On

Computer Science Trends
and Priorities in Palestine

الاتجاهات العلمية في مجال تقنية المعلومات والأولويات في فلسطين

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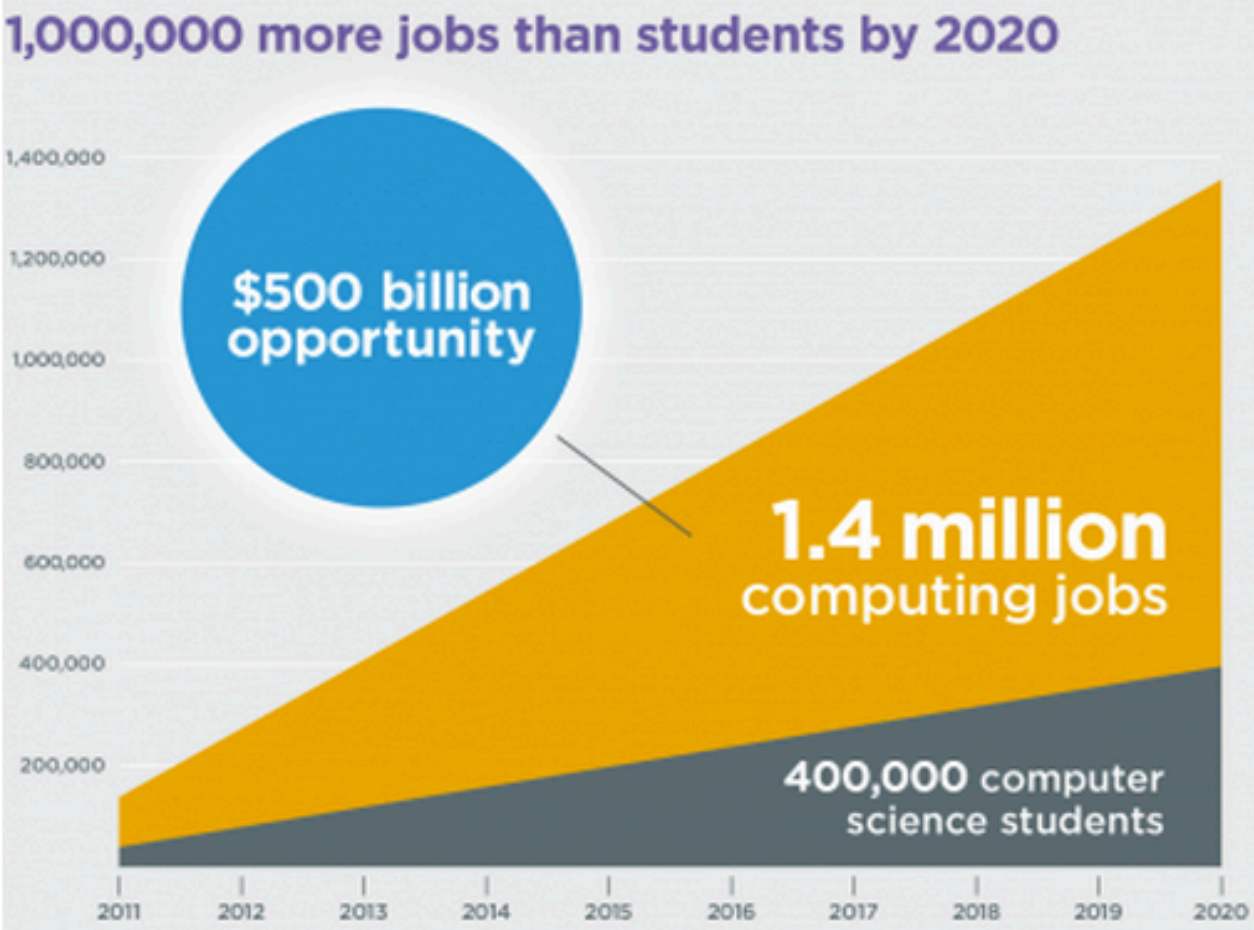
Good News – Be Prepared!



Computer science **is a top paying college degree** and computer programming **jobs are growing at 2X the national average.**

Source: http://www.geekwire.com/2014/analysis-examining-computer-science-education-explosion/

Outline

On Current Trends in Computer Science

- Trends in ACM and IEEE datasets (study)
- ICT Trends in Horizon 2020
- Current Trends in some top IT conferences.

Research Trends/Projects at Sina Institute – Birzeit University

- Arabic Language Projects
- e-Government Projects
- Industry Related Projects
- The Annual iArabic Symposium

On Palestinian ICT Priorities

- The Palestinian Challenges and Opportunities
- Why to Palestinians Research Thematic Priorities

Trends in Computer Science Research, 2013

This study was conducted by: *Apirak Hoonlor, Boleslaw K. Szymanski and M. Zaki, Communications of the ACM, 56(10), Oct. 2013, pp.74-83*

ACM Dataset (2005-2010):

Top 20 Trends

* Cloud Computing
* Social Networks
* Privacy
* Design
* Recommender systems
* Collaboration
* fpga
* User experience
* Virtualization
* Wireless sensor networks
* Wikipedia
* Visualization
* Evaluation
* Web 2.0
* Collaboration filtering
* Search
* Sustainability
* Performance

Bottom 20 Trends

* Internet
* fault tolerance
* Approximation algorithm
* Cryptography
* Optimal control
* Neural network
* Finite elements
* Scheduling
* Computational complexity
* xml
* Web services
* Quality of services
* Wireless networks
* Stability
* Sensor Networks
* 02.30.yy
* Genetic algorithms
* Grid computing
* Ad hoc networks
* Neural networks

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IEEE Dataset (2005-2010):

Top 20 Trends	Bottom 20 Trends
* Network	* Network architecture
* Sensing	* Error correction
* Database	* Software Engineering
* regression	* Reinforcement learning
* Cloud Computing	* Software agents
* Clustering	* Microelectronics
* Information Systems	* Genetic algorithm
* support Vector Machine	* Finite differences
* Neural Networks	* xml
* Data mining	* Integrated circuit
* Network model	* Telecommunications
* Machine Learning	* Ubiquitous computing
* Data transformation	* vhdl
* clustering algorithm	* Microprocessor
* factor analysis	* Distributed system
* virtual machine	* Grid computing
* image processing	* Internet
* different evolution	* Digital signal processing
* Finite element method	* Montecarlo
* Computer vision	

ICT Trends in EU Horizon 2020

- Horizon 2020 is the largest research program in the history
- A seven-years program
- ICT is seen as a horizontal, rather than a vertical sector.
- The most heighted ICT vertical sectors are (not ordered):

- Big data
- Social Networks and social media
- Natural Language Processing
- e-learning
- Smart System Integration
- e-Government
- Software Development
- Cybersecurity
- gaming technologies
- Human computer interaction

- Cloud Services
- Robotics
- Nano technologies
- Internet of Things
- Smart Cyber-Physical Systems
- Thin/Organic Electronics
- Smart Networks
- 5G Network
- Green computing

* Some themes are re-names for simplicity

Current Trends in Top Conferences (selected)

VLDB 2015 (Data)

Storage, Indexing, Scalable Data **Analysis**, **Data Models** and Languages, semi-structured; multi-media, **temporal** and **spatial** data; **Domain-Specific, Web and Heterogeneous** Data: **User Interfaces** and **Social Data**:

SIGMOD 2015 (Data)

Storage, indexing, **Text database**, XML, **Cloud computing**, **MapReduce**, Security, privacy, data warehouses, **analytics**, **Streams**, Knowledge discovery, **data mining**, **Spatial**, **temporal**, multimedia and scientific databases, Graph management, **RDF**, **social networks**, Database models, **integration**, **Crowd sourcing**

ISWC 2015 (Web)

Linked Data, **Web Databases**, **Retrieval**, Extraction, Knowledge representation, reasoning, **Semantic data analysis**, Ontology engineering, Ontology-based integration,**Multilinguality**, visualization,**Personalized** access,**Geospatial**, **streams**

WWW 2015 (Web)

Behavioral Analysis, **Personalization**, **Crowdsourcing**, **Social Media**, Content **Analysis**, Security, Privacy, Semantic Web, **Social Networks, Graph Analysis**, Datacenters, Content Delivery Networks, Cloud, **Web Mining**, **Web Search**

Current Trends in Top Conferences (selected)

ACL 2015 **(Natural Language Processing)**

Search, Classification, Morphological Analyses, Lexical semantics and ontologies, **NLP applications**, **Tagging** and chunking, **Sentiment, Text mining**, information extraction, **Phonology, word segmentation,** Cognitive modeling …..

COLING 2015 **(Natural Language Processing)**

cognitive, mathematical and **computational models** of language processing, generation and **summarization**, **information extraction and knowledge base linking**, machine learning for natural language, applications and language resources, **tagging** and chunking, **sentiment analysis, opinion mining**

KDD 2015 **(Data Maning)**

Big Data, social network analysis, recommender systems, **data mining model selection**, distributed data mining platforms and algorithms, **distributed computing, web mining**, **bioinformatics, semi-supervised learning**

ICDM 2015 **(Data Maning)**

statistical methods for data mining, **Machine learning**, **Mining text,** theory of data mining, spatio-temporal, **streaming**, graph, **Data mining systems and platforms**, **Data mining**

Current Trends in Top Conferences (selected)

SECRYPT 2015 **(Information Security)**

Data **Integrity**, Data **Protection**, **Database Security and Privacy**, Digital **Forensics**, **Network Security**, Applied **Cryptography**, **Biometrics** Security and Privacy, Formal Methods, Human Behavior Recognition, **Software Security, PKI, Digital Signature**

SIGGRAPH 2015 **(Computer Graphics)**

Computer **Animation**, **Image** and **Video** Processing**, Rendering** Techniques, Applications of Computational **Geometry**, **Computer Theory and Engineering,** Information **Visualization**, **Computer Vision, Virtual Reality** and **Augmented Reality**, **3D Printing**

ICSE 2015 **(Software Engineering)**

Agile software development, **Cloud computing**, Human-computer interaction, **Middleware**, **frameworks**, **Mobile applications,** Parallel, **distributed systems,** Reverse engineering**,** Program analysis, **Ubiquitous**, pervasive, **Software architecture**, Security, privacy, Software modeling and design

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On Palestinian ICT Priorities

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Research Tends and Projects @ Sina Institute, Birzeit University

Ontology Engineering, **Arabic Natural language** , Arabic Lexical **Semantics**, Knowledge Management, Semantic Web, **Interoperability**, **eGoverments**, Web Data Management, Information Systems, **Database**, **Data Modeling**, Logic, **Business Rules**, Legal ontologies. **processing**, **Information Retrieval**, Artificial Intelligence , **Reasoning**, Computers and Society, Mobile Applications.

Sina Institute

Birzeit University, Palestine

http://sina.birzeit.edu

- Founded in 2011.
- Among the top R&D centers in the Arab world.
- Coordinator of several FP7, TEMPUS projects.

We have
Tools, Content, and Solutions

Lexical Database

100s of multilingual dictionaries **digitized** and **Integrated** into one **huge Lexical database**

Arabic Ontology

Can be used as **Arabic Wordnet**, but it's much **more sophisticated,** with clean **Top level concepts.**

Arabic NLP Tools

Categorizer, Spelling tools, root extractor, Query Expansion, Language detector, and many tools

Multilingual Ontology Studio

Cross-lingual Mapping framework, Matching **Algorithms**. **Smart** portal

Arabic Entities

A repository of Arabic named **entities**, and **tools** extract, process, and **link** them

MashQL

A **query** formulation language for querying/ **mashing up** web **semi-structured data**

Interoperability Framework

E-Gov Ontology, Service Repository, Service Bus, address server

implemented by all ministries

E-Learning Material

500 teaching hours (10 courses) in advanced topics related to e-**Governance**

(slides and video online)

(e-Government Academy)

Graph Signature

Indexing and query **optimization** for **big** datasets, RDF/**Graph databases**

(Much faster than Oracle 11g ST)

Our Projects

SIERA

***Project** Coordinator (5 partners).*

Multilingual & Multicultural Knowledge Sharing **Technologies.**

Arabic Ontology

***Project** Coordinator*

To build **a formal Ontology to represent all meanings of Arabic terms.**

Wojood

***Project** Coordinator*

Research Excellency in **tools and APIs for Arabic** NLP.

Palestinian Dialect Corpus

***Project** Coordinator.*

Build a **corpus**, map to the Arabic Ontology, and **tools for processing it**.

VerbMesh

***Project** Coordinator*

To build **a large-scale graph of Arabic Verbs.**

Web Content Quality

***Project** Coordinator*

Techniques to evaluate and increase quality **Arabic web content**.

Our Projects

E-Gov Academy

Tempus

***Project** Coordinator (11 partners).*

Establish the **e-Government Academy** & train ministries to build e-services.

MOSAIC

***Project partner, (**12 partners)*

Link EU Mediterranean **ICT industries** and prepare them for **Horizon 2020**.

Zinnar

*Inventor and knowledge **Partner***

Help Palestinian ministries build **The e-Government interoperability framework**.

CovSeer

Cooper Link

***Partner,** (2 partners)*

Help On Interoperability of e-Government Services

Organizing Annual Symposium @Sina Institute

http://sina.birzeit.edu/iarabic2013-en/

The Annual Palestinian Symposium on Computational Linguistics and Arabic Content

النّدوة السّنويّة الثالثة للسانيّات الحاسوبيّة والمحتوى العربي في فلسطين

Arabic Ontology Project (funded by Birzeit University)

http://sites.birzeit.edu/comp/ArabicOntology

Formal Ontology to represent all meanings of Arabic terms

أنطولوجيا اللغة العربية

ARABIC ONTOLOGY

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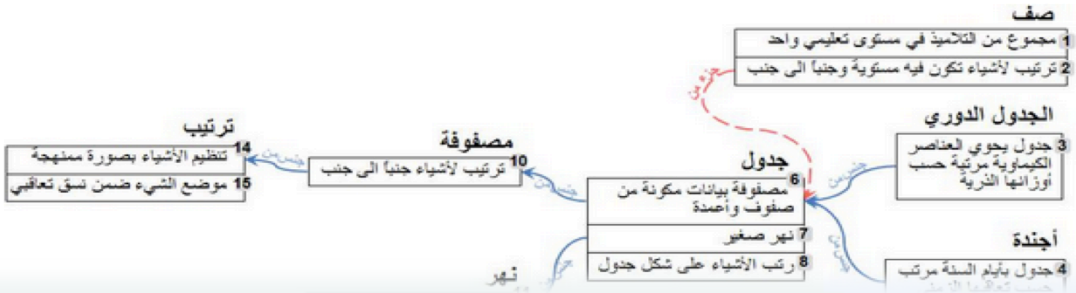
About Arabic Ontology

The Arabic Ontology is a formal representation of the concepts that the Arabic terms convey. For each term in the Arabic language, the set of its meanings (i.e. concepts) are identified, and semantic relationships (such as subtype-of and part-of) between all concepts are introduced. For simplicity, the Arabic ontology is a tree of the meanings of the Arabic terms (see the diagram below). The Arabic Ontology can be seen as an Arabic WordNet; however its relationships are well-formalized, and glosses follow strict formulation and ontological rules.



Arabic Onto Project

Like You this.

Live Tweets

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refresh this page.

News & Events

- SIERA-WP2 meeting in Italy
- سينا يطلق عمل تعاوني باسم الانطولوجيا العربية" بالاشتراك عمادة شؤون الطلبة – جامعة بيرزيت
- SIERA Kick-off Confere

SIERA Project (FP7 funded)

On developing Multilingual Search Engines

Test beds : Cultural Heritage, environment &ecosystems

http://sina.birzeit.edu/SIERA

Curras كراس

Funded by
State of Palestine دولة فلسطين
وزارة التعليم العالي
MINISTRY OF HIGHER EDUCATION

Corpus for the Palestinian dialect
مدونة اللهجة العامية الفلسطينية

To building a high coverage and well-annotated corpus for the Palestinian Arabic dialect to be used to create NLP tools such as machine translation.

http://sina.birzeit.edu/projects/curras/

Wojood (Google funded)

http://www.wojoodapis.com

On developing tools and APIs for Arabic Language Processing

VerbMesh (funded by Birzeit University)

Graph of Arabic Verbs
شبكة الأفعال العربية

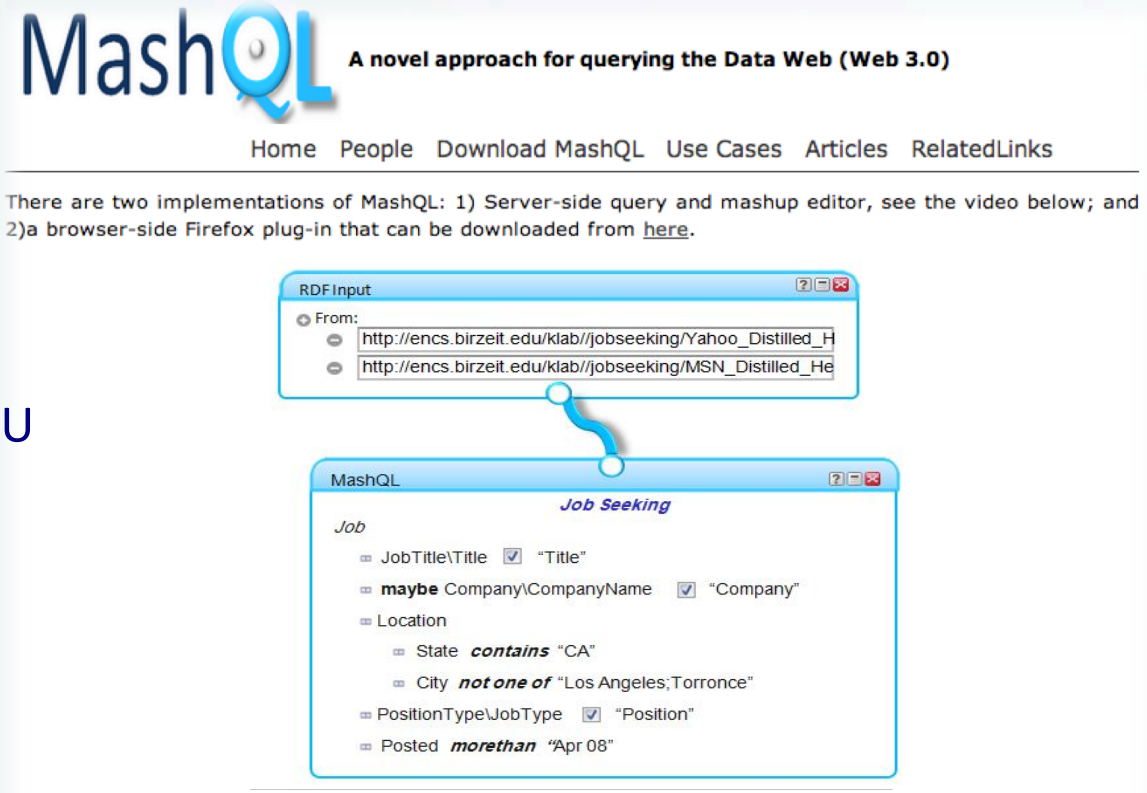
To build a large-scale pattern-based inflectional verbs morphology (Graph Database)

MashQL (cooperation with the university of Cyprus)

http://sites.birzeit.edu/comp/mashql/

A query formulation language and query optimization for Graph Databases

A query formulation language for querying and mashing up structured data on the Web (including a novel query optimization technique)



Was funded by the EU SearchIn Project

GovSeer Project (Italian funded)

http://sites.birzeit.edu/comp/GovSeer

On Interoperability of e-Government Services

GovSeer
Interoperabilty of e-Governmental Services

About | Partners | People | Publications | News & Events | Service Repository

About GovSeer

The ICT systems of many public authorities have been designed through choices that reproduce the existing functional separation in the administrative structure, leading to disparate systems and databases. Therefore, Interoperability is a key challenge for the development of e-Government and the basic requirement for the exchange and sharing of knowledge between organizations, and for the reorganization of the administrative processes to better support the services.

There are four levels of interoperability for the delivery of e-Government data and services: legal, organizational, semantic, and technical. The legal level refers to the laws and regulations necessary for the exchange of data and service delivery. The organizational context refers to the ability of cooperation between administrative processes. The semantic level is concerned with the meaning and the structure of the

Recent Posts

- Zinnar Presented at SIMPDA'11 Conference
- Birzeit University Concludes Its First Course of the International Information Technology Summer School
- Professors Batini and Viscusi visit the Palestinian Ministry of Telecommunications & IT
- Professors Batini and Viscusi are teaching at the BZU summer school in July
- Birzeit University wins an Italian-funded project on the Interoperability of e-Governmental services

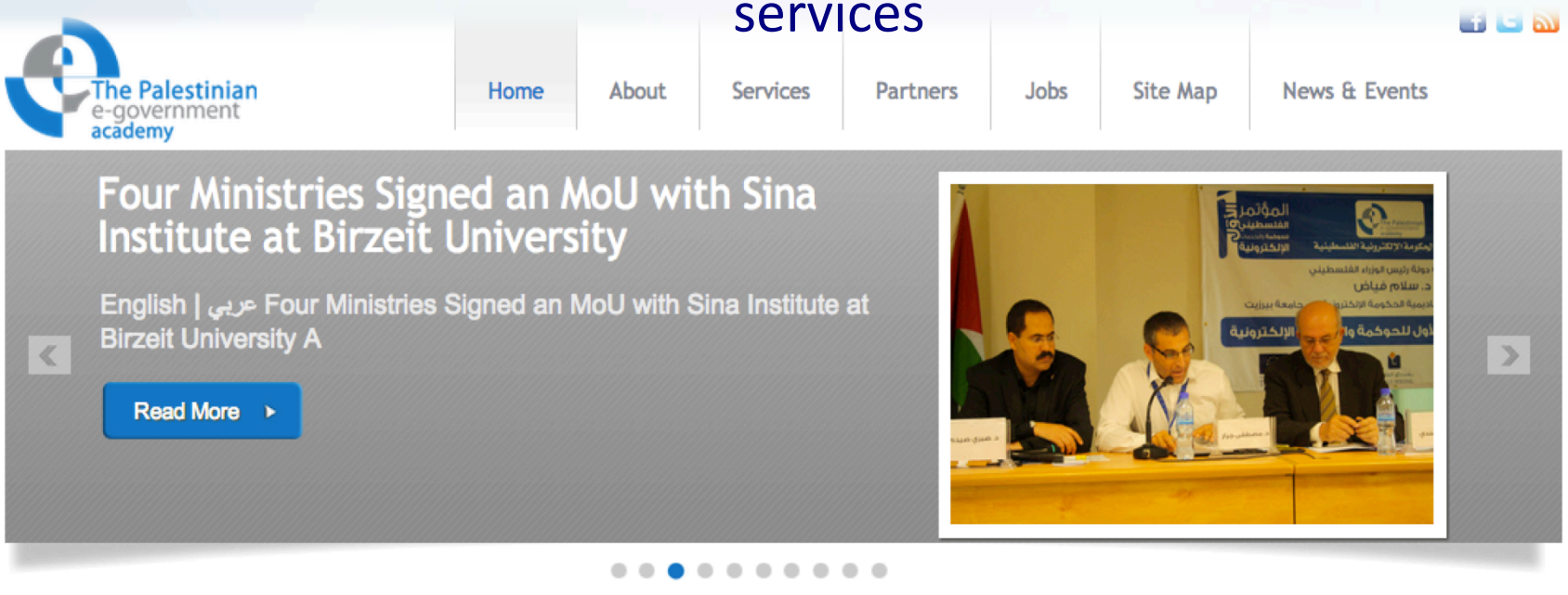
جامعة بيرزيت

DEGLI STUDI

E-government Academy (by Tempus)

www.egovacademy.ps

Establish the **Palestinian e-Government Academy** and train Palestinian ministries to build e-government services



Zinnar (The Palestinian e-Government framework)

www.egovacademy.ps

A framework for e-government interoperability

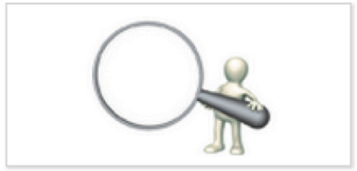
Training Programs

One of the most important goals for the academy is to provide training and

Consultancy

The Palestinian e-Government Academy provides support and consultancy for the

Research

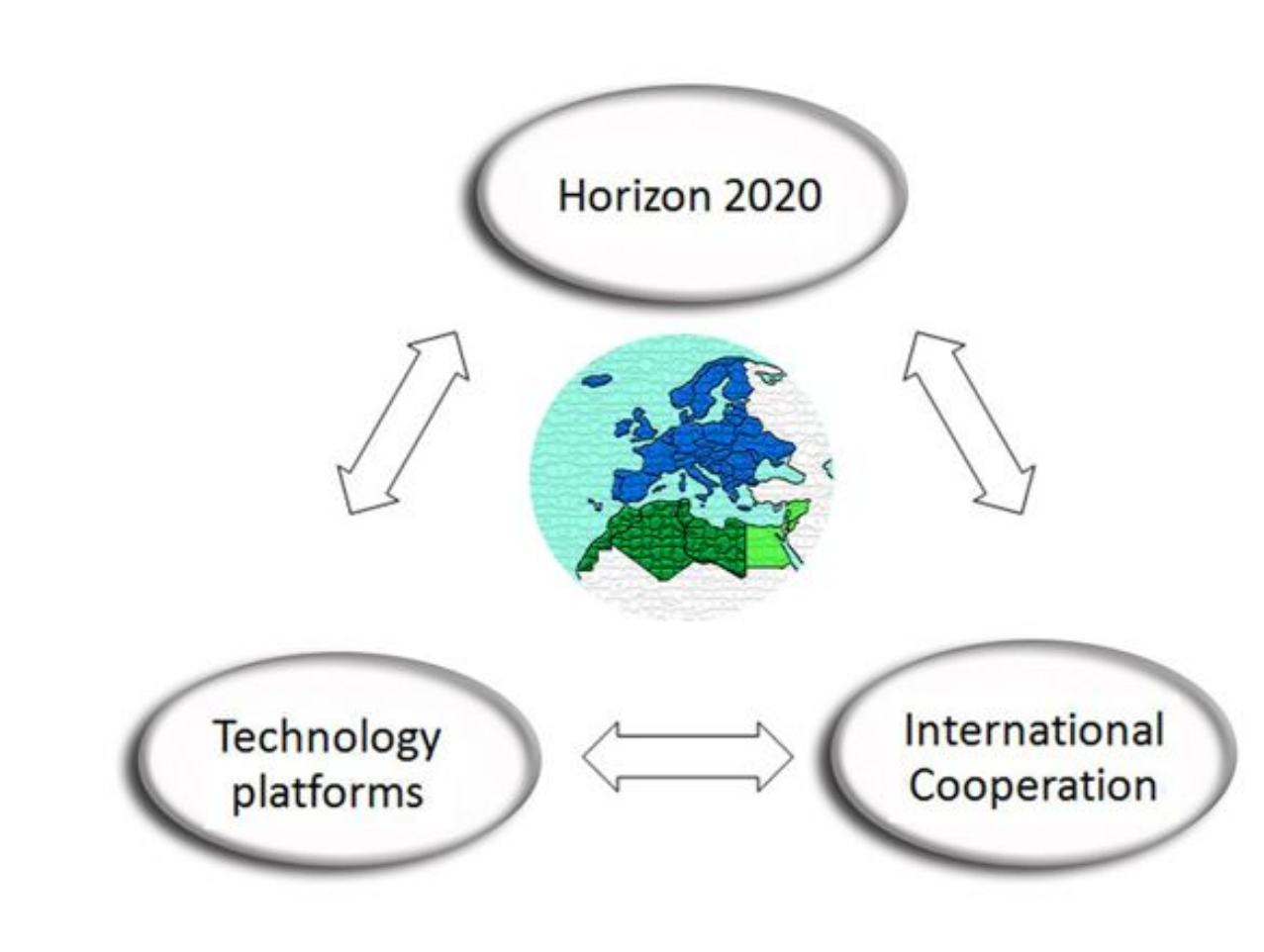


The Palestinian e-Government Academy aims to highlight and promote research

Publications

The Palestinian e-Government Academy provides a wide range of quality

Cooperation with Mediterranean Partners to build Opportunities around ICT and Societal And Industrial Challenges of Horizon 2020



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The Palestinian Context

Some Key Challenges and Weakness

- **Political**: instability – national needs and priorities keep changing.
- **Political**: brain-drain –Intellectuals attracted by other countries.
- **Economical**: Weak state – little money and experience.
- **Economical**: No/little national research funding.
- **Social**: Palestinians love certificates more than knowledge.
- **Bureaucracy**: No incentives for researchers –not necessary money!
- **Bureaucracy**: Old-style research, old-style staff in administration.
- **Bureaucracy**: Universities became teaching-oriented.
- … among others!

The Palestinian Context

Some Key Strengths and Opportunities

- **Political**: Real-life difficulties are drivers of innovation!
- **Political**: Many Palestinians intellectuals abroad to network with!
- **Political**: Many international donors like to support Palestinians.
- **Political**: Palestinians have access to most EU programs.
- **Social**: Palestinians are energetic and handworkers.
- … among others!

Why to set ICT Thematic Priorities

Why Palestinian universities should define their thematic priorities (i.e., the important ICT topics)?

Thematic priorities will help to:

Improve **Teaching**: update curricula with modern topics - to meet market needs and improve employability.

Guide **New Staff**: encourage PhD students (future instructors) to seek and target more relevant themes.

Foster **Innovation**: encourage sound and more relevant research – meet national needs.

Build **Excellency**: encourage researchers to build excellency in some important themes.

Suggested Thematic Priorities (For Discussion)

Based on personal observations (IT needs)
The most important themes we should target in Palestine are:

Research/Excellency

1. Computational Linguistics
2. Social Networks
3. Security
4. Software Localization
5. E-Services

Teaching

1. Security
2. Social Networks
3. Data mining
4. Machine learning
5. System/Data Integration
6. Business Process Manag.
7. GIS
8. Cloud Computing
9. Big Data
10. IT laws

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