

A practical ICT for development framework: The ICT Center of Excellence

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ABSTRACT

This paper describes an initiative to implement a network of competency building centers that can assume a central role in shaping the Information Society in developing countries. The paper describes the business model of the centers and reports on the evaluation of their performance and their impact on national ICT initiatives for development. The main objective of the evaluation is to quantify the degree of success and effectiveness the initiative has contributed to the development of the Palestinian IT sector. In this paper we report on the evaluation of SKITCE Center of Excellence, as a model of the initiative's five centers.

The initiative involves the establishment of ICT Centers of Excellence in close proximity to Palestinian universities which host academic institution in IT and related fields. The Initiative serves multiple purposes, in that it enables IT to act as a transformational agent for economic and social development of the Palestinian society. To that end, it works to generate highly qualified IT professionals, badly needed by the IT industry. The center further works to create strong links to the private, public, and to NGOs communities to enhance their roles in the development drive. Among the strategic goals of the initiative is to provide capacity building that help entrepreneurs build viable IT businesses, through providing facilities, resources, and tools to develop both a research and development culture and activities in a rich environment for innovation and creativity.

The assessment of the activities has exhibited mixed results. The training and capacity building endeavors have shown ample successes. The vast majority of the surveyed trainees felt that they gained valuable knowledge and experience in their field of specialization, and believed that the training was critical to their successful job search. On the side of business development and promotion of entrepreneurship, however, the center did not score tangible achievements, and it tended to show a lack of vision and clear route to make a breakthrough in that regards.

Keywords: *ICT for Development, Center of Excellence, IT Training and Education Programs, IT for Poverty and Unemployment Reduction.*

INTRODUCTION

Information and Communication Technologies (ICT) has been receiving mounting attention in recent years as a critical driving force for development in both developing and developed countries alike. Many scholars, (Fuglesang, 1972, Rostow, 1960, Ngwainmbi, 1995, Lerner, 1958) have stressed the value of information and communication and they all tend to see these as prerequisites for economic and social development. Nagwainmbi (1995) describes development as an ongoing process which requires information in constant flow among politicians, decision makers, project leaders, and receivers. Moreover, information is a "non-exhaustible" item, i.e. its use does not in itself degrade its present or future availability, Meier (1980).

The importance of information and their processing technologies have given rise to a new development paradigm, that endeavors to explain the process of development and growth through endogenous forces such as human capital, knowledge 'spill over' and ICT, (Sengupta 1998, Castells 1996).

ICT is now receiving mounting interest from aid and international agencies that see it as one of the best development catalyst. Many of these organizations believe that ICT gives inimitable prospective to establish contacts and relations as well as being a source for knowledge exchange and innovation to the poor communities, Goransson (2000). The new wave of technologies, being the Internet and its applications, the mobile and its applications, or the satellite TV stations are forming a new platform for communications and information exchange of allies and lobbying to defend the rights and interests of poor and marginalized communities. Moreover, this platform is very effective learning tool to facilitate educating and training communities with issues that are crucial for their development and betterment. With these new tools, there is no need for the community members to be physically present to socialize and participate in activities.

On the contrary, there are also critiques for this view. Wilson and Heeks (2000), argue that ICT, like any other new generic technologies, is often mentioned in wide prospective about what it can do for development. There is an overall belief that poor people and developing communities should gain eventually when adopting new technologies, the same way as developed communities do.

Many claims are being made for the role of ICT in poverty alleviation and development facilitation, Wilson and Heeks (2000), especially that these technologies can be readily adopted and should not be reinvented, in what has been recently coined as "leap-frogging". According to Wilson and Heeks, ICT may play three main roles in the development process of poor communities. First, ICT can be seen as a production sector, of either tangible (hardware) or intangible (software) products. The second role views ICT as an information processing technology, with the motivation that all people and enterprises in modern days need to process information that arises from inside and outside. Domestic information should be processed and interrelated with the indigenous environment to generate knowledge and to be ready for decision makers to enhance operations efficiency, productivity and accountability. This will allow the enterprise to acquire a competitive position at local, regional and international stage. The third promising role is the communication technologies, which is in line with Ngwainmbi, (1995), who views ICT as a tool for fast and reliable communication and exchange of information and knowledge. Furthermore, the ICT sector requires less initial investments in capital and infrastructure than do more traditional sectors, which may be why high-tech industries are growing faster than medium-tech industries in developing countries, Jussawalla (2001).

These views are just some few examples of the extensive debates that have been taking place at the macro level in development discourses. However, a gap does exist in knowledge and practices at the micro level, that is, on the level of know-how in employing ICT to achieve development, particularly in the context of developing nations, Fuglesang (1973). This paper gives an insight in a development initiative that touches on the micro level of how effective ICT could be in fighting poverty, and achieving prosperity.

Within the perspective of a developing nation, ICT supports a wide range of human activities and it offers a means of breaking barriers to knowledge, civic participation, social and economic opportunities. Developing countries aspire to boost economic and political capability through adopting forward looking development strategies, through promoting foreign direct investment, technology transfer, research and development, human resources development, and employment, Sachs (2005). The initiative at hand is in line with this investment stream of business and meant to achieve similar goals.

Having said this, it is still less transparent how a country or a community in a developing nation should utilize ICT to attain their development goals. Countries in different parts of the world are trying a wide spectrum of routes and initiatives in their way to achieve development, and mixed results are being reported, Andeya (2002).

The most common ICT initiative is the so called tele-centre which has been tried in almost every country around the world. However, the aid and development community are shifting interests to other kinds of initiatives that could have further direct and more pronounced economic and social impacts similar to the initiative at hand, (Proenza 2001, Oestmann, 2003, Mahmood, 2005).

The present initiative focuses on ICTs as a production sector to promote economic and social progress and work in close collaboration with higher education institutions. The idea is not new, and there are reports that describe similar endeavors across the world. In Africa, in Asia and in Latin America, we can find comparable initiatives, Hanna, (1994). In West Africa for instance, the government of Ghana, through a partnership with the Government of India launched a state-of-the-art facility to establish an ICT center of excellence to stimulate the growth of the ICT sector in ECOWAS (Economic Community Of West African States) and provides an enabling environment for innovation, teaching and learning, as well as practical research on the application of ICT4D in Africa, (Dzisah 2006, Alemna 2006). Another similar initiative is the AITI (Africa Internet Technology Initiative) which was launched with the help of MIT University, and is committed to providing clients with opportunities for wealth creation through knowledge sharing and the optimal acquisition and application of ICT, Gray and Gaudi (2005). For more on similar initiatives see reference, McNamara (2003).

This paper reports on the experience gained by a group of researchers who extensively investigated a similar unique initiative in ICT for development. The team evaluated the initiative components, its business model, and its effect on building the Palestinian Information Society. The evaluation of the initiative focused on the performance of two sets of indicators: the establishment of the flagship Information Technology Center of Excellence at Al-Quds University, and the value of its activities and the success of training programs sponsored by the initiative.

The remainder of the paper is structured as follows: Section 2 describes the ICT initiative. Section 3 addresses the relationship between the initiative and economic development. Section 4 presents an evaluation of SKITCE, a key component of the initiative. Section 5 gives an overall summary of the key findings of the evaluation study. Section 6 presents some recommendations to improve the performance of SKITCE. Section 7 concludes the article and provides a glimpse at future work.

THE INITIATIVE OBJECTIVES AND MAKE-UP

The initiative outlined in this paper was sponsored by ANERA (American Near East Refugee Aid) whose general mission is to alleviate poverty and enhance the quality of life among the people of the Middle East, particularly amongst Palestinian refugees. In compliance with this mission, it decided to carry out an Information Technology initiative in West Bank and Gaza Strip. The project identified the IT industry as one with the long-term potential to create thousands of high quality, high paying jobs and aimed to facilitate the expansion of this industry. By focusing on delivering practical training to university graduates, students, and business people, ANERA hopes to build a cadre of international-standard professionals, who have the practical skill sets to help them find or create jobs and/or launch viable IT businesses in short periods of time.

ANERA selected the ICT sector as the target industry for the Program for several reasons. First, the IT industry does not require major financial investments in either equipments or infrastructure.

Also, generally speaking, the start-up and running costs of IT businesses are relatively low in comparison to businesses in other fields. Second, IT software and services are labor intensive which make them highly appropriate for the Palestinian society which is considered among the most highly educated in the region. A significant segment of the Palestinian workforce is well educated and academically qualified in engineering and technical subjects. Hence, intensive training, it was hoped, would turn these individuals into highly qualified ICT professionals. Third, many job opportunities exist for Palestinian ICT professionals, their products and services in the local, Arab and international markets. For more information see the organization web site: www.anera.org.

ANERA's strategic plan began with the establishment of four ICT Centers of Excellence; The Said Khoury IT Center of Excellence at al-Quds University in Jerusalem which was inaugurated in 2004, and to date has trained over 2,000 students and others in IT subjects, the vast majority of whom have gone on to secure employments in the field, (www.itce.alquds.edu). The Hasib Sabbagh IT Center of Excellence located at the Arab-American University in Jenin, was inaugurated in late 2006, (www.hsitce.ps). Both of the above centers were funded by the Consolidated Construction Companies-CCC, a multinational Palestinian owned construction firm.

A third Center for Excellence is located in the southern West Bank city of Hebron. It was established at the Palestine Polytechnic University under the name of Friends of Fawzi Kawash IT Center of Excellence, and was funded by a consortium of local and international firms, (www.ffkitce.ps).

ANERA's fourth IT Center of Excellence will be launched in Gaza. Intel Corporation has committed to provide funding and technical assistance for its establishment and consequently, ANERA signed a Memorandum of Understanding (MoU) with the Islamic University of Gaza to build and establish this IT Center of Excellence. For additional information on these initiatives see www.anera.org/ourWork/education/it.php

ANERA went on with its mission and in April 2008, the Najjad Zeenni Information Technology Center of Excellence (NZITCE) was inaugurated to be the fifth consecutive IT centers. The NZITCE was constructed at the campus of Birzeit University with the generous support of the Palestinian business man, Engineer Najjad Zeenni, see, www.birzeit.edu/institutes/nzitce/.

It has to be mentioned that another center of excellence was also build and inaugurated but it does not belong to the same network operated by ANERA, however, it uses the same business model. This one was inaugurated in 2007, funded by the Korean government and hosted by Najah University, in the West Bank city of Nablus. With this center there will be five operational centers in the West Bank, and one which is being constructed in Gaza, see the map below.

All five Centers of Excellence were designed with the following goals: (1) to offer training programs with professional trainers and state-of-the-art curricula, and in partnership with the IT business community, which would allow individuals to earn an IT certificate; (2) to provide career development services to help IT professionals find jobs; (3) to provide loans which would make high-level (expensive) training broadly accessible; and (4) to develop business incubating services for entrepreneurs.

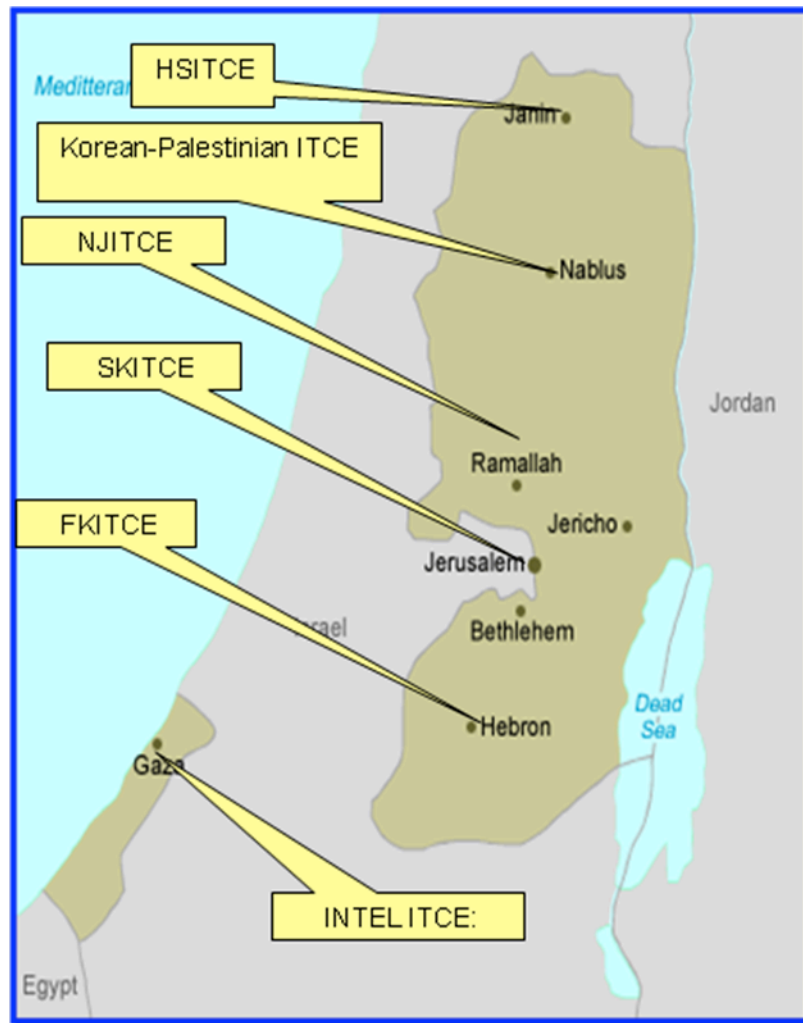


Figure 1: The five Centers of Excellence

The training phase started with the funding and implementation of training programs focusing on establishing a base of certified professionals. The pilot training and certification exam projects were completed at five Palestinian universities: Al-Quds University in Jerusalem, An-Najah University in Nablus, Palestine Polytechnic University in Hebron, and the Arab American University in Jenin in the West Bank, and the Islamic University of Gaza.

The Centers are located in the proximity of the university campuses to facilitate students and faculty interactions and access to the resources of each Center. They are open for the community at large as well. Academia and local business community meet in the Centers with the goal of developing training contents, environment and tools, which will enhance graduates' competencies in those areas of higher demands by local businesses.

Having decided on the particular training model to adopt, ANERA then decided that the business model to be adopted by the project would break up responsibilities between the three basic partners, ANERA, the universities and the Private Sector. ANERA, as the initiative sponsor,

assumed basic financial responsibilities to run the programs, recruit training centers and private sector partners to perform the training, and supervise the entire training process. The second partner, the university, was responsible for the training setup, the selection of the students, and the administration of the onsite activities of the training sessions. The hosting university was supposed to undertake this role voluntarily without any financial return. The third partner, the private sector, was responsible for the preparation of the training materials in collaboration with ANERA and with the input of the universities.

THE INITIATIVE AND SOCIO-ECONOMIC DEVELOPMENT

The adopted model was set forth with the intention to help the ICT business community generate some revenue. It also works to equip fresh graduates with state-of-the-art technology in badly needed professions. In this regards, it works to reduce unemployment among fresh graduates through encouraging local firms to hire them, which in the end helps to boost ICT industry.

It is believed that the achievements of the initiative objectives will have an improvement in the living standard and the prosperity of a significant section of the population, namely the graduates from IT schools in the Palestinian Territories. This improvement is a direct consequence of increasing the quality of universities' graduates and their preparation to take positions in the local market. This is of particular significance at this time, as poverty and unemployment have both increased in the last few years as a result of the political situation (occupation and sanctions) and any programs which alleviate and/or reduce this situation positively impacts not only the students but also by extension, their families and extended families. Efforts which help to maintain some level of economic stability during these times ultimately play key roles in maintaining political stability and in achieving future long term stability and peace in the region.

The initiative addresses the first goal of the Millennium Development Goals, namely reducing poverty. However, it has an indirect impact on the other goals as a result of preparing highly qualified and skilled IT professionals who can develop useful applications in many areas such as health, education, environment, etc.

EVALUATION METHODOLOGY

To evaluate this initiative, the research team gathered data using a combination of techniques, carried out in two phases. The first phase included: (1) A review of all key documents, files, and reports provided by ANERA, (2) The conduct of focus group meetings with beneficiaries, including university administrators, faculty members, students, and trainers, (3) The conduct of individual interviews with IT stakeholders; namely, Palestine IT Association (PITA), that represents the majority of the private sector businesses, Palestine Information Communication Technology Incubator (PICTI), a number of NGOs, and a number of private sector IT firms. The team conducted 39 individual interviews with key stakeholders throughout the project, including information system managers and ICT practitioners (e.g. software developers) (10 interviews), professors, university presidents and ICT education practitioners (15 interviews), Business consultants and CEOs (8 interviews), ANERA management personnel (5 interviews), and others.

The second phase consisted mainly of a quantitative analysis and assessment of the initiative. A questionnaire was developed and mailed to trainees and beneficiaries. The questionnaire contained a series of tasks and knowledge/skills inventories drawn from discussions in phase one, including: (1) assessment of training programs and their contexts, (2) effectiveness of training programs in terms of teaching methodology, (3) impacts of training on trainees' future careers, (4) The correlations between training and employability, (5) numbers, qualities, and

relevance of training programs, and (6) the impacts of training on women. Two hundred and fifty questionnaires were administered to trainees by emails or faxes, of which eighty or 32% were completed, including some which were completed via telephone interviews.

EVALUATION OF SKITCE CORE ACTIVITIES

In this section, we report on the performance and effectiveness of the center core activities with reference to the original and pre-set objectives of the Initiative. We limit the evaluation to one of the leading centers, SKITCE, as it's the first and most active center among the group. The evaluation is done based on the strategic goals of SKITCE outlined in the next sub-sections.

Human Resources Development

SKITCE human resources development unit is the most active unit of the centre to date. Its mission is to improve the quality of training through its Training of Trainers (TOT) programs. The unit has acquired two training labs with 16 PCs each, networking labs donated by CISCO systems, a video conferencing facility, and an Official Testing Center. The unit is authorized as a regional CISCO, Microsoft, and Sun Microsystems academy. It offers Oracle training through its authorized local partner ATS (Arab Technology Systems, a key software solution firm based in Ramallah, now identified as Hulul). The trainers in the unit are mainly the personnel of other units, subcontracted trainers, or the Computer Sciences or IT staff members.

Between June 2003 and September 2005 the unit performed more than 3,450 training hours distributed over 57 training programs. Most trainees were university students, staff, and other community members from nearby areas. Note that 2003 was a preparation year for the launch of SKITCE, and training programs were intensified to build a cadre to operate the centre. The training programs are centered on CISCO courses, with more than 24 CCNA courses being offered out of the total of 44 courses completed by the unit. The statistics for courses are given in the table 1.

Table 1: SKITCE Training Information

Year	No. Training Courses	Training hours	Al-Quds University Trainees	Trainees from Outside University	Total No. of Trainees	CISCO Courses
2003	3	200	80%	15%	36	1
2004	21	1149	80%	20%	288	14
2005	33	2100	75%	25%	620	9
Total	57	3450			944	24

It is clear from the table above, that the opening of SKITCE has improved the amount of training offered to both Al-Quds University students and the local community. The number of training hours multiplied 5 and 7 times in the years 2004 and 2005, as compared to 2003, the year prior to the launch of the center. In terms of occupancy, which is defined as the percentage of actual training hours to the total available training hours, improvement is noticed (see Table 2), marked also by the increase in the number of trainees, training courses, and hours.

Table 2: Training Occupancy

Year	2003	2004	2005
Occupancy	0	30%	57%

The occupancy for 2005 is 57%, which is a significant increase when compared to 30% occupancy in 2004. These occupancy rates rival other private training centers which are more established. For instance, the IT training company Galaxy, established in 1996, is at 60% percent occupancy. The constant availability of trainees encouraged by the proximity of the Center to Al-Quds University, and the increased credibility of the center among students, are two main reasons for the success of the unit. These factors undoubtedly reflect positively on the income generating ability of the Center, as can be seen in the table 3. Note that values are given in US dollar.

Table 3: Income Generation by Training Unit

Year	Income Generated \$	Funds Raised	Paid by Trainees	Training paid by Organizations	Free of Charge Training
2003	10,000	0	10,000	0	0
2004	57,450	7,650	47,600	2,200	0
2005	102050	30,350	35,700	0	2,000

* Projected value for the last third of 2005 based the first two-third of the same year.

65% of the trainees were unemployed at the time of training, and found the training programs valuable in their hunts for better jobs. 50% of the trainees who were unemployed acquired jobs after the training and certification, either locally or internationally, and reported the Practical Training Program as the main reason for the job appointment. The remainder of those who found jobs reported that the training was not the main reason for finding a job but that it was nevertheless helpful in one way or another. This suggests that an important link exists between the completion of the training programs and the degree of employability among graduates.

The success rate of the Practical Training Program and the encouraging outcomes that were achieved were mostly due to the selection of training subjects. The subjects that were selected were limited to those identified by the Palestinian ICT sector, especially companies involved in software development, as being most needed by the Job Market. Additionally, each Training module was structured to include a significant number of training hours dedicated to real cases and practical implementation, as well as covering essential topics in business, communication and interpersonal skills.

Many of the business managers we interviewed explicitly expressed their interests in hiring trainees who had completed the Program, saying they found them to adapt to their work environments faster and therefore contributed tangible value-added work very quickly after assuming their jobs. Interviewed managers believed that fresh graduates who lacked any practical training, required several months to get acquainted with the applicable technology, and to improve their technical, and interpersonal skills before they could produce value-added work. Most managers were attracted by the up-to-date technological and practical experiences that Program graduates had already added to their academic education. Finally, employers who were of the opinion that academic programs concentrated too heavily on theoretical concepts and

obsolete technologies rather than on the practical and technical knowledge, were impressed by the hands-on experience which they found in the Program graduates.

Business Development

The idea behind the setting up of the business incubator is to provide IT talents with the necessary resources, both technical and business, to empower them to generate, innovate, and convert their IT-related thoughts into value products that are attractive, marketable, and inventive.

The incubator provides selected talents with office space, software, and hardware that accommodate their needs. In addition to that, talents will receive extensive and professional training in their area of interest to help them create world-class products.

Business skills development track is designed to build and enhance needed business skills in order for the talents to be able to finance their projects. The incubator will play a vital role in linking those talents with businesses that are interested in, and willing to adopt, support, and finance them.

The business development unit works on setting-up solid affiliations with the ICT business community to promote ICT business initiatives and enhance business skills and capacity building. It also works with academic institutions to increase opportunities for industry start-ups and promote a culture of entrepreneurship. Some of the projects the unit is involved with are listed below:

- **Software development initiative:** a leading Palestinian software development company, ATS , signed a memorandum of understanding in April 2005, to sponsor software development projects in cooperation with SKITCE. The MOU established a basis for cooperation whereby ATS will assign talented IT students to work on real-life projects defined, supervised and mentored by its staff. The focus, according to the MOU, is on e-learning and science education. It is part of ATS' responsibilities to pay stipend compensation allowances to participants, which cover transportation and other costs associated with their participation in the project. SKITCE on its side, will take care of the management and logistical issues. The project follows a small scale incubation model at SKITCE and promises to yield skilled IT professionals, standardized IT systems, possible employment by ATS, or joint ventures between ATS and participating students.

The program was based on the premise that students in their senior year have a significantly solid technical background to develop good products, but lack the essential business skills required to either take positions of significance in established companies or start their own firms. The program, funded by ANERA, recruited 60 senior students from electronic engineering, computer science, and Information Technology departments. Training topics included business skills such as project management, financial management and accounting as well as communications skills such as technical writing, documentation, public speaking and presentation. The program offers 21 modules, each of which runs for one week.

The project started with 60 registered participants, and dropped to 53 at the outset of the program. By May 2005, one month after the starting, participation had dropped steeply to 10 students due to involvement of the participants in other training courses and graduation projects. Later on, students lost interests in the program which was called off by the administration.

The assumption was that, upon completion of the program, students should have the essential skills to enroll in a real incubation process. It was also expected that the program will increase their chances of starting their own businesses and/or securing quality IT-related jobs.

Student dropout rates were higher than expected due to the lack of a genuine incubation model, which may include a pre-incubation program followed by incubation and business development training. The initiative at hand has signaled to the management of SKITCE to rethink and reengineer the whole incubation process.

- **Cooperation with the Palestinian Information and Communication Technology Incubator (PICTI):** PICTI [www.picti.ps] is an independent non-profit Palestinian entity established in 2003 with the majority of its funding coming from USAID [www.usaid.gov]. It was established to help Palestinian entrepreneurs develop and initiate ICT businesses. SKITCE has been trying to link with PICTI for some time now, and was finally able to put together an ambitious program. The original plan was for SKITCE to play a pre-incubation role in cooperation with PICTI, whereby students in their senior year of programs in Computer Science, IT and Electronic Engineering would receive intensive training to improve their business and technical writing skills.

The proposal as SKITCE management described it, was very motivating, and was designed to be scaled up to the national level. It involves SKITCE teaming up with other centers of excellences, PITA (Palestine Information Technology Association of companies) [www.pita.ps], PICTI as well as with the International Technology & Trade Network at San Diego State University, in the United States. This program did not see the light for reasons which are not entirely clear. What is clear, however, is that PICTI has succeeded in the development of an incubation processes, but lacked sufficient financial resources for seed funding and also has limited access to a sufficiently large number of graduates to implement the program. SKITCE, meanwhile, has access to students and graduates but has not chosen to undertake the incubation program on its own. SKITCE is committed to partnering with PICTI, because the crucial issue of the seed funds needed to start up new businesses ideas demands this course of action. But it was not clear to PICTI whether it was dealing with SKITCE, Al-Quds University or ANERA. PICTI seemed willing to work with each center, but appears to have difficulty running and/or managing their incubation process. PICTI is seeking agreements that would clarify its relationships with the Centers of Excellence and there is yet an opportunity for this program to get off the ground.

The overall evaluation from the two pilot projects described above is that SKITCE has not been successful in its endeavors toward the initiation of workable ICT business incubation programs. To the evaluation team it appears as if SKITCE still lacks the adequate resources and/or the right mechanisms for such efforts to kick-off the ground.

Research and Development

This unit has been set, according to SKITCE's original plan, to provide facilities and resources to promote an R&D culture and activities in a rich environment of innovation and creativity. The ultimate goal of the unit is to develop Hi-Tech products geared toward local needs in terms of industrial, economic, and educational innovations.

To date, however, this unit exists only on paper. To set the unit in motion, the university, which is hosting the centre, has initiated a committee comprised of personnel from both the university and SKITCE to lead this endeavor. The primary task of the committee is to design a strategy and action plan to stimulate the unit. According to some sources, part of the predicament lies in the

hosting university's bureaucracy and the limited research resources made available to staff members. The heavy teaching load is another major barrier for carrying out research. University academics sincerely welcomed the idea of collaborating with SKITCE in doing research and development, but most of them questioned the possibility of succeeding without first being provided with the necessary means to enhance the environment and provide some incentives.

Community Outreach

Community outreach is an effort by the center to convey its mission and practices to other organizations, groups, specific audiences and/or the general public. Community outreach within the SKITCE efforts tries to respond to the needs of the community through providing education and training in current information technology (IT) skills and practices, as well as providing consulting services to the community in information technology issues and solutions.

To date there have been few projects completed by the unit, and with limited impacts on neighboring communities. The evaluators believe that the unit has to carry-out extra efforts as well as a stronger commitment towards local communities. Below is a list of some of the completed projects:

- **Almersat project:** This project is a community outreach program funded by the Italian Government. It aimed at improving the employment opportunities of youth in the Jerusalem area by combining training in ICT with training in small business development and management skills. The program has been undertaken as a pilot project with the idea of possibly including similar programs of this kind in Palestinian high schools. The project lasted for two years and recruited 24 instructors and 100 youngsters, a third of which were female. The curriculum for this project was developed in collaboration with local business leaders, community colleges, and university professors. Al-Quds University was represented by SKITCE. The role of SKITCE was to develop an IT/entrepreneurial and IT business management Training of Trainers (TOT) handbook and to conduct a five-day workshop in IT/entrepreneurial skills and IT/business management.
- **Orphans IT training:** In 2005, SKITCE took some initial steps toward greater participation in the broader community by beginning to offer a training program for orphans in Geel Al-Amal and Dar Alaytam schools. 45 children aged between 10 and 14 participated in the program, and they completed a 35 contact hours course in basic ICT skills, in what is called International Computer Driving License, (ICDL).

Up to the date when the evaluation was carried out, the above mentioned projects were the only community service courses offered, which signals the need for greater efforts to reach communities. The Center markets its services either through its website, or inside the university. The trainees have been mainly affiliated with Al-Quds University, although, statistics show that the percentage of outsider participation increased in 2004.

In all other respects, SKITCE remains largely isolated from its surrounding communities, thus limiting its assumed role in community outreach. If SKITCE's impact is to be maximized, cooperation with the surrounding communities should be stressed upon, especially in local schools.

Serving the University Community

SKITCE encompasses a unit which carries out tasks typical of a computer center, like troubleshooting, network installation, monitoring and administration. The unit also controls/administers the university WAN connecting the various University Campuses, and the Internet connectivity. According to SKITCE sources, the network availability is roughly estimated at 95%, with down time of 10 minutes/week. The Internet availability was at 90%, with a down time of 30 minute/week, before the launch of the unit.

The main goal of this unit, as stated by the SKITCE document, is to analyze and develop all information systems at Al-Quds University such as those related to human resources, inventory, procurement, library, students, and personal affairs. This unit collaborates with the web development and design unit to prepare the databases on which web-based services are built. Examples of the projects implemented by the unit are described below:

- **The Telemedicine project:** The College of Medicine requested SKITCE to develop a telemedicine project, which aimed at linking an international medical center and local centers through the college. This is a good project and SKITCE should be commended on its' involvement on this project as it not only provided unit members with strong practical exposures, but also enabled the roll-out of valuable services to the broader community.
- **The development of the university portal:** the unit provides web-based services to the university community. Among its tasks are the upgrading and maintenance of the university portals. Since the launch of the unit, the portal has undergone great improvements in terms of functionality, stability, and availability. According to the Unit Coordinator, the portal improvement is estimated to be more than 95%, with a down time of no more than 30 mins/month. The unit consists of web design, e-learning, e-libraries, and web development and designs.
- **Open Source software development:** Other than the technical services offered to the university, the unit is experimenting and gaining experience in open source software, which was undertaken as a strategic direction for SKITCE. As disclosed by the top management, the centre has gone quite far in its open source activities, such that it is now contributing to the International Open Source Society.
- **The Arabized open source web-mail:** the tool was developed at SKITCE and released to the public under the name *Issam Issaq*, the technical manager of SKITCE. Currently, the team is working on Arabization of an E-group open source package, and has almost completed the development of servers with open source packages. The unit is also busy in the rehabilitation of old PCs to work as Linux terminals, and placing them in public spaces where anyone can access network resources.

According to many people we interviewed, SKITCE has made major improvements to the services offered by the network. SKITCE's image among the University Community is quite good, primarily because of the quality of services it offers through this unit as well as through the web and software development units. Prior to the launch of SKITCE these units did not exist, and it was the responsibility of the technical people in the computer science department (teaching assistants and lab technicians) to provide such services. According to university sources, this unit serves more than 1,000 PCs on campus, 95% of which are networked and connected to the internet.

DISCUSSION OF RESULTS AND OVERALL EVALUATION

- *Healthy relation with the hosting university*

While the IT Centers contribute to a large degree to the physical infrastructure of the targeted academic institutions, the evaluators feel that, the hosting universities have had no clear visions about the role that the Centers should play in the development of the ICT industry as it was initially set-out by ANERA. This is the main reason why the evaluators think that the Centers have not been developed to their full potentials. It is clear that the Centers' relationships with their hosting universities needs to be further examined and outlined. As a matter of fact, this is not only to focus on a growth process, but also to prevent the Centers from being overwhelmed with the hosting university's traditional IT services, and thus avoid becoming its' computer service unit. Working with the university community to achieve the project's goals is a part of the mission statement of these Centers, but making the Center a service unit to the university is not serving its original purpose.

According to the organizational chart of SKITCE, the Center is directly linked to the University president's office. There is a Steering Committee to help in setting up the Center's goals, activities and strategies. The Committee is made up of university administrators and IT staff members; the Vice President (VP) for planning and development, the VP for financial and fundraising affairs, and two representatives from the IT department. Our evaluation of the Committee's performance, however, leads us to believe that the Committee is not sufficiently involved in the Center activities. As the Center's main goal is to boost the ICT sector and to promote the use of good ICT practices for development, it does not seem that the Steering Committee under its current makeup is bound to achieve those goals. We think that it should be reformed to take into account the different stakeholders' interests in the initiative, especially the ICT business, government, and public communities.

The Centers' relationship with the private and public sector, however, needs to be better defined and developed. ANERA should set up a coordinating body of managers (Board of Advisors) for the Centers to share experiences, exchange ideas and coordinate with other national ICT institutions such as PICTI, PITA, PALTEL (Palestine Telecom Incumbent), and MTIT (ministry of Telecom and Information Technology) to have better synchronized and coordinated national projects.

- *Evaluation of training activities*

By stressing upon the improvement and enhancement of proficiencies of IT workers, through upgrading in technical, business, and interpersonal skills, ANERA works towards the improvement of the local software industry, as well as the integration of equitable access to governmental, economic, educational, health and social services. The initiative has done a remarkable job to that end. Out of hundreds of participants in the initiative training programs, we documented 115 professionals trained in Java, 135 in Oracle, and 75 in MCSD (Microsoft Certified System Developer). The number of trainees, who have received international certifications to date, was estimated to be more than 50, which constitutes about 12% of the total number of trainees who graduated from the Center. Those certified professionals will be regarded as producing assets in the local IT industry, since they have the potential, ability, and required skills and knowledge to work as trainers and generate additional qualified professionals. Many of those that we were able to contact are enjoying prestigious and well paid positions in either the software industry or the local training centers; others were able to set-up their own successful businesses.

Table 4: impact of the initiative on professional certifications (number of certificates)

	Oracle	MCSD	Java
Before ANERA project	5	1	1
After ANERA project	45	14	7

ANERA needs further to focus on training areas which produce ICT diffusion into other sectors and professions. It is certainly possible that the Centers could join forces to launch ICT training series on TV stations, publish recorded multimedia training programs on CDs, and/or launch an Internet learning environment.

Training should be subject to periodic independent evaluations to ensure quality and relevance to needs. Training programs should be introduced based on real needs from the industry and the community as a whole. SKITCE should play a role in studying and analyzing the present and future needs of professionals, and designing training programs on this basis.

- *Relation with private sector and incubation model*

SKITCE, for all its successes, needs to do more to introduce rigorous business training programs and build transactional and transformational relations with the private ICT sector. SKITCE, as well as the other Centers need to develop effective and workable incubation models. The centers should lead the efforts in pioneering solutions which have distinctive impacts on the ICT sector. SKITCE should develop a training strategy that plays a role in providing the market with software developers, by setting up relevant, up-to-date training programs, not only in the IT core technical subjects, but also in the build-up of ICT business, marketing strategies, and interpersonal and communication skills. ANERA should continue its support to the Centers of Excellence through the development of a detailed plan for a sustainable incubation model. This includes sending out an experienced task force to study best practices in other countries, and try to adapt those models to the Palestinian context and needs.

To that end, there is a call for greater attention paid to R&D in ICT in order to set up future developments and stimulate innovation. This should include the appointment of an R&D manager and staff in the Center, as well as a budget and research plan. The Centers should be able to tap into the intellectual capital of their host and associated universities.

- *Public outreach*

The public outreach of the initiative is not yet counted among the core activities of SKITCE. To broaden the initiative circle of influence, activities targeting different sections of the public such as the school population, women, SMEs and local government personnel should be increased. A public relations unit needs to be established to market the centers' services and activities, especially among the public. ANERA and SKITCE need to develop a gender unit to ensure adequate equality in services, and set recommendations for encouraging more involvement by women in the ICT sector with the aim of closing the gap between males and females in the workplace.

The distribution of the Centers of Excellences over the Palestinian territories is an excellent practice and should be encouraged. The idea of letting some universities host the Centers is also an appealing scheme. However, the project should work in full cooperation and integration with other initiatives and institutions, especially with universities which are not hosting a Center of Excellence. By widening the institutions indirectly associated with the Centers, the goal of nationalizing the mission and the objectives of the Centers and to circulate operations of the initiative might be better met. This nationalization might be reached through collaboration with the MTIT (Ministry of IT and Telecom) and other government institutions.

CONCLUSIONS AND FUTURE WORK

This paper has evaluated the performance of the SKITCE Center of Excellence as part of the ANERA initiative to create ICT Centers of Excellence in Palestine to help leverage technology and education and relieve the current economic situation. SKITCE as a single entity, and its impact and relationships with the university, the local community, ANERA and other IT Centers of Excellence was appraised. This evaluation is based on interviews and observations, questionnaires collected, and information collected from documents.

The evaluation found that the Center has achieved mixed results. While its performance has been impressive in the area of training and upgrading the university's ICT infrastructure and management, it did not achieve other goals in the areas of curriculum development and production of training materials, business incubation, and building an R&D program. Perhaps the nature of these programs/goals requires a longer time span to be planned and implemented.

Although SKITCE was not able to accomplish all of its goals under the ANERA initiative, it has certainly contributed heavily to the success of the initiative. The evaluation and recommendations presented in this article can play an important role in the success of the initiative if taken into consideration by the ANERA and SKITCE management.

As a future study, we would consider evaluating the remaining Centers and comparing the new data with the existing SKITCE findings.

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