



International Development Initiative

Technology Dissemination Guide

The following document is a technology dissemination guide for students participating in development initiatives. It contains a brief description of technology dissemination approaches, including the identification of development needs, collaborative models for working with development organizations, technology development and manufacturing decisions, effective distribution and sales approaches, and additional technology dissemination resources. This guide is not comprehensive, and is intended to be a supplemental reference resource to assist with the identification and understanding of key questions and challenges that commonly arise as part of technology dissemination projects.

May 2011

Massachusetts Institute of Technology

Table of Contents

Section 1: Identification of Location-Specific Development Needs	3
Section 2: Understanding Current Development Activity	5
Section 3: Technology Development Decisions	6
Section 4: Manufacturing & Cost Decisions	7
Section 5: Distribution Decisions	9
Section 6: Price Determinations	11
Section 7: Technology Uptake and Adoption	13
Section 8: Technology Licensing and Intellectual Property	14
Section 9: MIT Venture Mentoring Services (VMS)	15
Section 10: Additional Resources	16

Section 1: Identification of Location-Specific Development Needs

The first step to engaging in technology dissemination in a developing country is to understand the location-specific development needs. Before investing time and resources to establish the infrastructure and networks required to disseminate a technology in a specific geography, the potential impact of the technology in key development areas including social welfare, economic growth, sanitation, food and water safety, energy efficiency, and education should be evaluated and understood.

A number of resources are available to identify key development needs in a location:

- **Economic, Social, Health, and Education Indicators:** Certain indicators that are published by organizations can provide insight into current problems faced by certain countries/regions. Specifically, the World Bankⁱ, U.N Human Development Reportⁱⁱ, the Gini income distribution indexⁱⁱⁱ, and the CIA World Factbook^{iv} are helpful resources.
- **Location-Specific Government Websites:** Many developing countries have government departments devoted to development efforts. The websites of these departments can be valuable resources in identifying priority initiatives and problems in a specific geography.
- **NGOs and Development Organizations:** Using a search engine or by interviewing experienced development workers in a region, it is helpful to identify the most active non-government organizations and other non-profit development organizations. The websites of these organizations will generally explain the key development issues.
- **USAID^v:** The USAID website contains specific sections for each developing country with active USAID projects that outline key development needs, priorities, and current U.S. foreign assistance efforts.

Once the development areas are identified, it is important to think about how a specific technology dissemination plan will address them. Key questions to consider throughout this process include:

- What local problem is the technology trying to address?
- What is the expected outcome of addressing this problem?
- How will the technology have the desired impact?
- Are there cultural and/or logistical challenges to implementing the proposed technology that would prevent it from being adopted?
- Is it possible to quantify the total impact using measurable metrics (e.g., improved crop yield, changes in infant mortality, literacy rate, etc.) using a base, best, and worst-case scenario analysis approach?
- Have other people/organizations tried to address this problem in this location or in other comparable locations? If so, what worked, and what did not? What factors led to failure, and is my plan at risk of these same factors?
- Are there any “deal breakers” that I need to consider before I even attempt to work in this location (safety, political climate, past history with failed programs, etc.)?

The process of thinking through these questions should help to refine a technology dissemination plan, and to evaluate the concept feasibility.

Section 2: Understanding Current Development Activity

Once key development needs are understood, it is necessary to inventory the efforts that are currently being taken to address them to avoid duplicative initiatives or to identify potential partnerships. This process can be completed through a combination of online research and informational meetings with organizations. The following organizational types should be identified and researched:

- **NGO Initiatives:** Each NGO identified in section one can provide a summary of key development projects and initiatives. Meetings with these organizations can provide valuable information including prospective project plans that have not been launched, local resource recommendations, and advice on project-specific challenges.
- **Government Programs:** Many governments run development initiatives and/or subsidize development efforts. It is important to understand current government activity and priorities before
- **Market-Based Solutions:** Development needs are often met with sustainable market-based solutions, including current operating companies that sell products/services that solve development problems, as well as start-up companies planning to launch products/services. It is helpful to understand who the major players are, and why a market-based solution is thought to be preferable over an NGO or government subsidy solution.

This information will help to determine which development areas are currently saturated with initiatives and projects, and which areas could benefit from new efforts.

Section 3: Technology Development Decisions

There are three distinct approaches to disseminating technologies that should be considered as part of the development of the project plan. Specifically:

- 1. Disseminate an Existing Technology in a New Location:** In many cases, existing technologies may be available to solve a local development need. Research should be performed to understand how similar development problems have been successfully addressed in comparable locations, and to determine whether one of these existing solutions is feasible. Leveraging an existing solution will help to avoid an unnecessary duplication of development technology creation.
- 2. Modify an Existing Technology to Meet Unique Needs:** In situations where an existing technology is not practical due to cost, materials, cultural, or other geographic constraints, it may be feasible to modify existing technologies to overcome these location-specific challenges.
- 3. Develop and Disseminate a New Technology:** If there is no proven technological solution to a development project exists, or if a new innovation has the potential to more efficiently/effectively address a problem, it may be practical to develop and disseminate an entirely new technology. Technology development is always best done in close collaboration with a community partner who has a strong, stable, positive presence in the local context.

A full evaluation of these technology development alternatives will help to identify the most practical approach to solving development challenges through technology dissemination.

Section 4: Manufacturing & Cost Decisions

After identifying location-specific development needs, existing initiatives, and an appropriate technology development approach, manufacturing and production realities should be explored. There are many approaches, and the optimal strategy will vary greatly depending upon specific locations and technologies. However, the following are some important considerations that should help to inform these decisions:

- **Materials:** It is necessary to first determine the collection of feasible materials that can be used to build a technology. Cost, durability, availability, and safety should all be assessed for each alternative, and the various tradeoffs should be well-understood before making any decisions. Additionally, in some locations it may be practical to source all materials from the location-specific economy; however, in other instances it may be cheaper and/or more scalable to source from various countries. In general, it is important to determine the set of materials for a technology that will most effectively facilitate the accomplishment of the development objective. It is also helpful to evaluate whether secondary development objectives can be accomplished (e.g., employment growth, skills development) by sourcing some or all materials locally.

- **Manufacturing Location:** The manufacturing location decision will be closely tied to the materials strategy as the distribution of raw materials and component parts to the manufacturing facility may have significant cost implications. Similarly, the trade-offs between local and international manufacturing should be evaluated with consideration of secondary development objectives. The complexity of the technology will also play an important role in the manufacturing location:
 - **Simple Technologies:** Simple technologies with minimal parts and/or potential quality issues may be efficiently developed by either for profit manufacturing facilities or non-profit/NGO workshops in locations with low labor costs. The expected

production scale should also be considered so that manufacturing capacities in various locations can be evaluated.

- **Complex Technologies:** Complex technologies may require either skilled labor or experienced/disciplined manufacturing facilities. In these instances, it is important to evaluate the workforce skill-level, manufacturing infrastructure, and technology-specific expertise to determine the most appropriate manufacturing location.
- **Manufacturing Entity:** While it is often ideal to outsource manufacturing to a separate entity with relevant experience, in some cases, particularly in situations involving simple technologies and low quantities, it may be beneficial to develop a new manufacturing operation. As part of the project plan, the tradeoffs should be clearly evaluated before a decision is made.
- **Sustainability, Maintenance, and Replacement Considerations:** The expected lifetime and maintenance schedule for a technology will play a significant role in determining which materials should be used and whether certain manufacturing arrangements will facilitate sustainable dissemination and use of a given technology. Specifically, it is important that replacement parts for technologies that may require repairs are readily available and affordable in the technology dissemination location. Additionally, potential manufacturing facilities should be evaluated based upon whether they can commit to continued manufacturing of a product as well as replacement parts for the time horizon of the dissemination initiative.

Section 5: Distribution Decisions

Distribution can be one of the most significant challenges to disseminating a new technology. Optimal channels and approaches will vary based upon manufacturing and materials decisions, existing location-specific infrastructure, and the ideal distribution end-points (e.g., store, community center, school). In general, it is most difficult to build a new distribution network from the ground up, and it is beneficial to research whether existing networks can be leveraged. The following are some alternatives for consideration:

- **NGO Partnership:** Many NGOs have the infrastructure and expertise to distribute development-based products throughout their operational geographies. NGOs with missions that are consistent with the technology dissemination objective should be identified and contacted to determine whether a potential partnership could be mutually beneficial.
- **For-Profit Organization Partnership:** Similarly, there may be for-profit organizations that have the capacity and expertise to distribute the technology. Revenue sharing and/or other contractual arrangements should be explored to determine whether working with a local for-profit organization.
- **Licensing:** It may be possible to license the rights to distribute the technology to multiple organizations to reach the maximum possible dissemination scale. Licensing arrangements could vary significantly based upon the costs agreements and the level of control that is maintained over pricing and distribution locations.
- **Develop a New Organization or Venture:** If partnerships or licensing arrangements are not feasible or economically sound, the optimal approach may be to develop a new organization or venture to distribute the technology. Key considerations include transportation costs and logistics, distribution end-point logistics (e.g., permission to sell in certain locations), and inventory/storage costs/logistics. Additionally, the development of a new

organization of venture could require significant and sustained financing sources.

Finally, it is important to consider the financial sustainability of the various distribution options. For example, NGOs may require sustained donations and/or grants to continue operations, for-profit organizations may need to sustain the distribution of a certain quantity of items for a partnership to be economically feasible, and the sustainability of the funding sources for a new venture should be fully evaluated to determine whether the distribution solution introduces unnecessary risk that could jeopardize the success of the dissemination project.

Section 6: Price Determinations

Pricing determinations will affect product demand and distribution scale, and will also have an impact on the project's ability to accomplish specific development objectives. The two primary models are a for-profit company and a non-profit organization with subsidized operations/distribution from grants, donations, and/or sales at cost:

- **For-Profit:** For-profit models for development technologies are generally sustainable in instances where the end user can and will afford to purchase the technology at cost plus a margin, and when there are no other firms engaging in comparable activities. Before a for-profit model is pursued, detailed cost and operation projections should be estimated, and the prospective competitive advantage should be identified (e.g., why is there a profit opportunity?).
- **Non-Profit / Subsidized Distribution:** Non-profit models are ideal in situations where the target user would not be able to afford the technology at market prices and a reliable source of organization funding is identified. Under a non-profit model, the organizations resources could be deployed to partially or wholly subsidize the technology. Before a non-profit model is pursued, detailed costs and operations projects should be estimated, and the sources of funding and related motivations should be clearly identified (e.g., where will financing be obtained, and what is the objective of the financing source(s)?).

To help determine the optimal pricing model, the following questions should be considered:

- Can my target consumer/user afford to purchase my technology at a price that is greater than the manufacturing cost?
- Will there be meaningful demand for my technology at a price that is greater than the manufacturing cost? Will the potential benefits outweigh these costs?

- In a for profit model, will the sales margins sufficiently cover materials, operating, distribution, and management costs?
- In a subsidized model, is there a suitable financial source for the subsidy (e.g., grants, donations, government support)?
- Are there behavioral and/or cultural factors that will affect the optimal pricing strategy?
- If the product is free or distributed at a negligible price, will the end users utilize the technology for the desired purpose?

Section 7: Technology Uptake and Adoption

There are many different approaches to technology uptake and adoption, and the correct approach for a specific project will depend upon the local cultural factors, the level of technology complexity, the intended use and frequency, and the amount of training and behavioral changes required before the technology can be successfully disseminated. As part of a technology dissemination project, the following uptake and adoption questions should be carefully considered:

- How large is the technology's target population, and how will they be reached?
- Is the technology's function and/or benefit intuitive, or will education and training be required to teach the intended users how and why the technology can be useful?
- What level of monitoring and evaluation is necessary to understand whether the technology has been successfully adapted? How will this be performed?

Once these questions are understood, it is important to research how similar technologies in comparable geographies have been historically disseminated to determine an effective approach. There are various documented models, ranging from market-based solutions with minimal end-user interaction to full participatory processes that involve extensive on-site training sessions and workshops with the intended users. The costs, benefits, and logistics of various approaches should be considered as part of the project planning process.

Section 8: Technology Licensing and Intellectual Property

It is important to consider technology licensing and intellectual property considerations at the outset of a project, especially in instances where a new technology is developed, or an existing technology is modified in a transformational manner. In cases where new technology is developed, it is necessary to determine whether patents and other intellectual property protection mechanisms should be pursued to prevent other organizations from replicating the technology. However, in instances where the objective is to maximize the distribution of a technology, replication under licensing agreements may be the most effective distribution model.

MIT's Technology Licensing Office offers resources and assistance to help MIT students protect proprietary technology, and license technology to other organizations. For additional information, visit <http://web.mit.edu/tlo/www/>.

Section 9: MIT Venture Mentoring Services (VMS)

The MIT Venture Mentoring Service (VMS) offers a range of mentoring and venture training assistance programs to MIT students interested in founding and operating for-profit and non-profit ventures. Founded in 1997, VMS is a volunteer-based organization with a mission to assist students that are committed to executing new business ideas. The organization's focus is on results, and VMS pairs prospective venture founders with experienced mentors to refine venture strategies, overcome obstacles, and get ventures up and running.

VMS has over 140 active mentors with expertise across a wide range of disciplines including entrepreneurship, technology development, venture funding, business management, distribution, intellectual property, consumer goods, healthcare, and social entrepreneurship. Mentors are currently assisting over 200 venture projects, 150 of which continue to request active assistance. Prospective mentees are required to fill out a VMS questionnaire and will then be invited to VMS for an initial screening meeting to discuss the scope of the requested assistance.

Following this initial screening, VMS will pair the mentee(s) with a team of 2-5 mentors that have the required experience and skill-set to provide results-oriented assistance. Mentees will meet with the mentor team as needed throughout the development of the venture, and the relationships will last as long as the venture continues to find value in the mentor relationships.

The Venture Mentoring Service could provide technology dissemination fellows with assistance across a range of applicable topics including financing, product development and manufacturing, distribution, pricing, intellectual property, and regional considerations. VMS encourages all serious prospective venture founders to complete the questionnaire and schedule an initial consultation meeting.

For additional information, visit <http://web.mit.edu/vms/> or contact Louis Goldish at 617-429-3556, lgoldish@mit.edu.

Section 10: Additional Resources

The following additional resources may be helpful in developing a technology dissemination project plan:

➤ Web-Resources:

- **USAID:** Global development priorities and current initiatives.
<http://www.usaid.gov/>
- **The World Bank:** Detailed development priorities and current initiatives.
<http://www.worldbank.org/>
- **The UN Human Development Report:** Global Development trends.
http://hdr.undp.org/en/media/HDR_2009_EN_Complete.pdf
- **The CIA Factbook:** Detailed economic, health, safety, and social facts and figures by country.
<https://www.cia.gov/library/publications/the-world-factbook/fields/2172.html>

➤ MIT Resources:

- **Venture Mentoring Services:** Assistance with the establishment of a new organization or venture.
<http://web.mit.edu/vms>
- **Technology Licensing Office:** Assistance with technology licensing and intellectual property considerations.
<http://web.mit.edu/tlo/www/>
- **Sloan Entrepreneurs for International Development:** Sloan student international development club.
<http://seid.mit.edu>

D-Lab: a program that fosters the development of appropriate technologies and sustainable solutions within the framework of international development

<http://d-lab.mit.edu>

Sample Development Organization Contact Email:

Dear [Contact Name],

I am a student in [Department Name] at the Massachusetts Institute of Technology (MIT), and am working on a research project to identify effective technology dissemination approaches in [Country Name]. MIT has a portfolio of agricultural, sanitation, water filtration, and mobility technologies, and we are working to determine (1) which technologies could be effectively brought to [Country Name] to help address local needs, and (2) optimal strategies and organizational partners to facilitate effective dissemination of the technologies.

[Organization Name] is of particular interest to us, and it would be extremely helpful to meet with individuals from your team to discuss the following topics:

1. [Organization] current and planned projects
2. Effective technology dissemination/adoption strategies and practices
3. Local organizations and institutions that we could partner with to facilitate the adoption of new technologies in Cambodia
4. Potential opportunities for collaboration with MIT

I will be in [Country Name] from [Date Range]. Would you or a representative of your organization be available to meet at your office during this time period to discuss the above topics? It is our hope that we can ultimately collaborate with you to perform development work in [Country Name].

Please let me know if you have any questions, or would like additional information about our initiative.

Thanks for your time and assistance.

Best Regards,
[Your Name]

ⁱ <http://www.worldbank.org/>

ⁱⁱ http://hdr.undp.org/en/media/HDR_2009_EN_Complete.pdf

ⁱⁱⁱ <https://www.cia.gov/library/publications/the-world-factbook/fields/2172.html>

^{iv} <https://www.cia.gov/library/publications/the-world-factbook/rankorder/2004rank.html>

^v <http://www.usaid.gov/>