2015/16 KNOWLEDGE SHARING PROGRAM

Final Reporting Workshop

Policies to enhance competitiveness of SMEs in the Costa Rican ICT sector: Human resource development

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Human Resources in the Costa Rican ICT sector

John Hewitt

Context: global and national ICT sectors

- **The global ICT sector is especially dynamic and innovative**
  - Daily expansion – geographically, and in terms of penetration into more areas of societies and economies
  - New versions of existing products and services; entirely new products and services
    - The defintition of the "ICT sector" is constantly changing
  - Existential threats to traditional industry leaders; need for transformation
- **Businesses in the Costa Rican ICT sector are exposed to international competition, and must also be dynamic and innovative to be successful**
  - Important in terms of direct job creation and exports by domestic ICT businesses
  - It is also important because the commercial success of a large part of the rest of the economy depends on the use of ICTs

Human resource availability

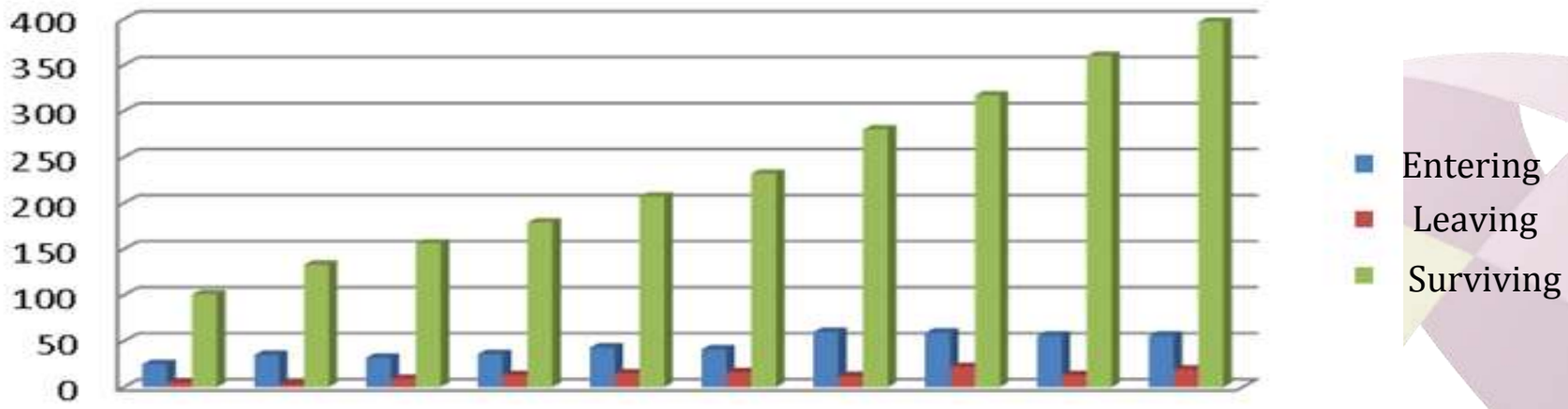
- **The Costa Rican work force does not have enough of the types of workers needed in businesses in many sectors**
  - There are persistently high levels of unemployment, and 60% of the work force has not completed secondary education
  - Constant comments on the situation: Manpower reports on the scarcity of labor, newspaper interviews with businessmen, complaints from multinational corporations
- **Furthermore, there is no systematically collected data on labor market supply and demand, which makes it hard to create plans to improve the situation**
  - There is a strong need for labor market prospection
  - We are left with the feeling that we ought to be creating more technicians, more technologists, more scientists…but what kind? How many?
- **Other complicating factors …**
  - Possible inflexibility of educational institutions when confronted with adapting the educational system's output to meet market demands
  - Slow response time of the educational system, quickly changing demands for skills

Domestic and foreign ICT companies

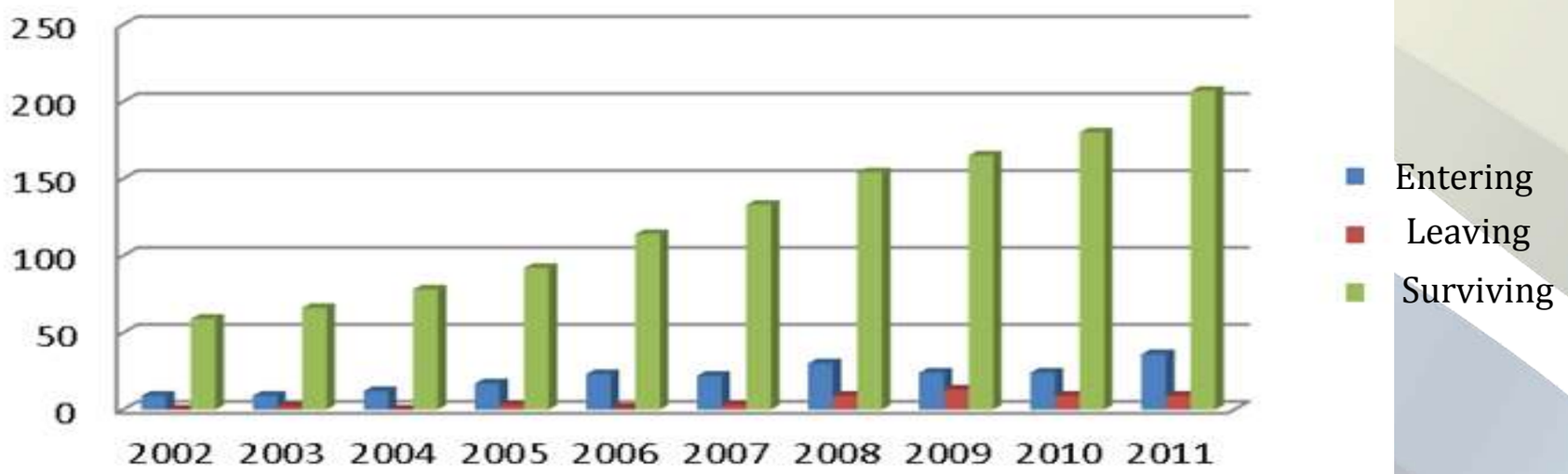
- **Costa Rican (domestic) ICT companies (600-700)**
  - Mostly 30 or less employees (more than 80% of members of the Costa Rican Chamber of ICT Businesses [CAMTIC] in 2014); one-half have annual sales of US$ 250,000 or less
  - Oriented towards the national and regional markets
    - 47% of CAMTIC members export; more than 60% of exports go to the USA, 20% to Central America, 8% to South America; 14% of members account for 80% of exports
  - Principal activities are providing solutions (55% of CAMTIC members) and software development (52%); there are effectively no domestic hardware companies
  - Almost no assistance from government programs, little interaction with academic sector
- **Foreign ICT and ICT-enabled multinational corporations (MNCs) (approximately 300)**
  - Some MNCs compete in the local market, but the most important employers do not
    - Attracted by FDI initiatives, operate in special export zones (are by definition exporters)
    - Some are ICT companies, others are “IT-enabled” – including BPO outsourcers
    - Typically have hundreds and sometimes thousands of employees
    - Have excellent linkages to global value chains
    - Specialize in high value-added manufacturing and services sectors

Growth of the Costa Rican ICT sector: businesses

Number of domestic ICT businesses entering, leaving, and surviving in the ICT sector: 2002-2011



Number of ICT and ICT-enabled Multinational Corporations entering, leaving, and surviving in the ICT sector: 2002-2011



Human resources in ICT companies

- ICT companies do not hire only technicians: they need managers, sales and marketing staff, and other types of workers: several studies show a distribution of staff as follows:

	Domestic	MNC
Managers, administrators, sales and marketing	20-25%	15%
Mid- and high-level technical staff	60-65%	45%
Other	10-20%	40%

- What kinds of human resources do ICT companes have the most trouble recruiting?
  - Domestic ICT companies – High-level technical staff (skilled programmers)
  - MNCs – sales and marketing, managers, high- level technical staff
- One of the most obvious reasons that MNCs have little trouble recruiting higher-level technicians is the salaries that they can offer.

Skilled programmer annual salaries	
Costa Rican minimum wage (university educated)	$11,574
Domestic ICT company	$20,000
MNC (H/P, Intel)	$25,000
US average salary	$80,000

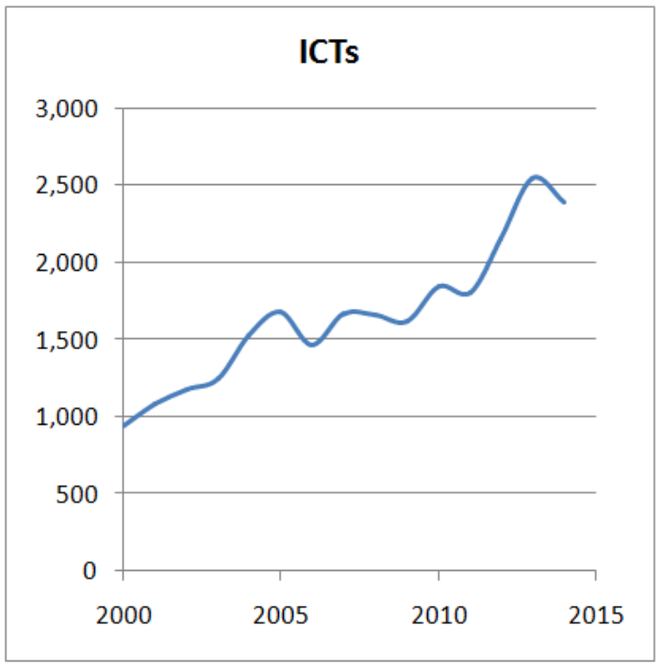
Technicians and Professionals

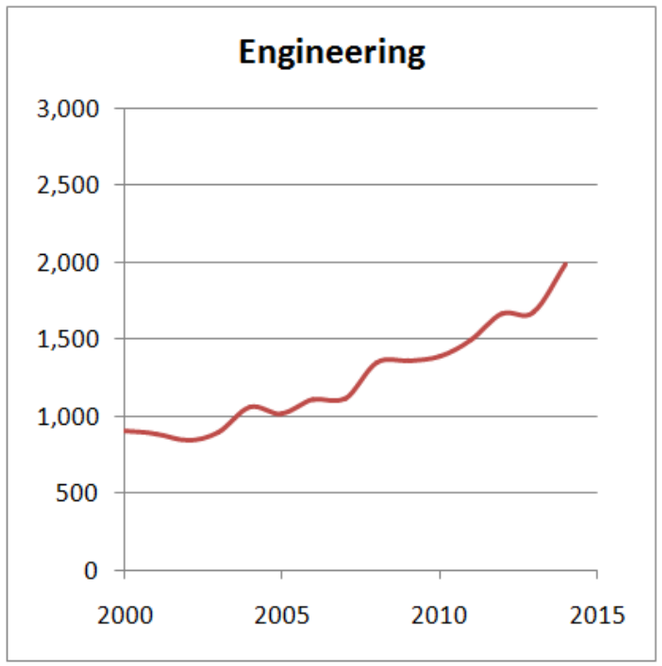
- **Technicians**
  - Sources
    - Ministry of Education technical colleges (MEP) – 7,091 technicians graduated in 2014
      - 2006-2014 - 41% accounting, finance, secretaries; 11% ICT, 7% electronics
    - National learning institute (INA) – "non-formal" education – 7,160 technicians in 2014
      - 2014 – 51% health, business administration, "other"; 10% ICT, 4% electronics
  - Types of labor provided (CAMTIC 2015)
    - Mid-level network, computer, operating system and application technicians (33%)
    - Software development (22%)
    - Web development (15%), design (20%)
- **Professionals**
  - Sources – 5 public universities, 50+ private universities – 49,778 graduates in 2014
    - 2014 – 45% social science, 24% education, 15% health; 5% ICT, 4% engineering
  - Types of labor provided
    - Software/computing Engineer (73%)
    - design and animation (14%)
    - industrial and electronics engineers (7%)

Numbers of ICT and engineering graduates

	ICT graduates (2014)		Engineering graduates (2014)	
	N	% total	N	% total
Technical training	--	--	--	--
Learning Institute (INA)	10,567	35.1%	352	1.2%
Education Ministry (MEP)	788	11.1%	507	7.1%
Professional training (universities)	2,390	5.1%	3,383	6.8%

- There were more than 10,000 INA graduates with computing specializations in 2014, but they were almost all “qualified workers”, rather than technicians
- The annual number of university ICT graduates has increased by more than 150% between 2000 and 2014, and the number of engineering graduates has increased by more than 120%





Are enough workers available?

- **There is ample evidence of a lack of availability of skilled workers**
  - CAMTIC recently stated that there was a shortage of 8,000 programmers in the sector
  - Strong competition for skilled workers
    - 75,9% of domestic ICT companies believe that there such competition existed (2013)
      - MNCs specializing in ICT areas were seen as the most important source of this competition, followed by other domestic ICT companies
      - ICT MNCs themselves also believed that other ICT MNCs were the greatest competitors for human resources
    - Employee turnover rates of as high as 40% for the most skilled workers, of which 2/3 was due to employee resignations (2012)
    - …which leads to salary inflation and loss of competitiveness
      - Of domestic ICT firms, who cannot afford to hire the best workers
      - In attracting foreign direct investment (FDI)

- There are no existing policies specifically intended to remedy this situation

Are enough workers available? (2)

- **What can be done?**
  - The government can enter the labor market as an intermediary, to make sure job seekers and employers can find each other (see www.buscoempleo.cr)
  - Retrain workers - produces results more quickly than a 4-year university education
  - Take more substantial steps – modify current educational programs
    - Raise the levels of skills of graduates from the INA and MEP Technical Colleges
    - Increase the number of university graduates in key areas

Other approaches to increasing skills and knowledge in the work force

- **Beyond working to provide greater numbers of technically-trained workers, other types of support can also work to increase the levels of knowledge and skills in the work force:**

  - **Soft skills -** primarily socioemotional skills, which are vital for creating a cooperative and efficient work environment; not commonly taught in formal education.

    - The approval of the Dual Education bill to promote apprenticeships would provide valuable opportunities for students to acquire these types of skills to students before they begin full-time employment.

  - **Assistance with starting a business** (incubation and other startup support)

    - A mix of practical experience, training, funding, and other types of support for entrepreneurs, who often have very little idea of how to manage a business, and very few resources to pay for facilities

    - The availability ot this type of support has increased to include all public universities and several privately- funded initiatives

  - **Carrying out research and development** (R&D)

    - Some level of R&D was carried out by almost 80% of CAMTIC members in 2014, but the power of R&D efforts can be greatly extended by cooperation between the private and academic sectors, (although levels of such cooperation have historically been low).

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ICT HRD policy of the Korean Gov.

Ji Woong Yoon

ICT HRD policy of the Korean Gov.

- Building and expanding ICT HRD through formal education system

  - Establishment of ICU (Information Communication Univ.) in 1998
    - Started with Graduate Degree
    - Expanded to undergraduate
    - Merged with KAIST

  - Establishing 25 ITRC (IT Research center) in 2000
    - Funding the IT Research Centers within the University through competition

ICT HRD policy of the Korean Gov.

- ITRC (IT Research center)
  - 70% of fixed contributions for initial investment was covered by the government, and the remaining 30% was bored by matching funds from universities and industries
  - The ICT field of research can either be designated by the government or be freely chosen by the applicants
  - For balanced regional development, the universities in the Seoul Metropolitan area were not allowed to apply for the contest for ICT fields freely chosen by applicants

(National Assembly Budget Office, 2006)

ICT HRD policy of the Korean Gov.

- ITRC (IT Research center)
  - Qualification, Selection Method and the Size of Budget

Classification	Contest for ICT Fields Designated by the Government	Contest for ICT Fields Freely Chosen by Applicants
Area	ICT and ICT convergence	ICT, ICT convergence, specialized local industry related with ICT
Qualification for Application	University with a graduate school and ICT department - Participation of over 8 professors and over 40 graduate students in MA/Doctor's course	University with a graduate school and ICT department - Participation of over 5 professors and over 20 graduate students in MA/Doctor's course
Selection Method	Research plan Evaluation	First: Preliminary plan evaluation (The size of applicants should exceed 2.5 times of the quota) Second: Research plan evaluation
The Size of Budget	About 800 million won/year Up to 8 years (4 years is the maximum since '08)	About 500 million won/year Up to 6 years (4 years is the maximum since '08)

Source: Information Technology Research Center Website http://itrc.or.kr.

ICT HRD policy of the Korean Gov.

- ICT HRD through retraining programs
  - Private educational org. competed for the programs

Classification	Project in Detail	Budget (won)
ICT Professional Skills Nurturing Program	- ICT conversion education, ICT Education for International Vendor Certificate Acquisition, multi-media content education and SOHO business start-up education for the highly educated unemployed	15 billion
Specialized ICT Training Support Program	- Support of state-of-the-art ICT education facilities specialized in ICT educational institutions such as AIIT and IIC	7.1 billion
International Joint SW Education Program	- Support of the introduction of SW education curriculum from prominent overseas university to nurture globally competitive SW skills	3 billion
ICT Overseas Training	- Support of workers at ICT SMEs, professors at vocational colleges, and teachers at vocational high schools to experience overseas training to nurture up-to-date knowledge	1 billion
Foreign ICT Specialist Utilization Support Program	- Support of the employment of foreign ICT specialists by domestic SMEs - Inviting ICT specialists from advanced ICT nations to support the propagation of up-to-date ICT technologies in Korea	1 billion

Source: MIC (1999)

ICT HRD policy of the Korean Gov.

- HR related policies to support ICT start-ups
  - Allowing faculties on leave to start venture business
    - At most 3 years
  - Faculty can establish and run “a school company”
    - University provides space and facilities and can invest in the company
  - Fostering Industry-Academic collaboration to commercialize new business ideas
    - Students getting credits by working at the accredited start-up

ICT HRD policy of the Korean Gov.

- HR related policies to support ICT start-ups
  - Start-up Academy
    - A center to support seed funding and provide managerial knowledge to start a new business by SBC
  - Supporting excellent diaspora/foreigners to join the local SMEs or Venture business
    - Ex: Golden Card Program for foreigners by MIE
  - Government funding for the training needs of the outstanding researchers in the accredited venture business
    - 20% of the training fee is supported by the gov. by MIC

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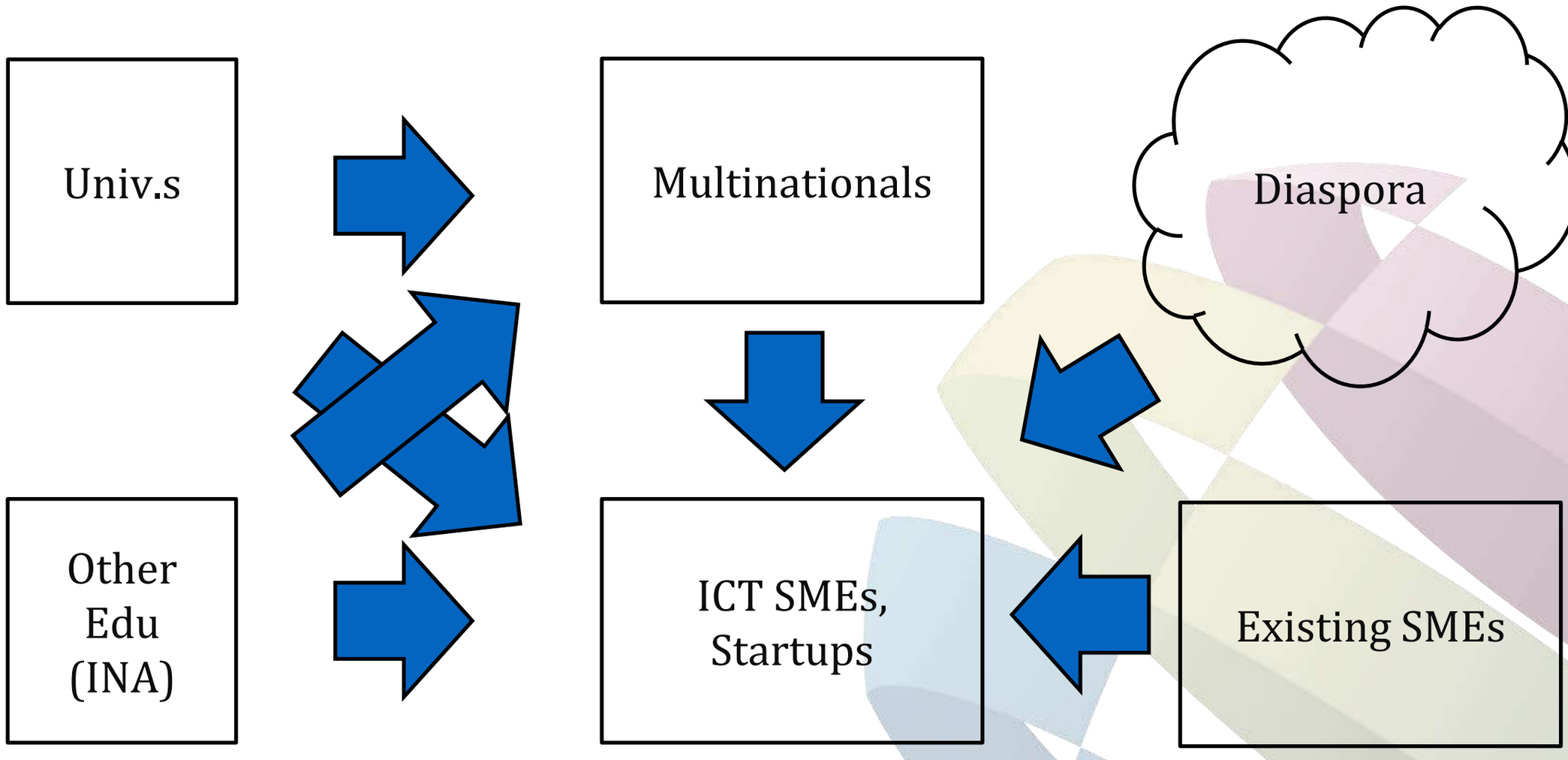
Conclusion and Recommendations

HRD Policy Areas for ICT SMEs



Human resources can come from various sources to ICT SMEs: Migration of qualified human resources transfer technological and business capabilities, and make knowledge to spillover
(Monge-Gonzales, Hewitt, and Torres-Carballo, 2015 and others)

Policy Suggestions

- Strengthen the ICT education in the universities through developing strong R&D programs (with an emphasis on ICTs)
  - in at least two public universities, focusing on developing engineers conversant in management, and vise- versa
  - promoting industrial-academic collaboration to improve the flow of knowledge and information about the needs of the private sector for ICT related R&D
  - The Costa Rican government can design a R&D program that provides indirect support by allowing R&D tax incentive and university faculties to participate in the R&D program with the domestic ICT companies
  - a Korean joint R&D program for emphasizes mutual benefits where companies get access to high-level human resources and universities get the access to financial resources
  - expanding NEXO can be reasonable option that can benefit both industry and university

Policy Suggestions

- Fostering ICT convergent businesses by designing and implementing programs in areas in which Costa Rica has comparative advantages (such as healthcare-ICT convergence program)
  - Costa Rica is well-known for providing quality and affordable healthcare, and has a strong capability in the biomedical sector
  - Hence, fostering the healthcare-ICT convergence R&D program seems to be a good direction
  - The Korean government has recently begun launching R&D projects for ICT-healthcare convergence, while no tangible outcome has yet been achieved
  - For example, the Korean government's Essential Medical Device Development Program, launched in 2012, fund a joint team of medical school and medical device SMEs

Policy Suggestions

- Costa Rica should improve its mechanisms for maintaining contact with highly skilled individuals outside the country (the Costa Rican diaspora)
  - Can help to bring very highly skilled individuals back to the country to work in the ICT sector
  - Strengthens scientific networks in areas in which Costa Rica has particular strengths (such as biomedicine, including biodiversity, medical tourism, and genomics)
    - Contributes significantly to possibilities of developing ICT-convergence programs

- Foundations for this type of effort already exist
  - Hipatia platform - scientific diaspora database
  - Ticotal.cr – a Web site and network enabling skilled Costa Ricans outside the country to re-connect to Costa Rica

Policy Suggestions

- Providing assistance or programs to carry out short-term retraining and training of domestic ICT firms' employees
  - In Korea, short-term IT HR retraining programs were carried out by the government's Information and Communications Training Academy, part of the Korea Communications Agency (KCA)
  - While the KCA currently has no Costa Rican counterpart, the INA could be and appropriate organization to design and run this kind of programs in Costa Rica
  - The INA already provides a wide range of training programs, but it needs to be more proactive in providing training programs tailored to the specific needs of SMEs in a timely manner

Thank you

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