University of California, Davis

International Agricultural Development Graduate Program

Case Study: D-Map

Benefits And Limitations

Of Geographic Information Systems (GIS)

As Knowledge-Sharing Platforms

In International Development Programs

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D-Map: A case study on the benefits and limitations of using GIS as Knowledge-sharing platforms in international development programs

Abstract

International Development Programs provide multiple resources to better equip development practitioners while implementing their projects in the field. Various social theories agree that communities of practice, such as international development programs, benefit from the knowledge that each member contributes with, as well as the use of technologies as useful platforms for sharing and storing this knowledge. However, existing social and technological barriers limit community members' contribution, especially in communities with geographically distributed members and high staff turnover rates.

This project provides a case study on the benefits and limitations (pros and cons) of using geographic information systems (GIS) as information and communication technologies (ICTs) to facilitate knowledge exchange in communities of practice involved in international development efforts. Results from a one-year study conducted with the UC Davis International Agricultural Development Graduate Program as the group of study, concluded that GIS have advantages compared with existing technologies (low cost and time required to implement and maintain), thus GIS can be used as effective communication platforms for knowledge exchange. However, there are technological and social barriers (such as under-contribution and technology adoption) that are presented in this document to invite further research.

Introduction

This case study presents the co-creation of D-Map, an online interactive map developed to promote knowledge exchange within the UC Davis International Agricultural Development Graduate group. Between November 2015 and November 2016, D-Map served as the prototype to evaluate the performance of geographic information systems (GIS) to become effective knowledge banks and knowledge-sharing platforms in communities involved in international development efforts. Each of the ten chapters contains specific goals, activities, and results, as well as important considerations to move forward into the design process. Over a year period, primary and secondary data was collected to evaluate the effectiveness of online interactive maps (GIS) as knowledge-sharing platforms and knowledge banks. Finally, this project concludes with the benefits and limitations of using GIS as effective knowledge banks and knowledge-sharing platforms.

The ultimate goal of this project is to validate the use of GIS as information and communication technologies (ICTs) that International Development Programs can use to better communicate international development efforts. The final output of this project is a four-step Manual that guides international development programs through the process of *designing*, *building*, *promoting*, and *maintaining* interactive online maps for community engagement and marketing and outreach (M&O) purposes.

This project has been an encounter point for me to learn about social psychology theories and human-technology interaction, combining multiple disciplines such as Participatory GIS and human-centered design to create this interdisciplinary project, which I am passionate about and look forward to escalate in the future.

Methodology

This project used the participatory design approach as the methodology for co-creating the online interactive map called "*D-Map*" in collaboration with the International Agricultural Development Graduate Program at UC Davis. The participatory design approach combined aspects of both the Design Process and the Human-Centered Design Approach. While the Design Process is a structured and iterative approach, IDEO also proposes the concept of Human-Centered Design as a process that starts with the people you're designing for and ends with new solutions that are tailor made to suit their needs. This is how the Participatory Design Approach[1] it's a change from a user-centered design process to that of participatory experiences. It is a shift in attitude from designing for users to one of designing with users.

Three iterative steps occurred during the Participatory Design Process that followed the co-creation of D-Map:

1. *Problem Framing Process:* Collecting information and gain knowledge about the problem, context, and user.
2. *Idea's Generation:* Coming up with ideas and generate multiple alternatives to solve the problem, in such a way that it is possible to choose the best approach to solve it.
3. *Implementation and Validation:* The third step is to implement and validate the solution to learn and improve the solution as much as possible before moving to the following development stage". [2]

Qualitative and quantitative data was collected through survey research tools and one-to-one meetings with users, to validate their interest to implement new technologies for knowledge-sharing purposes.

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1 http://maketools.com/articles-papers/FromUsercenteredtoParticipatory_Sanders_%2002.pdf
2 Creative Capacity Building, Design WorkBook, IDDS Education, Colombia, Bogotá, 2016

Chapter I: Problem Framing

Today international development programs, such as the USAID Farmer to Farmer Program, Peace Corps, the International Development Innovation Network (IDIN), among other programs, as well as college-based programs such as the UC Davis Blum Center, UC Davis D-Lab, Global Affairs, Humphrey Fellowship Program, or the International Programs Office (IPO), give college students, young professionals, and faculty the opportunity to apply their skills and knowledge in research and development projects targeted to tackle global poverty.

Even though we agree that international development efforts are reporting a positive impact in improving livelihoods worldwide, we know that there is room for improvement in terms of <u>better communicating these efforts, promoting multidisciplinary collaborations within and beyond International Development Programs, and incorporating technologies to automatize their internal and external communications (among other benefits).</u>

It is known that the current environment in international development involves a high level of staff turnover. Short term projects and weak transition models have been in the sight of experts, looking to gain a better understanding of the reasons for this lack of continuity of efforts: *"The continuity problem spills over to International Development Agencies (IDA) staff in country. Not only are the in-country personnel bound by short-terms of service, they are seldom well trained about their target location, in order to perform their roles effectively.*[3]

My initial research focused on understanding the causes and consequences of this existing "lack of continuity in international development efforts" with an emphasis on <u>how knowledge flows in International Development Programs</u> and <u>which online communication channels</u> are involved in this process. As part of the participatory design

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[3] Michael, Joseph (2015): Continuity and Metric problems in international development agencies.

approach, a "Problem Tree" was developed to present the causes and consequences of this problem, and ultimately to determine the best path to action.

Problem Tree
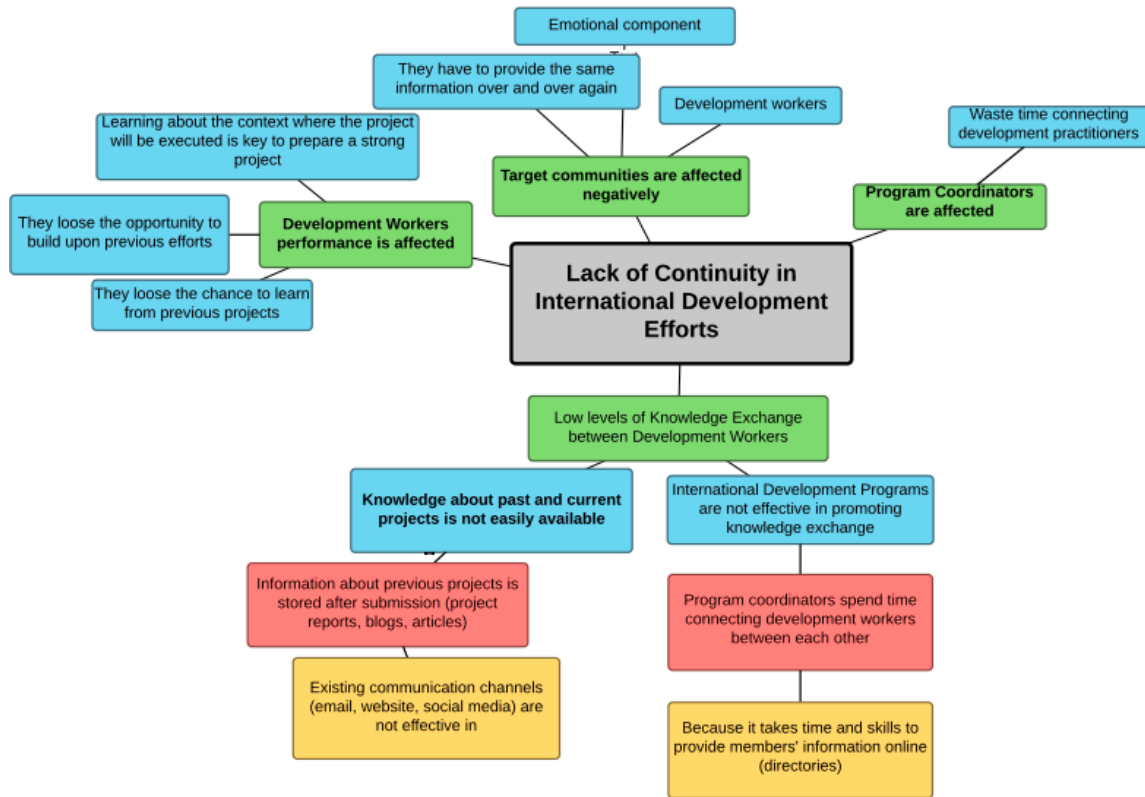
A short duration of assignments, but also a <u>low interaction and communication between development practitioners and their successors</u> could be triggering the lack of continuity of efforts in international development. In some cases, *during the last few months of the personnel's assignments, they find themselves preparing for their coming assignments, which means they focus considerably less on the projects that they are handling.*[4]

These low levels of communication become also an exhausting process for underserved communities, which are required not only to provide the same information every time a new organization comes in place but also involving an emotional component (unfulfilled expectations).

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[4] Michael, Joseph (2015): *Continuity and Metric problems in international development agencies.*

Theory of Change

If the existing lack of continuity of efforts in international development is caused due communication barriers for knowledge to flow easily within international development programs, understanding how knowledge flows and which communication channels are involved constitutes the next step in the participatory design process.

Moreover, under the assumption that **IF** knowledge flows easily (better communication) from previous to future development practitioners, **THEN** practitioners' performance in field would be affected positively by this exchange of knowledge, it is worth to gain a better understanding on how the knowledge is being transferred and which channels of communication and technologies were in place within International Development Programs.

How Knowledge Flows Within International Development Programs?

Before and during their work assignments, development practitioners will **collect** knowledge about a specific region and target community (ies):

➢ *Before* a project is executed, international development programs recommend development practitioners to learn (gain knowledge) as much as possible about the project's social, political, environmental and financial environments.

➢ *While* working abroad and especially during their first exposures, development practitioners are also encouraged to get advice from experts that can provide knowledge (their own experience) about a specific country or region, cultural context, or local community.

➢ *After* practitioners finish their obligations abroad, each program will collect a fairly large amount of this knowledge in forms of project reports, blogs, research results, survey results, etc. Programs' staff, such as program coordinators or communication and outreach teams, will canalize and distribute this knowledge to shareholders, decision-makers and eventually future practitioners.

Is it worth for international development programs to invest time and resources on distributing this knowledge to future practitioners? If so, how and who takes care of this task? Each program evaluates and decides whether or not to share this new social knowledge. Programs may consider sharing blogs and reports through their websites or Social Media (Facebook). Peace Corps for example, invests in transitioning programs where existing volunteers would train their successors sometimes over a six-month period (Peace Corps RPCV Handbook). A common practice within international development programs consists in one-to-one email introductions performed by program coordinators manually.

Before, during and after working abroad, development practitioners will also share their experiences with friends, colleagues and family using social media and other informal communication channels. In both formal and informal communication channels, technology such as Internet is widely used as an Information and Communication Technology (ICT), and plays a key role to ensure a *continuous* and *asynchronous* flow of knowledge that makes it available anytime and anywhere. It urges the need to identify and evaluate the usefulness of current ICTs to act as knowledge-sharing platform and knowledge banks in international development programs.

Chapter II: International Development Programs
According to Wenger, "Communities of practice are groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly
International Development Programs form communities of practice (CoPs) where social knowledge is generated and shared through projects. The International Agricultural Development (IAD) Graduate Program at UC Davis is two-year master's program and a strong and diverse community of development practitioners (graduate students, alumni, faculty), and staff (program coordinator). Every year, new students join the community while others graduate and become alumni.

This project identified the UC Davis International Agricultural Development Program as the first community under study, to evaluate the usefulness of current ICTs to share and store social knowledge in forms of *projects*. In early 2015, the IAD group was searching for new ways to share their work and promote knowledge-exchange among their community members.

In November 2015, a short 10-question survey[5] was designed and distributed to the IAD group. The main objectives of this survey were to raise information about the group's behaviors when working in international development, to collect information about the current technologies (ICTs) used by participants to share knowledge of their projects, and to identify the feasibility of implementing a new online platform to promote knowledge exchange between community members. The survey was sent using the email listserv: iadgrads@ucdavis.edu. From a universe of 35 development practitioners (students), twenty-six answered the survey (results can be found here).

Survey results showed that the IAD community shares knowledge naturally, and uses technologies such as email, Social Media (Facebook, LinkedIn, Twitter). All of the participants use email and writes a report (often or always), while nearly half of them write a blog (54.17%). Even though 92.6% use Social media and 79.17% of the participants share their pictures using this channel, only 78.6% like to participate in online communities.

The difficulty of implementing online directories (due the time required to collect and publish information on the website) was discussed with Theresa Costa (IAD Program Coordinator), Professor. Lovell (Tu) Jarvis, and students involved in the 2014-2015 IAD committee. Additionally, during this exploratory phase, none of the current communication technologies had the capacity to store historical data about students' projects in agricultural development, key knowledge for incoming students looking to learn about how their own projects should look like.

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[5] Survey developed as part of the course Survey and Research Methods EDU237

Chapter III: Current Information and Communication Technologies (ICTs) used in International Development Programs

The next step in the design process was to evaluate each of the commonly used ICTs in International Development Programs for their capacity to <u>promote knowledge exchange</u> and <u>serve as knowledge banks</u>.

Email, social media, and websites were defined as the group of study (current ICTs). With the goal to evaluate each of them in terms of their capacity to <u>promote knowledge exchange</u> and <u>serve as knowledge banks</u>, a three-criteria model was developed based on previous literature from Hoadley and Kilner (2005). In their study: "*What is a community of practice and how can we support it?*", authors identified three areas of technology affordance relevant to communities of practice including *Content*, *Process*, and *Context* (CPC). These three affordances are ways in which technology may be deployed or designed to add value or improve learning generally, and a community of practice specifically.

<u>Criteria Required for Knowledge Sharing Platforms (CPC):</u>

1. ***Content*:** Refers to the <u>ability to store</u> and <u>manipulate information</u> in a variety of formats, to <u>transmit</u> representations across distance or allow time-shifting (asynchronous collaboration), and the <u>ability to support human representational capacity</u>.
2. ***Process*:** Refers to technology's ability to scaffold a particular task (constrain, improve, implement new processes), activity, or sequence of actions.
3. ***Context*:** It refers to the ability of technology to shift the social context of the user. A social networking tool for example, may allow someone <u>to communicate with a much broader audience than face-to-face communication</u>.

Each of the current technologies was evaluated for their capacity to store, manipulate, and transmit knowledge about community members' projects (Content), their capacity to make the processes of sharing and storing knowledge easier and faster (Process), within

the UC Davis International Agricultural Development graduate program community
(Context)

Benchmark Analysis between existing ICTs

		Current ICTs		
	Ability to:	*Email*	*S. Media*	*Website*
	Store Data	✔	✗	✗
	Manipulate information (in a variety of formats)	✔	✗	✔
	Transmit representations across distance or time-shifting (asynchronous collaboration)	✗	✗	✗
	Support human representational capacity	✔	✗	✔
	Constrain processes within the community	✔	✔	✔
	Improve a process within a community	✔	✔	✔
	Implement a new process within the community	✗	✗	✔
	Support forming a community at a distance	✔	✔	✔
	Promote discussion (include peripheral members)	✔	✔	✗
	Support communication with much broader audience	✔	✗	✔

Yellow: Content   Orange: Process   White: Context

Email is the strongest technology currently in place and it has multiple uses such as data management and storage in multiple formats, promote discussion, and support communication with much broader audience (listservs).

Even though **Social Media** allows multiple data storage formats (posts, pictures, videos), it is not a platform for data management and data is lost over time. There is a similar problem with time-shifting (asynchronous collaboration) which is not possible (or difficult).

Websites finally looks like a useful platform for communication, and the International Agricultural Development Program uses its own to share students' blogs, faculty work, program's description, among other uses. Other international development communities build online directories on their websites to share projects and members' profiles and

attract people willing to support them. However, this requires time and specific skills in website management.

Chapter IV: Idea Generation & Design

During this divergent stage of the design process, research was carried out to identify geographic information systems (GIS) as potential technologies for knowledge exchange[6]. According to the National Geographic Society, a geographic information system (GIS) is a computer system for capturing, storing, checking, and displaying data related to positions on earth's surface. This enables people to more easily see, analyze, and understand patterns and relationships (National Geographic Encyclopedia). Google Maps and ArcGIS are some GIS technologies.

The goal was then to build a GIS platform and evaluate the usefulness of GIS to showcase geographically distributed data (members; projects) and store data. A participatory GIS solution would act as a collaborative and interactive knowledge bank for:

1. Community members to exchange knowledge (projects),
2. Program coordinators to store historical data and share their work with future members.
3. Program directors to promote the community with other groups, unleashing asynchronous collaboration and continuity of efforts.

Chapter V: Implementation

Goals of this step in the participatory design approach included:

1. To design and build a participatory online map (GIS) with the International Agricultural Development Program at UC Davis.

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6 Recent Advances in GIS Technology, GIS Lounge (2010)

2. To test the usefulness of participatory online maps as <u>knowledge banks</u> for International Development Programs to store, manage, and serve their work as communities of practice.

3. To test the usefulness of participatory online maps as <u>collaborative platforms</u> for development practitioners to share knowledge.

Minimum Value Product (MVP)

Research was conducted to evaluate existing online mapping platforms and identify the best platform to fit international development program's needs. Zeemaps was selected among other mapping platforms (such as Carto, MapBox, BatchGeo, and Mapmaker, among others). Between September and December 2016, a minimum value product (MVP) was developed at zero cost, using Zeemaps as the mapping platform. Finally, the MVP was published using "Wix" (free website builder). The MVP can be found [here](#).

The MVP was tested with nine IAD graduate students and the IAD Program Coordinator in one-to-one meetings. Users were asked to follow a set of instructions provided to navigate the map without receiving additional guidance. Users' interaction with the MVP was positive and provided sufficient data to move forward into the design process. After a trouble-shooting process, the MVP showed fidelity to the final end product. Students were able to create contributions with some technological barriers, and program coordinator used the MVP to show the impact of the program with prospective students.

Zeemaps proved to be the right mapping tool: A very responsive support team, intuitive and useful for students to contribute with their projects, and visually attractive interface. However, social and technological, such as difficulties to create entries and difficulties to understand which projects qualify to join the map, were addressed later in the design process.

Prototype: D-Map:

In January 29th 2016, a short survey was sent to the IAD students' listserv 2014-2015[7] with the goal to gather data (students' projects to populate the map). Thirty-five students answered the survey. 81.25% of them agreed to share their projects on the map while six people preferred not to share their projects. Even though twenty-six students stated their interest to contribute to the map (81.25%), only fourteen of them provided enough information (53.85%). This information was added as new entries on the map. Possible reasons for this decay of interest to contribute were:

- Lack of time/interest to complete the survey with project information.
- Students were not clear about what makes a good project for the purposes of joining the map.
- Students want to share their projects but they don't have one yet.
- Students visited the map but they didn't understand how to contribute.
- The process was too complex/time consuming/ boring that they quitted.

By the end of January 2016, the IAD graduate group approved to publish the map on their program website: http://iad.ucdavis.edu. This new version of the map, included better navigation tools, as well as improved commands (instructions) for students to contribute with their projects to this knowledge-sharing platform.

Chapter VI: Outreach & Sustainability Plans

After the map was published with past and current students' projects, an outreach plan was executed to ensure member's awareness of this new tool and promote contributions to the map. Specific activities included:

1. Validating the <u>usefulness of email</u> as the main outreach channel to promote D-Map.

[7] Survey can be found here.

2. Building and validating the <u>agenda</u> (dates) for outreach activities to ensure that students are aware of the existence of D-Map.

3. Building and validating the <u>sustainability model</u> with community members.

Outreach Campaign Analysis:

The outreach campaign was implemented between June and December 2016. Emails proved to be useful communication tools for outreach. Outreach activities included:

1. Email to 2014-2015 cohorts: *"Inviting students to contribute and visit D-Map"* (June, 2016).

1. Email to 2014-2015 cohorts: *"Mobile Version is Available"* (July, 2016).

2. Email to Alumni: *"Invitation to share their current projects"* (August, 2016).

3. IAD 200 Presentation to 2016 cohort (October, 2016).

4. Email to 2016 cohort: *"Inviting students to contribute and visit D-Map"* (November, 2016).

Graphic 1: Effects of outreach activities in community members' contributions to D-Map
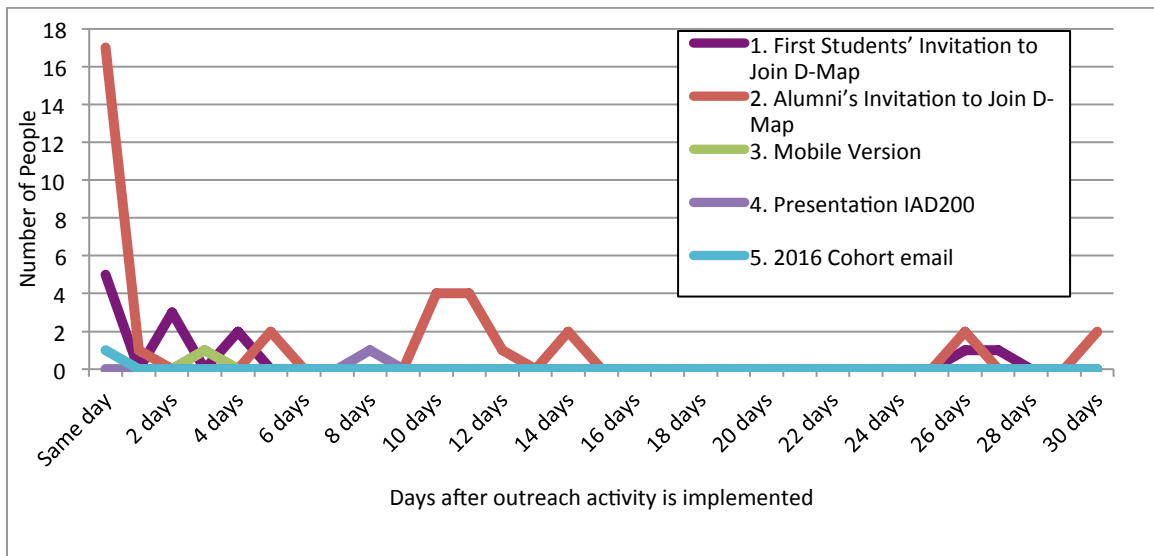
After each outreach activity, community members contributed within the first fifteen days, however after thirty days, the effect of emails in contributions decreased to zero.

Chapter VII: Results & Evaluation of GIS as ICTs in International Development Programs

After one year of design, implementation, and promotion, D-Map served as the pilot to validate the performance of geographic information systems (GIS) as Information and Communication Technologies (ICTs), to become effective knowledge banks and knowledge-sharing platforms in communities involved in international development efforts. Goals for this last step in the participatory design process included:

1. To evaluate the usefulness of participatory online maps as underline knowledge banks for International Development Programs to store, manage, and serve their work as communities of practice.
2. To evaluate the usefulness of participatory online maps as underline knowledge-sharing platforms for development practitioners.
3. To collect data about community members' motivations and barriers to contribution to knowledge-sharing platforms.

Online interactive maps (GIS) as Knowledge Banks (Goal #1):

Overall, D-Map proved to be a reliable and representative source of data (projects), which program coordinator (Theresa Costa and later Angie Nguyen) and high-level decision makers at the International Agricultural Development Graduate program are using to inform prospective students and stakeholders. By December 2016, D-Map had **eighty-two projects** in **forty-six countries**, and from **fifty-five students and alumni**. These geographically distributed projects varied in topics (soils science, nutrition, crop systems, etc.), location, and extent.

Table 1: Distribution of IAD community members in D-Map

Year of Admission	Contributed To D-Map	Total N	Ratio D-Map / N	Gender F	M
2016	3	18	17%	1	2
2015	8	23	35%	4	4
2014	15	18	83%	13	2
> 2013 (Alumni)	29	500[8]	5%	12	17
Total	**55 people**		**35% (Average)**	**28**	**25**

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[8] Estimate.

Table 2: IAD Projects by Continent

Continent	Number of Projects
Africa	24
Europe	4
Asia	21
North America	23
South America	10
TOTAL	**82**

Chart 1: IAD Projects' by Country

Senegal 6%
Tanzania 6%
United States 12%
Afganistan 5%
Paraguay 4%
Haiti 4%
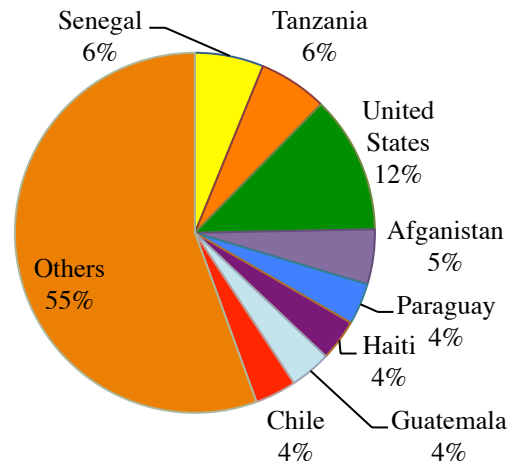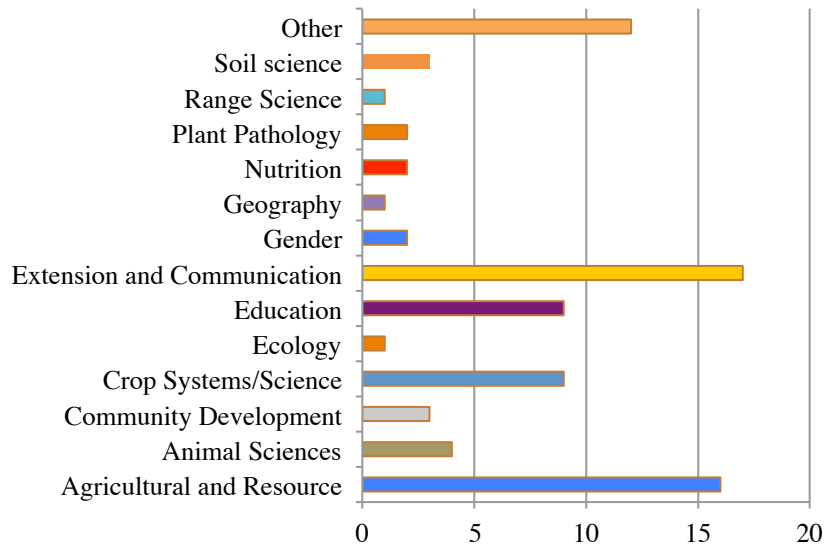Guatemala 4%
Chile 4%
Others 55%

Table 3: IAD Projects by Category

Online interactive maps (GIS) as Knowledge-sharing Platforms (Objective #2)

After one year, D-Map showcases students' projects and promotes knowledge exchange within community members (prospective and current students):

1. IAD students respond positively to outreach mechanisms (email): In average 45% of IAD students contributed to D-Map within a time frame of two weeks after each outreach activity was performed.
2. IAD students able to create new contributions by following the guidelines provided above D-Map (website).

3. Prospective IAD students are able to learn about past and current IAD projects as well as connect with current students using D-Map as a source of knowledge.

IAD Program coordinators (Theresa Costa and Angie Nguyen) currently use D-Map to show prospective students what and where past and current students have worked on.

Even though, D-Map proved to be a reliable and representative source of knowledge for students, throughout the implementation and validation process, technological and social barriers were recognized and tackled.

Social Barriers for contribution in knowledge-sharing platforms:

Under-contribution: In February 9th, 2017, a short survey was delivered and completed by eighteen IAD students (cohort 2016). This survey had as it main goal to understand the motivations and barriers for contribution among the 2016 IAD cohort in order to develop better outreach strategies and ultimately increase members' contribution in the future. This survey was a result of a very low contribution of the 2016 cohort. Even though results from this survey showed that email was an effective outreach tool (95% of the participants knew very well or fair enough what D-Map is for), 88% of the participants had not contributed to D-Map (by the time they answered the survey).

This survey was based on studies done by Archidvili: "*Motivations and barriers to participation in virtual knowledge-sharing communities of practice*" (2003), and Beenen: "*Using Social Psychology to Motivate Contributions to Online Communities*" (2005).

Motivations for knowledge contributions were based on the "Benefit" factor (self-benefit, other-benefit, and self and other benefit), described by Beenen (212). Results from this survey showed that participants' most important motivation to contribute comes from supporting future community members (students) so they can learn about the community and its practice (other-benefits). Followed very closely, self-incentives to learn about previous projects and/or connect with past members of the community (self-benefit) were strong intrinsic motivations for contribution to D-Map. Finally, motivation to showcase their projects and have access to resources from other groups at UC Davis were not considered as important reasons for contributing to the map (self-benefit). Students

considered the low visibility of the map, *hidden* under the IAD website, as one potential reason for low levels of contributions.

Limitations for contributing to D-Map were attributed to three main factors:

- Communication (lack of clarity of the map's purpose)
- Content (information was not reliable or out-of-date)
- Technology (difficulty to find information in regions with too many projects).
- Lack of incentives to contribute,
- Fear of criticism (not being sure if their projects were good enough).

This new knowledge about students' motivations and limitations for contribution to knowledge-sharing maps was used to improve the outreach plan and adjust the scope of the map. After this last iteration, projects with more than four years would be removed from D-Map once a year, and transferred into a Historical database (Google drive). Finally, a list showing students' names was added to the left side of the map to facilitate navigation on the map.

Chapter VIII: Sustainability & Scalability Models

After implementing D-Map in collaboration with the IAD community, and thanks to my work at UC Davis D-Lab as a Graduate Student Researcher, I was able to connect with International Development Programs and validate the idea of using GIS as platforms for sharing and storing knowledge. The goal for this final iteration was to provide International Development Programs with a step-by-step guide to design, build, promote, and maintain online interactive maps.

The D-Map Manual consisted in a ten-page manual composed by four steps:

1. **Design**: This manual guides a community through a co-creative process between community members with the goal to design an online map that is easy-to-use and understand by community members.

2. **Build**: This manual explains how to create, test and improve an online interactive map using zeemaps.com (mapping tool).
3. **Promote**: When the map is ready to be launched, how to reach the target population and engage them is key to ensure their future participation. This manual provides an outreach plan and outreach material.
4. **Maintain**: Finally, this manual provides guidelines and resources to maintain, and keep your map up to date (avoiding crowded and out of date maps) at zero cost.

Between October and December 2016, online meetings (Skype) were held with six international communities. The Manual was sent for guidance; however this tool didn't prove to be self-sufficient for communities to build their own maps. This is why, mentoring was provided through the process.

Finally, as part of the process to ensure the sustainability of D-Map over time, two documents were developed and delivered to community members at the IAD Program:

1. A step-by-step manual for students to update D-Map once a year. This manual was validated with one IAD student who was able to complete the manual and update D-Map in only twenty minutes.
2. An Outreach Calendar that Program coordinator received to promote students' contributions to D-Map over the academic year.

Chapter IX: Conclusion

This project was conducted over a one-year period (2016) to evaluate the effectiveness of geographic information systems (GIS) as knowledge-sharing platforms. For these purposes, the International Agricultural Development (IAD) graduate group served as the population under study to test the viability of GIS as Information and Communication Technologies (ICTs) in International Development Programs, and D-Map corresponded to the GIS platform under study.

In his article *Motivations and Barriers to Participation in virtual-knowledge sharing communities of practice*, Alexander Archidvili provides important considerations (factors) to promote knowledge exchange within communities of practice. These factors were used in this project as the theoretical framework (criteria) for a benchmark analysis between current ICTs and GIS.

The capacity to share and store knowledge at the UC Davis International Agricultural Development Graduate group was included in this framework:

Benchmark Analysis (Social and Technology Criteria):

Criteria → <u>Communication Technologies</u>	Social Criteria			Technology Criteria				
	Institution Based	*Intrinsic Motivations*	*Source of Knowledge*	*User-Friendly*	*Time Efficient*	*Safety*	*Data storage and Mgmt*	*Zero-cost*
Email	✔	✔	✔	✔	✗	✔	✗	✔
Social Media	✔	✔	✗	✔	✗	✔	✗	✔
Websites (Directories)	✔	✔	✔	✗	✗	✔	✗	✗
Participatory GIS	✔	✔	✔	✔	✔	✔	✔	✔

Results of this study show that participatory GIS have advantages such as a low startup and maintenance costs, low time required to build, low time required to manage and update data (compared with existing solutions), easy to use, and visually attractive for community members and stakeholders, thus GIS can be used as ICTs to promote

knowledge exchange in international development programs. Nevertheless, important considerations regarding <u>social</u> and <u>technological</u> limitations of GIS as ICTs need to be addressed.

Sub-optimal participation: Despite the benefits of online communities as a source of knowledge and other resources, sub-optimal participation is a common problem that authors involved in human-technology interaction studies, such as Butler (1999), Adar (2000), Ardichvili (2003) and Beenen (2004), have investigated in depth. The challenge relied on how to generate ongoing contributions from a larger fraction of the participants (Beenen, 2004).

Technology Adoption: Adoption of new technologies such as GIS by communities (International Development Programs), requires a set of factors:

1. Institution-based communications: Technology (i.e. GIS) needs to be community-driven to promote credibility, proximity, and participation. Outreach strategies are more effective when Program coordinator or faculty assumes this task.
2. User-friendliness: Technology (i.e. GIS) needs to be easy to navigate and easy for users to contribute and have access to knowledge.
3. Safety: This criterion relates to privacy concerns that participants can face when choosing to share information online and potential misuse of the information.
4. Reliable source of knowledge: Technology allows only community members to contribute while external users can visit the tool but are not allowed to contribute.

The study "*Participatory GIS: Opportunity or Oxymoron"* also provides important considerations for future use of GIS as online tools for knowledge exchange: Cost, sustainability, privacy and confidentiality, skills and training, user- friendliness, data quality, and currency and legitimization of 'bad' data.

Chapter X: Future Steps & Important Considerations

This project proposes further improvements for current GIS to become effective tools to better communicate international development efforts.

Further improvements include:

- *Demand Development:* One of the factors determining virtual knowledge-sharing communities' success defined by Archidvili (2003) is to ensure a continuous supply and demand of contributions: For a community to be vibrant, there should be also an active participation on the demand side too: numerous members should be visiting the CoP "website", using online search tools or posting questions when they search for advice or information (Ardichvili, 66).
- *Specific Goals:* How to include specific goals as a strategy for individual contribution. According to Bennen (2005), specific goals led to higher contribution rated than non-specific ones.
- *Create user-based messages:* To design persuasive messages that encourage community engagement and contribution to knowledge-sharing platforms. To do this, all or some of the following elements need to be included into the message:
    a. Uniqueness: Based on the collective effort model, believing that one's contributions are unique in a group or that they will benefit the group (intrinsic motivation)
    b. Prize for contribution (extrinsic motivation)
    c. Recognition: Believing that their contributions to the group are identifiable.
    d. Understanding that their individual efforts will lead to value of group performance.
    e. Access to resources (faculty, project volunteers, grants, jobs)
    f. Salience of benefit and the beneficiary: The collective effort model also posits that people are motivated to contribute when they see the value that their contribution makes to an individual or group outcome (Karau, 1993)
    g. Benefits dissemination: Benefit to self and others.

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- Participant at the International Development Design Summit (MIT), Colombia. Professor Kurt Kornbluth.
- Two-day training ArcGIS. UC Davis Global Affairs. Professor Karen Beardsley.
- Expositor at the First Latin-American Congress in Interdisciplinary Education, Montevideo, Uruguay. Professor Kurt Kornbluth.