We would invite a well established entrepreneur (of international reputation, probably associated with the Deshpande Center) to speak, followed by a presentation of a successful case study from the Deshpande Center or MIT Enterprise Forum. The event would promote the entrepreneurial culture and provide useful practical information.

The Centre would also be establishing a database and using web-based tools to link researchers, venture investors, and potential CEO candidates in both the Singapore and Boston ecosystems. We will ask to link to the Deshpande website. We will produce a web magazine providing a flow of useful information on entrepreneurships and new technology developments to our web subscribers.

Section 6: Structure

The SMART Innovation Centre is headed by a Director who reports to the Director of the SMART Centre and is accountable to the SMART Governing Board. The Centre is not a separate legal entity but is a Centre within the SMART organization. As such, it relies on accounting, legal, patent, promotional (PR), and event management support from the larger SMART Organization. The Director is supported by an Administrator who provides administrative support to the Centre.

Figure 3: The proposed Structure of the Centre



An Advisory Board/Selection Committee, initially established as one body, provides pragmatic oversight and selection of the Projects for the Innovation Grants. This Committee will be composed of 10 to 15 local and international leaders in business and commercialization of emerging technologies. The Committee will meet together four (4) times per year: two (2) meetings for initial Project selection (review and selection of the Preliminary Proposal, see figure 3); one strategy retreat to discuss potential new directions or programs for the Centre; one (1) annual review of the Projects and overall progress of the Centre. The review and approval of Full Proposals will be made by smaller groups within the Advisory Board/Selection Committee.

“Catalysts” shall be selected from the local Singapore business communities who have expertise working with emerging technology companies. The “Catalysts” will be volunteers and will be involved in one or at most two Projects and will act as a volunteer member of i-Teams (see, Section 4) to develop a go-to-market scheme for his/her particular project. The Catalyst will be supported by the Director and will be invited to all the Centre’s networking events. The Catalyst will not be involved as an investor or manager of an eventual company (however, if the Catalyst wants to become an investor or manager, then he/she must step down from the Catalyst role and negotiate that new position at arm’s length).

The Centre will also establish “Collaborating Catalysts”. They are experts in the Boston entrepreneurial community (they may be Boston-based venture investors or successful entrepreneurs) who are unable to perform the role of Catalyst due to geographical distance, but can provide expert experiences to several projects; provide guidance to the PI and Catalyst, and provide linkages to the large investment community in the US. The Collaborating Catalyst will communicate with the rest of the Project team mostly via video teleconference. The number of “Catalyst(s)” and “Collaborating Catalyst(s)” will expand with the number of Projects managed by the Centre. Initially, we would like to identify four (4) Catalysts and two (2) Collaborating Catalysts.

With the establishment of the joint educational initiatives with INSEAD and SMU, a series of i-Teams will be formed (see, Section 3). The i-Teams will be supported by the Centre and mentored by the Centre Director.

As the number of Projects managed by the Centre grows, and as the Projects become more mature, the Centre Director may hire a full time Project Manager to oversee the Projects that are larger and require more administrative and product development support.

The Director may also identify (or recruit) experienced CEO candidates who will operate out of the Centre (without salary, but may be paid a small stipend) to work with a potential lead venture group to form a company around a particular Project. This Entrepreneur-in-Residence program could contribute a potential CEO to a company leaving the Centre's oversight and launching as an independent businesses.

The Centre will work with the Technology Licensing Offices at NUS and MIT to prepare each Project for licensing to an established Company or a Start-up. The Centre, through SMART, has a contract with NUS for all patent and commercialization to be done by them. The Centre Director will also act as the IP Coordinator under the SMART/NUS IP Agreement to assure that the commercialization occurs smoothly. The MIT Technology Licensing Office will also provide expertise and guidance as needed.

Conclusion – Enhancing the Singapore Entrepreneurial Ecosystem in Emerging Technology

The Deshpande Center provides an excellent model for nurturing innovative scientists and engineers and accelerating emerging innovation to commercialization. This draft paper outlines how the SMART Innovation Centre can duplicate this model in the Singapore ecosystem. This paper is for discussion and critical review. I believe the Centre can be uniquely position to act as a catalyst in the Singapore entrepreneurial ecosystem, establish a model of international collaboration, and foster excellence in the important field of innovation and entrepreneurship.