

Going Global – Lessons learned from developing an online Master's in ICT4D

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Abstract— Information and Communication Technology for Development (ICT4D) is a rapidly expanding field where successful outcomes require interdisciplinary collaborations. Stakeholders involved in ICT4D projects have a wide variety of educational backgrounds and ICT4D training. Literature and education on ICT4D has been compared to a lost sheep but currently there exists seven master programmes in ICT4D at university level (University of Colorado, Boulder, Berkeley University of California, University of Cape Town, Royal Holloway University of London, University of East London, University of Manchester and Kobe Institute of Computing). However, none of these existing programmes are entirely available online and possible to complete by distance studies only. The aim of the present study is to analyse and discuss the needs and requirements for a master's programme in ICT4D given entirely online as distance education. Applicants to a new online master's programme developed at the Department of Computer and Systems Sciences at Stockholm University have responded to an online questionnaire on what they find important in an ICT4D programme. Findings show that even though online education has been around for quite a while, there are still a lot of issues to address and globally oriented distance education does have particular pedagogical, cultural, administrative and technical challenges. The lack of interdisciplinary programmes in ICT4D is evident and we definitely think that there is a need for a new master's programme that is given in distance mode only. Furthermore, our vision is to open up the programme in the line of open access principles in a near future when course content and pedagogical ideas have been evaluated more in detail.

Keywords— Online learning, Distance education, ICT4D, e-learning, Technology enhanced learning

I. INTRODUCTION

Capacity building is a crucial part of development. Access to high quality education is a key to sustainable development in all areas of society. As the diffusion of ICT intensifies globally, there is also a growing need to understand the dynamics of this process. ICT for development is a growing, interdisciplinary field of research which can support the development efforts with relevant information and knowledge. The use of ICT in development projects has rapidly grown in the 21st century where a few success stories are accompanied with failures and lack of sustainability [1]. Literature on ICT4D and appropriate education in the field are seldom there [2] and ICT based development projects are often ill designed [3] and sometimes without coordination with other ICT initiatives in a country [4].

The various stakeholders involved in ICT4D projects have a wide variety of backgrounds and there is a need for an improved multidisciplinary ICT4D training [3]. At university level, there are lots of ICT4D modules but only a few where ICT4D masters programs are available (currently seven). Most of them have a very limited online presence and none of them are given in distance mode accessible in developing regions.

A new online master's programme, which is open for a global audience, was launched in September 2013 at the Department of Computer and Systems Sciences at Stockholm University in Sweden.

II. AIM

The aim of the present paper is to analyse and discuss the needs and requirements for a master's programme in ICT4D given entirely online as distance education. The paper will point out some challenges and lessons learnt, and suggest issues for further examination.

III. BACKGROUND

1) *ICT for Development (ICT4D)*: A rapid expansion of infrastructure as well as services and applications have made ICT an essential part of today's societies around the world. "ICT for development" is a fairly new, interdisciplinary field that examines the use of technological innovation for socio-economic development.

The term ICT4D mainly refers to the possibilities of Information and Communication Technology (ICT) as a catalyst for various kinds of development. Most research in the area of ICT4D is focused on the evaluation of the feasibility of existing technologies and often with an emphasis on tools and techniques of Western or Far East Asian origin [5].

Important areas in ICT4D are infrastructure development and capacity building in ICT, e-government/governance, e-learning, e-business, e-health and digital content development. Billions of dollars have been invested in ICT4D programmes around the world with funding from international aid organisations, state funded aid agencies and multinational companies. ICT4D is a complex, multidisciplinary and multi stakeholder field with an emerging theoretical framework [1]. Research on ICT4D and its components is a relatively young discipline and compared to other areas in social sciences, it is still greatly under theorised. The suggested multidisciplinary approach is seldom truly applied and literature on ICT4D has been compared to a lost sheep [2].

...very first time a computer was used in a developing country was at the Indian Institute of Statistics in Kolkata in order to improve the scientific calculations. In the early stage of ICT4D from the 1950s until the 1990s computer supported development in emerging regions was focused on two main areas, initially for administrative functions of the public sector and later in the 1980s as a tool for increasing the economic growth in the private sector [6]. In the 1990s, the rapid growth of the Internet extended IT into ICT emphasising the communicative possibilities of the technology and the United Nations Millennium Development Goals formulated new targets for global development in the areas of health, education and gender equality. A myriad of ICT supported development projects were rapidly initiated and often too hastily without appropriate planning, design or evaluation. The major challenges in ICT4D 1.0 have been identified:

Lack of scalability: Small and isolated ICT initiatives were impossible to scale up

Lack of sustainability: Quickly started project also had a sudden death

[6]

The 4D part of the ICT4D acronym seems easier to explain and motivate than the ICT part of the acronym [6] and it is not doubtful if the investment of ICT by itself can lead to any real elevation [2]. The person behind the One Laptop Per Child (OLPC) Foundation, Nicolas Negroponte, once said about the OLPC project:

It's not about training teachers. It's not about building schools. With all due respect, [to HP's e-inclusion efforts] it's not about curriculum or content. It's about leveraging the children themselves". [7]

However, the majority of experiences around the world contradict Negroponte's statement and that the lesson learned is that the acquisition of ICT itself is not enough and that educational projects always will need pedagogical frameworks. The Asian way of developing content in local languages is more promising and in general there is a need for an involved contextual understanding and careful design if ICT4D projects should be successful and sustainable [8],[9].

Further development of the field of ICT4D requires relevant education combining knowledge of technologies, digital literacies, understandings of development issues, social sciences and history into a holistic perspective that will allow people engaged in ICT4D to run projects that will work for sustainable change and improvement for emerging regions.

Technology enhanced distance education: Technology-enhanced learning or e-learning, is designed and developed with the objective to provide socio-technical innovations for learning practices given in an Internet teaching and learning environment independent of time, place and pace. In emerging regions, the lack of sufficiently trained teachers is often a barrier to traditional face-to-face education. With appropriate design, technology enhanced learning can be an efficient alternative for education in emerging regions, not least in rural areas [4].

Two crucial issues for technology enhanced distance education have been identified:

- **Scaffolding:** The need for scaffolding and structure is probably higher in technology enhanced learning than what is the case in traditional education. Scaffolding also seems to be even more important in online courses with global participation [10]
- **Multi-modality:** Variety in learning styles requires special consideration in e-learning [11]. In online courses, learners with an audio learning style will miss traditional lectures and suffer if only visual information is given. To superimpose multi-modal course content is a way of addressing some of the problems with different learning styles in online environments. According to the Dual-Coding Theory, presentations using various media modes will improve the learning for students in general [12].

IV.

ICT FOR DEVELOPMENT – MASTER'S PROGRAMME AT STOCKHOLM UNIVERSITY

1.) Background to the programme: The Department of Computer and System Sciences at Stockholm University (DSV/SU) decided in 2012 to establish a new Master's Programme in Information and Communication Technology for Development (ICT4D) with some financial support from The Swedish Program for ICT in Developing Regions (Spider).

The time was right for this enterprise from several perspectives. DSV has got a history of several research and development collaborations in developing regions in Africa and Asia with an increasing number of doctoral students. As a natural continuation of these collaborations Spider was established at the department in 2004. Due to the position of DSV within the Faculty of Social Sciences, the interdisciplinary nature of computer and systems sciences has always in a natural way characterised both research and education resulting in newly defined profile areas that mirror the current societal developments and interests. One of these profile areas is ICT for development thus giving DSV a strong base of expertise in the area.

Another expanding research and development area at DSV is technology enhanced learning (TEL), online education, and open education initiatives. The general policy of the department is to increase the volume of both online and open education.

Combining expertise in the area of ICT4D and in TEL gives DSV a unique possibility to develop a programme that is innovative in both content and in pedagogy.

2.) About the Programme vision:

The goal of the programme is to educate individuals who are capable of initiating and implementing sustainable change in developing regions. We aim to train graduates who will be aware of the many challenges of development work and who are able to face them creatively and innovatively. It is also our aim that the students will take an active role throughout the programme and grow into bold, knowledgeable and motivated Change Agents contributing to environmental, economic, and social sustainability.

We are aware of the risks that lay in our set-up of providing a programme about developing regions for developing regions as we are part of the so-called developed North. Our understanding is, however, that through contextualisation and collaboration we can contribute in creation of a learning environment where knowledge building takes place on equal premises, where each participant is encouraged to contribute with their own local experiences, and enriched by multiple perspectives, further develop their knowledge. Our notion of knowledge building is contextual and collaborative as well as global and individual.

2.1) Challenge to the vision: In order to contextualise content and reach truly equal premises for knowledge building, we consider it essential and a key success factor to the programme that the student body consists of a mixture of individuals from all over the world. A main barrier to this is that non-European students are subject to an annual tuition fee of SEK 135,000. For citizens of countries within the EU/EEA or Switzerland, the application and tuition fee is free of charge and tuition fees in higher education in Sweden are fully subsidized by the government. Consequently, this year, there were only 13 non EU students admitted and accepted to the Master's programme, while there were 139 presumptive EU students in the admission process. We have approached both the university authorities and Swedish development authorities in the matter. For us the current situation is highly problematic. Collaborations and joint ventures with institutions and organizations globally and in emerging regions particularly may play an important role in finding creative solutions to overcome the tuition fee barrier.

3.) The academic goals of the Programme:

The new master's programme in ICT for development was established to be a two- year online programme giving a Master of Science degree for the completed studies.

The academic goals of the programme have been formulated according to the standards and requirements of the Swedish two-year master's degree [14]:

- Have a clear understanding of different approaches to development and their theoretical underpinnings;
- Recognise and understand the relationship between development theory and contemporary development practice in a number of key thematic areas;
- Understand the ways in which the history of development shapes present day global economic and social change;
- Recognise and understand some of the reasons for the similarities and differences between and within developing and industrialised societies and economies;
- Demonstrate the ability to critically analyse material in the readings and present their arguments coherently through written assignments, group work and oral presentation;

The first year will give the students a solid theoretical and practical platform. They will learn about the theories of development and about the technologies that are available today. They will train methods of research and project management and examine cases of development projects with ICT.

The second year will enable the students to deepen their knowledge and skills. They will examine more closely four specific areas: e-business, e-governance, e-health and e-learning. They will conduct field studies, practice and gather empirical data for their thesis work. The thesis will give the students the opportunity to dig deeper into an area of their special interest.

Our goal with the programme is to help the students build a critically informed understanding of development and how ICT can be part of that development.

3.1) An online Programme:

The Programme is distributed online and the only one of its kind, designed for students from around the world. It offers a unique opportunity to study in the rapidly evolving field of ICT4D with the guidance of leading experts and researchers. The programme can be described as 'third way' for Master's studies. It is purposefully situated between the intensive face-to-face environments (such as offered at Royal Holloway/University of London) and the huge impersonal online environments (such as MOOCs). It opens a possibility for studies beyond time and place with a personal involvement of teachers and e-moderators and peers. The loneliness for an online distance student is hopefully reduced through collaborative assignments and accessible teaching staff.

V. ABOUT PROGRAMME DEVELOPMENT

1.) Development phases

We developed the Programme in four phases: needs assessment, structuring and content creation, programme launch and parallel content development, evaluation.

A needs assessment served as constructive input to the project process discussion among project team members and stakeholders. The needs assessment guided us in deciding the direction and vision of the programme. We want to emphasise transformation and agency and that the participants of the programme would be trained to become valuable change agents in their own contexts.

During the development phase, varying ways of working were applied. Brainstorming, workshops, exchanging ideas and experiences from previous online courses were carried out on demand. University teachers are accustomed to work individually and independently. In development of an entirely new programme it was quite essential to facilitate for collaboration for several reasons.

The initial Needs Assessment [13] underlined the importance of drawing together a committed and competent core team who would establish the philosophy and direction for the programme. The team became to consist of two key persons, the project manager with the central role of keeping the work focused and in the limits of time and economy, and the programme director with focus on the academic standards and pedagogical requirements of the programme. These two central figures worked in close cooperation with the teachers who were assigned the different courses, with the student administration, director of studies, technical support at the department, and with Spider which provided funding and expertise.

Our aim was to work for increased openness and transparency. Teachers were able to see all the emerging

courses of their colleagues. This was a way to guarantee a red thread through the programme and to see that the course contents did not overlap but complemented each other in a relevant way.

Collaboration between participating teachers was even a way for us to strengthen the motivation of the teachers to work with online education which still is a relatively rare way of teaching for many, and which still lacks clear incentives for the teaching staff. However, the closest and most intensive collaboration took place between the project manager, programme director and one of the course teachers.

We also found it important to underline recognisability. We wished to create a programme with a clear structural and visual identity so that the different courses and the whole programme would become easily identifiable to the students, which again required close collaboration between teachers. Our ambition was, however, somewhat disturbed by the platform design and its constraints.

The major challenges of providing education online lay in how pedagogy, technology and organisation can interplay. The space for pedagogical design possibilities is greatly affected by the technology and platform design. Of course, even a teacher's knowledge of the possibilities of a platform plays a central role in how an education is designed and delivered. The organisation of an educational institution is to support teaching and course creation but often there are inflexibilities in the system hindering innovative approaches.

Our decisions about programme content and structure were partly based on the results of a survey conducted among the presumptive students. Many saw the programme as a way to build on their previous competences and gain up-to-date knowledge in an area subject to rapid change. Some of them had been working with ICT for a long time and wished to 'certify' their knowledge with an academic degree. The motives were not only attached to their own professional development, but we could identify altruistic notions of capacity building and development efforts which they wished to carry out in their home countries.

We also decided to provide the programme as full time studies because our student survey suggested that a majority of the respondents were keen to finish the programme within two years. However, they added that they actually wanted to have an employment parallel to their studies and conduct their studies during evenings and weekends. The alternative of 'half time' studies would imply an engagement of four years, which is a long time. It will be a great challenge for us to support the students in carrying out their studies with high quality and high efficiency.

2.) Multi-modal ways of scaffolding - about programme pedagogy: The central pedagogical ideas of the programme were based on constructivism and connectivism [15]. We believe that each individual is in charge of his/her own learning and constructs new knowledge and skills based on previous experiences, skills and knowledge. We also think that learning is social by nature and that collaboration is a key element of successful learning [16],[17].

In addition, there is a focus on contextualization in a sense that students are consistently asked to contextualize the assignments to their own environment. Contextualisation is

also provided through the multi-cultural, multi-disciplinary teaching staff. Programme/course content is brought from the many collaborations the Department has in the world. Our programme also reflects the values and pedagogical understandings of the Swedish educational system, which are based on the emphasis of student independency and activism, critical thinking and reflective reading. The expectations of international students may differ from these core values and it is important to create an open dialogue about the mutual expectations and build a common ground for learning and teaching. We believe that transparency and emphasised clarity concerning pedagogical aims are crucial for student motivation and performance.

Retention of students at the course, programme, or degree level has been a great concern for many educators and in the online learning context dropout rates tends to be higher than for on campus courses [18]. High interactivity and managerial oversight seem to be very critical to maintain high completion rates [19]. Loneliness of the long distance student is a fact and as educators we need to understand the mechanisms of this and provide flexible scaffolding throughout the programme.

In our case, this has been done by increasing the possibilities to collaborate between participants and even making collaboration part of the course requirements. To provide clear information, we arranged an introduction to the programme as an online streaming activity consisting of brief programme and course information, interviews with course teachers, chat for questions and answers and a hangout for socializing and getting acquainted.

In order to promote and initiate personalised interaction and familiarisation, students were asked as their very first assignment to make a presentation of his/herself and publish it online in the programme's online learning platform. We thought that it would be of great importance to the participants to introduce themselves and to get to know each other and their differing backgrounds and experiences so that the ground for fruitful networking would be in place right from the beginning. These presentations took form of short written notes or even video clips.

Each course consists of a variation of assignments: individual reflections on text/audio/visual materials, peer-to-peer commenting and assessment of each other's texts, individual quizzes, small essays and project work. We also encourage participants to turn to their peers with questions instead of always addressing the teacher. As the student body is knowledgeable and experienced, it is important to create a collaborative learning environment where each and every one is recognised as a contributor and an equally important participant in knowledge creation [20],[21],[22].

An important, complementary role in online education is that of an e-moderator who functions as the closest support and inspiration to the students in forum discussions in particular. We hope that an e-moderator will work as an assistant teacher thus easing the workload that an online teacher otherwise may have. As the continuous support is essential for online students we hope that the e-moderator can contribute to fill these social and pedagogical needs.

Our understanding is that in the field of ICT for development it is particularly appropriate to combine theory and practice. We believe that the field is greatly under theorized which

prevents the systematic application of past experiences and lessons learnt for the evolvement of the field. Our presumptive student survey shows that a considerable number of the respondents have a long experience in the field of ICT4D but lack academic studies. It would be foolish not to recognize this body of practical knowledge and experience. On the contrary, we plan to rely on this knowledge, as well as making the effort of enhancing interaction between theoretical studies and practice through close examination of case studies and providing opportunities for practice placements during the second year of the programme.

As ICT for development is one of the so called profile areas at the Department, it is important to link the education in ICT4D with the emerging body of research in the same field. Fruitful collaboration and exchange will benefit both strengthening the quality and relevance of both education and research.

VI. DISCUSSION

The field of ICT for development is relatively new and lacks in theoretical work as well as in knowledge building on lessons learnt. There is a need for systematic studies as the field is growing and the needs concerning sustainable development with ICT in emerging regions are increasing. Until today, academic education in the field of ICT4D that is available globally has not existed [13] and with the objective to reach relevant target groups, we have chosen to develop and distribute the ICT4D programme online for distance studies.

The described new global master's programme in ICT4D was launched in 2013 available to students completely online. One ambition is to collaborate with universities in developing regions as active contributors that are making the programme content valuable locally. Lack of interdisciplinary programmes in ICT for development is evident but the multidisciplinary nature of the Department of Computer and Systems Sciences at Stockholm University might contribute to the development of a programme with interdisciplinary collaborations over the traditional borders.

It is challenging to give programmes entirely online in our traditional university organization. It is more common that online education is done as an application of campus education or as blended learning as part of campus education. In the development process, we have met both administrative and pedagogical 'gaps' suggesting that the academic and educational structures still lack in adaptation to the special requirements of online education. Our experience is that educators need support and training in the beginning both system wise and pedagogically. It cannot be taken for granted that functionalities of a system and the pedagogical possibilities of it are obvious for a seldom user of a system. Collaboration between those with more experience and beginners is thus valuable and a way to build competence within organisations. In addition, it is also valuable to the course development process, that institutional regulations and administrative routines are adapted to online conditions.

As "...Innovation in an educational setting requires both courage and stamina..." [23], we are fully aware that our enterprise is still in the beginning of a long journey, and a lot of effort will be required of us to realise the full potential of our online educational vision. In continuation, our ambition is

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to closely monitor the first round of the programme and make revisions and adjustments along the way as we understand that education in all its forms is an on-going and never ending process.

It is our ambition to conduct further research on the pedagogical and organisational aspects of online education. There are several interesting research questions to be answered: How does the pedagogy of contextualisation and collaboration function online? How does the technology, the online learning platform support the pedagogical design of the programme? How does the knowledge creation take place through contextual and collaborative assignments?

We also need to consider how to become truly global and find ways of opening the programme to non-European students. Here we need to find local partners globally and develop joint programmes.

After establishing a firm ground for the online programme, our vision is to open up the programme in the line of open access principles, but first we want to assure the quality of the materials through further development and experimentation.

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