



SIERA

Integrating Sina Institute into the European Research Area
FP7- 295006

D1.1 Revised R&D Strategy

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EXECUTIVE SUMMARY

In this document we present the results of the Work Package 1 (WP1) of the project entitled *Integrating Sina Institute into the European Research Area (SIERA) #295006*. In accordance with the stipulations, the goal of WP1 is to revise the research and development (R&D) strategy for the Sina Institute for Knowledge Engineering and Arabic Technologies (Sina Institute) of the Birzeit University (BZU). The Sina Institute is a research unit within Birzeit University and technically a part of the Faculty of Information Technology. The center is the largest research center dedicated to the Information Communication and Technology (ICT) field in Palestine. In addition to this, achievements include being awarded grants and support from Google™, the European Union (EU) Tempus program, and actually the SIERA project. The WP1 aims to widen and revise the R&D strategy of BZU Sina Institute according to the needs of the regional and EU societies in the area of Arabic/multilingual and multicultural knowledge sharing technologies. Accordingly, an assessment of both society and local stakeholders needs (Task 1.1: Assess society needs) have been carried out to identify the relevant issues to final revised R&D strategy of BZU Sina Institute (Task 1.2). Thus, the deliverable has been structured in three Parts: in Part I (*Society Needs Assessment*), and Part II (*Local stakeholders' needs assessment*) we discuss the results of the activities carried out in Task 1.1, while Part III presents the revised SINA R&D Strategy, and its action plan.

The study of the society and stakeholders needs has been carried out adapting the in-house eG4M methodology designed by the University of Milano-Bicocca Unit to support strategic planning of e-Government projects in Mediterranean Countries (Viscusi et al., 2010). The methodology provides a series of steps aimed to support the identification of contextual factors and local needs, to be worth considered in the strategy definition, and the action plan design. In particular, the SIERA project has followed the guidelines of *state reconstruction* and *assessment* steps to provide a detailed representation of the context of intervention, suitable to frame society and stakeholders' needs in the revised R&D strategy. The application of the methodology steps has seen an active involvement of BZU Sina, to conduct state-of-the-art surveys, secondary data analysis, and interviews to local stakeholders.

As for the society needs assessment (Part I) the study has been carried out adopting the Political, Economic, Social and Technological (PEST) analysis framework, a common tool which analyzes the political-legal environment, economic environment, socio-cultural environment, and technological environment, used in information systems research, likewise (Peng and Nunes, 2007). Considering the jurisdiction and the political situation analysis, the results have shown a relevance of SIERA solutions and research as useful to enable interaction and communication inside and outside the Palestinian Territories, notwithstanding the actual restriction to the movement of Palestinians, and the subsequent flow of goods and services. As for the legal framework, the following laws and rules has resulted as relevant to SIERA goals: Investment Promotion Law, Commercial Law and Companies Law, Tax Law, Competition Law, and Intellectual property rules. In particular, Investment Promotion Law provides guarantees to investors operating in Palestine, fostering an encouraging investment environment for Sina Institute research products.

As for the Research & Development a relevant source of funding is related to foreign grants and investments. Among them, the European Research Area is a European Union initiative to foster cooperative research efforts amongst various countries. Thus, Sina Institute should position as a competitive partner, identifying and exploiting its core strategic expertise such as, e.g., semantic interoperability, and Arabic ontologies. As for labor market and demographics, challenges has been identified with regard to Research and Development



(R&D) and IT sector, in particular, with regard to unemployment rate, fulltime employment, and the Palestinian contribution to global research and development. However, these figures represent an opportunity for Sina Institute to build a research infrastructure, on the one hand, promoting higher education and absorbing its graduate and post graduate as specialized workforce; on the other hand, acting as an innovation hub connecting Palestinian R&D expertise to European academic and related practitioners networks.

The local stakeholders' needs assessment (Part II) involved local stakeholders in the West Bank, institutions and individuals deemed relevant to the scope of the strategy were targeted to receive input. These sessions have been carried out via face-to-face, telecommunication and electronic means (i.e., skype, emails, phone interviews) in a semi-structured method with a series of talking points regarding common factors faced by those in the industry or in similar situations. In particular, the identified needs include the request for a more cooperative atmosphere/environment when it comes to research and integrating technological solutions to societal problems. Since the Sina Institute specializes in knowledge engineering and Arabic technologies, research in these fields becomes the core of any strategies aimed to ensure sustainability and viability in any future endeavors. In order to be more effective in the undertaking of any research projects, a cooperative spirit must be present between the Sina Institute, and other universities or institutions, focusing on the usage and promotion of the Arabic language in many different related matters, using solutions to assist in fields such as, e.g., education, healthcare, research, social media, and so on. This spirit of cooperative research can be manifested into cooperative efforts with local and international private firms focused on researching how various technologies can be integrated into different fields for a variety of solutions. Beneficiary groups resulting from this enhanced research were determined to include, but are not limited to, the following sectors: E-Government, Education, Healthcare, Social Web, Semantic Web, News/Media.

However, cooperation need refers also to the way the Sina Institute structure its action as a consequence of its strategy and innovation model. Ultimately, the Sina Institute isn't merely tasked with doing research for technological purposes solely, but rather it must find outlets for its research to further the societal development and meet the subsequent needs. Thus, an appropriate innovation model has been identified through a comparison of literature review and results of the society needs assessment. As a consequence, a parallel model (involving both technology-push and market-pull options) has been considered preferable for the Sina Institute, as it can operate in adverse conditions with limited resources, as well as being oriented towards receiving and integrating market or external information into a more viable or effective manner. Any achievements realized by the Sina Institute in this case, would likely be more in demand relative to its stakeholders and constituents, thus substantiating current funding, and likely to increase funding in future efforts. Besides cooperation and the subsequent innovation model, other needs identified were: knowledge Based Staff, awareness of global Trends and Technology, entrepreneurial spirit (both in research or competent solutions that can be used in delivering value to clients).

Finally, the revised R&D strategy is discussed (Part III) along with action plan made up of four levels of analysis for the Sina Institute. The first level is the *strategic objective*, which is intended to implement and realize the vision of the Sina Institute. The second level is the *annual objective*, which enables the Sina Institute to achieve this strategic objective. The third level is the *key performance indicator (KPI)* to be used as a measurement instrument in achieving this annual objective. The fourth and final level is the *KPI target*, which serves as the desired level of effort regarding the KPI.



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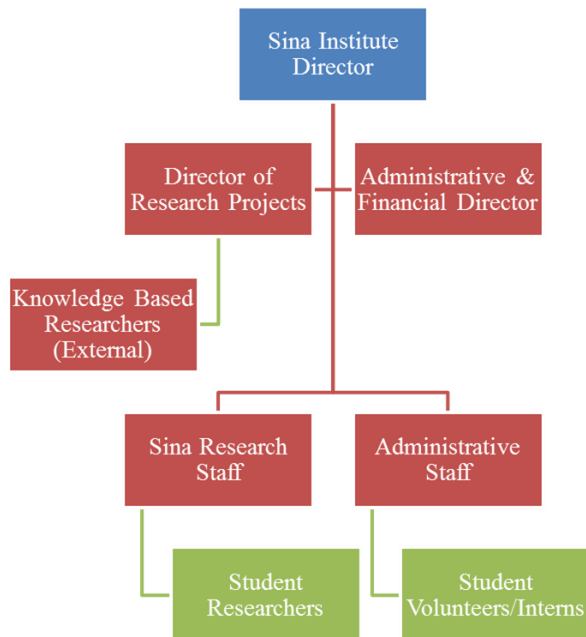
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PART I: SOCIETY NEEDS ASSESSMENT

1 Introduction

In this document we present the results of the Work Package 1 (WP1) of the project entitled *Integrating Sina Institute into the European Research Area (SIERA) #295006*. In accordance with the stipulations, the goal of WP1 is to revise the research and development (R&D) strategy for the Sina Institute for Knowledge Engineering and Arabic Technologies (Sina Institute) of the Birzeit University (BZU). Furthermore, the WP1 aims to widen and revise the R&D strategy of BZU Sina Institute according to the needs of the regional and EU societies in the area of Arabic/multilingual and multicultural knowledge sharing technologies. Before discussing these needs for Palestinian context and EU, we introduce the Sina Institute (we refer the reader to Annex 2 for a detailed discussion of the Sina Institute research areas, roles, core activities, main projects, key researchers, and publications related to the main research topics).

Figure 1. Sina Institute Organization



The Sina Institute is a research unit within Birzeit University and technically a part of the Faculty of Information Technology. Figure 1 shows its organization. The Sina Institute Director supervises and controls both the administrative and projects performance, through the Administrative and Financial Director and the Director of Research Projects, reporting directly to him. Their staff includes student researchers and volunteers, besides internal dedicated resources. The Director of Research Projects manages and coordinates external knowledge based researchers involved in the various projects, likewise. The center is the largest research center dedicated to the Information Communication and Technology (ICT)



field in Palestine. In addition to this, achievements include being awarded grants and support from Google™, the European Union Tempus program, and the SIERA project. The Sina Institute unit focuses on research in the following fields according to two groups:

OnTo Group

- Arabic Ontology Engineering
- Arabic Lexical Semantics
- Knowledge Management
- Semantic Web
- Interoperability
- eGovernment
- Web Data Management
- Information Systems
- Database
- Data Modeling
- Logic
- Business Rules
- Legal Ontologies

Arabic Language Technology and Information Retrieval Group

- Natural Language Processing
- Information Retrieval
- Artificial Intelligence
- Reasoning
- Computers and Society
- Mobile Applications

In its existence, the Sina Institute has been able to adopt a performance based approach through the successful oversight of various projects and research efforts. These endeavors are summarized below:

Projects

- **SIERA-Integrating Sina Institute into the European Research Area (FP7 program), (2011-2014):** this project aims to reinforce closer and sustainable scientific cooperation between Palestinian and EU scientists in the field of multilingual and multicultural knowledge sharing technologies. Sina institute will twin with four leading European research institutions that are pioneers in this field to: (1) set up joint research cooperation and (2) facilitate PhD students' co-supervision, and (3) organize summer courses and conferences. Two domains are selected as testbeds: (A) Cultural Heritage and (B) Environment and Ecology.
- **MOSAIC, (2013-2015):** this project aims to identify the ICT industrial challenges, and determine how ICT can support societal challenges such as Food security, sustainable agriculture, bio-economy and Secured, clean and efficient energy.
- **PalGov- e-Government Lifelong Learning Consortium (EU TEMPUS), (2010-2012):** this project aims to empower the Palestinian society with the know-how for



implementing e-services, in particular e-government services. The project aims at capacity building (i.e., lifelong learning) in three main areas (interoperability, security, and legal informatics). This is done through establishing a Palestinian e-Governance Academy, developing a series of specialized training tutorials and academic courses and delivering it to the Palestinian Society.

- **Arabic Ontology (BZU-internally funded), (2010-2012):** The project aims to develop an Arabic Ontology, a formal specification of concepts of all Arabic words, similar to Arabic Words, but with ontological principles. 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.
- **Wojood (funded by Google) :** The project aims to serve the Arabic language, that is to build a well-designed Arabic search engines with language support packages, to end up with APIs for Arabic search and query analyzing, APIs include basic searching and crawling, bookmarking, Arabic natural language processing (spell checking, categorizing, and language detecting, etc).
- A Suite of Automated Tools for Efficient Management and Search in Web-Based Arabic Documents.
- **GovSeer (2010-2012):** Interoperability of e-Government Services (Italian-funded): this project aims to support mobility and exchange of researchers between both universities (Birzeit University, and University of Milano-Bicocca, Italy) in order to facilitate joint research activities in the area of e-Governance and interoperability, in particular: service ontology engineering (i.e., the design of business process and service repositories and mash-ups of data and services), and multilingual government ontologies, policies, and business rules. Also, the project aims to support student mobility and PhD student co-supervision, in addition to dissemination and outreaching activities, such as joint tutorials and course materials and the organization of national and international conferences.
- **MashQL** - A novel approach for querying the Data Web.
- **MITVI** - Mobile Information Technology for the Visually Impaired.
- Model Generation for Selected Applications.

Research Contributions

- 2012, Arabic Text Correction Using Dynamic Categorized Dictionaries: A Statistical Approach
- 2011, Building a Formal Arabic Ontology
- 2011, Ontology-based Data and Process Governance Framework - The Case of e-Government Interoperability in Palestine
- 2011, Tools for Arabic People Names Processing and Retrieval: A Statistical Approach
- 2011, Enhancement Tools for Arabic Web Search: A Statistical Approach
- 2011, Guest Editorial: Knowledge Management and e-Human Resources Practices for Innovation
- 2011, Guest Editorial: Querying the Data Web- Novel techniques for querying structured data on the web



- 2010, A Query Formulation Language for the Data Web
- 2010, Towards Query Optimization for the Data Web- Disk-based algorithms: Trace Equivalence and Bisimilarity
- 2010, Mapping ORM into OWL2
- 2010, Querying the Data Web - the MashQL Approach
- 2010, Towards a Methodology for Building Ontologies - Classify by Properties (in Arabic)
- 2010, Towards Query Optimization for the Data Web
- 2005, Automated Reasoning, Knowledge Representation and Management
- 2003, A Relevance Restriction Strategy for Automated Deduction
- 2003, SATCHMOREBID: SATCHMO(RE) with BiDirectional Relevancy
- 2002, Ordered Semantic Hyper-Tableaux
- 2000, Minimal Model Generation for Refined Answering of Generalized Queries in Disjunctive Deductive Databases
- 2000, Positive Unit Hyper-Resolution Tableaux for Minimal Model Generation
- 2000, Model Generation for Disjunctive Deductive Databases

After having introduced the SINA Institute, we now discuss the main results of the analysis of the Society Needs assessment, aiming to provide a representation of the actual context for a revision of its R&D strategy grounded in local needs. It is worth noting that the study of the society and stakeholder needs has been carried out adapting the in-house eG4M methodology designed by the University of Milano-Bicocca Unit to support strategic planning of e-Government projects in Mediterranean Countries (Viscusi et al., 2010). The eG4M framework differs from traditional technology-driven approaches to e-Government, considering both how ICTs affect organizations and how the social context and the organizations influence the use of technologies. The focus of the analysis is on the different ways the different stakeholders interact when introducing ICTs and the way these interactions can affect institutions and society at large. On the one hand, the design and development of e-Government initiatives must take into account both the constraints and the opportunities in terms of potential incentives offered by the institutions. Accordingly, the methodology provides a series of phases and steps aimed to support the identification of contextual factors and local needs, to be worth considered in the strategy definition, and the action plan design.

Thus, there are two main phases of the methodology, (1) *strategic planning* and (2) *operational planning*. Strategic planning is the core phase of the eG4M methodology. The strategic planning is composed of three main steps: (1) e-Government vision elicitation, (2) state reconstruction, (3) assessment. As for the SIERA project, we have followed the guidelines of *state reconstruction* and *assessment* steps to provide a detailed representation of the context of intervention, suitable to frame society and stakeholder needs in the revised R&D strategy. The application of the methodology steps has seen an active involvement of BZU Sina, to conduct state-of-the-art surveys, secondary data analysis, and interviews to local stakeholders.

2 Palestinian Context

The society local needs assessment for Palestinian context has been carried according to the first step (*state reconstruction*) of the above mentioned eG4M methodology (Viscusi et al.,

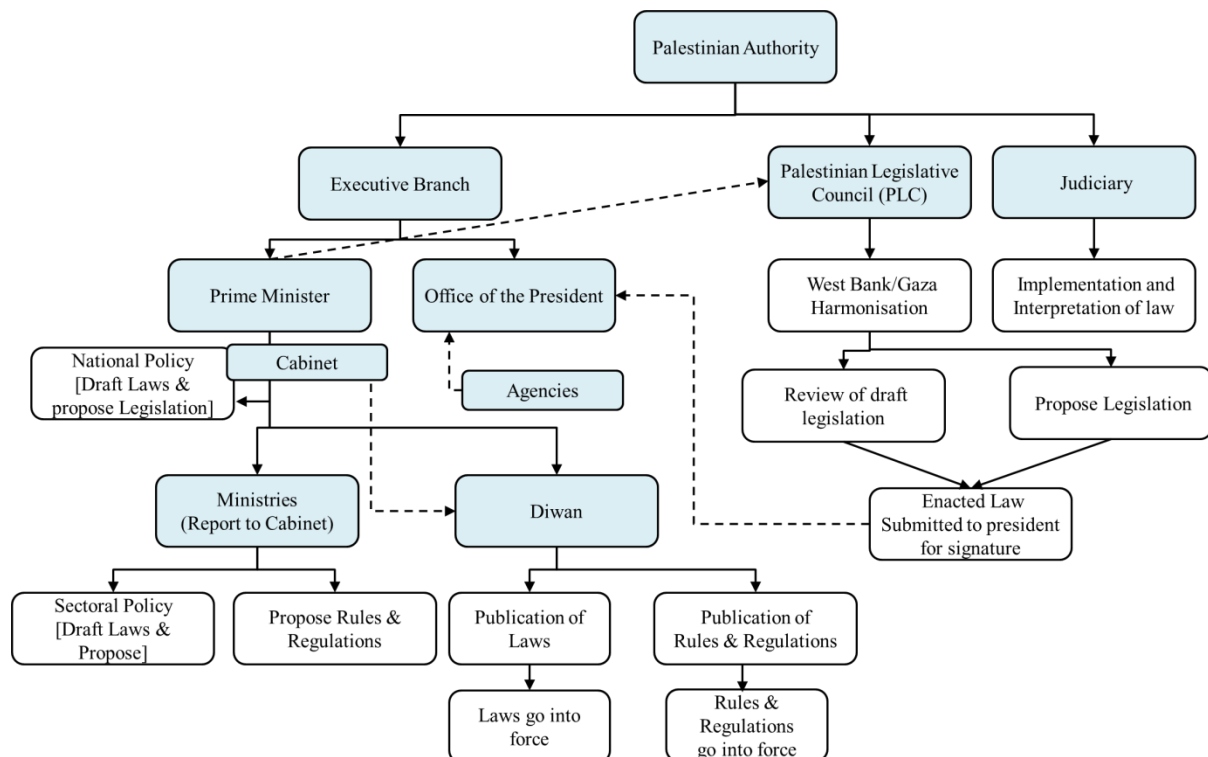
2010) adopted in SIERA. As for further instruments adopted in this step, the Political, Economic, Social and Technological (PEST) analysis is a common tool which analyzes the political-legal environment, economic environment, socio-cultural environment, and technological environment, used in information systems research, likewise (Peng and Nunes, 2007). It is worth noting that the analysis has been carried out both on secondary data (state of the art documents, reports, censuses, organizational records and data, etc.), and semistructured interview to Sina Institute stakeholders and members. In the following section, we discuss the results of the PEST analysis.

2.1 Palestinian Context (Political-Legal Environment)

Jurisdiction and Political Situation

According to the Israeli-Palestinian Interim Agreement, Oslo II¹, there are three distinct types of areas in the West Bank regarding the civil and military authority and jurisdictions. Areas classified as “A” are under the control of the Palestinian Authority (PA) according to the Interim Agreement between the PA and Israel. Areas classified as “B” are under the civilian jurisdiction of the PA, and the military jurisdiction of Israel. Areas classified as “C” are under both the civilian and military jurisdiction of Israel. As a result, this classification has restricted the movement of Palestinians, and the subsequent flow of goods and services to and from these areas, regardless of their classification.

Figure 2. Law enforcement process and organization in the PA



¹ <http://www.acpr.org.il/publications/books/44-Zero-isr-pal-interim-agreement.pdf>



Legal Framework

The legal framework outlined in Figure 2 illustrates how laws and amendments are addressed by the PA. As such, there are three branches that comprise the Palestinian Government; Executive, Legislative (Palestinian Legislative Council), and Judiciary. The legislative branch is tasked with drafting and proposing laws to be enacted, whereas the executive branch is tasked with approving them and determining their relevance to the needs of Palestinian society. Lastly, the judicial branch is responsible for the enforcement and interpretation of all laws. Thus, this system of checks and balances is designed to ensure a distribution of power and responsibility amongst various members of government and society. The Palestinian Legislative Council (PLC) essentially proposes laws and amendments for the President to sign, thus enacting them, with the judiciary assuming the role of identifying how they can be interpreted. The Diwan is then responsible for ensuring the laws are in state in which they can be implemented and enforced. In the following, we briefly discuss some of the main laws and rules relevant to SIERA goals: Investment Promotion Law, Commercial Law and Companies Law, Tax Law, Competition Law, and Intellectual property rules. These areas will help to determine whether or not the Sina Institute can actually pursue viable partnerships and endeavors in the private sector or whether the efforts will be restricted to research institutions and similar organizations.

Investment Promotion Law

The law on the encouragement of investment in Palestine was originally drafted in 1995 and revised in 1998 to achieve development objectives, provide guarantees to investors operating in Palestine, granting the afore mentioned investors incentives, and fostering an encouraging investment environment.

Commercial Law and Companies Law

Prior to the inception of the PA in 1993 and its arrival in 1994, the Occupied Palestinian Territories (oPt) consisting of the West Bank, Gaza Strip, and East Jerusalem were under the Israeli Civil Administration after the 1967 War. Prior to 1967, these areas were under the control of the Hashemite Kingdom of Jordan (West Bank and East Jerusalem) and the Arab Republic of Egypt (Gaza Strip) after the 1948 Arab-Israeli War. Prior to 1948, Palestine was under British Mandate which followed it being subject to the Ottoman Empire. As such, there are a variety of laws and regulations that reflect these influences and various status of Palestine historically. In regards to Palestinian Commercial Laws, in addition to the Palestinian Companies Act, their legal status is linked to the pre-existing laws prior to the arrival of the Palestinian Authority:

- Jordanian Commercial Law of 1964
- Jordanian Companies Act of 1953
- Labor Law
 - The labor law in Palestine states the following rights for employees:
 - i. A maximum of 45 working hours per week, with no daily limit
 - ii. One day per week for a weekly holiday



- iii. Overtime is calculated at 150% of the normal salary for every hour after the 45th, and shall not exceed 12 hours per week
- iv. Annual leave amounts to a minimum of 14 days during the first 5 years of employment, with a minimum of 21 after the 6th
- v. Severance pay amounts to one month's salary, for every year of employment (exclusive of overtime)
- vi. Accident insurance for workers is required to be carried by all employers
- vii. Fully paid sick days are 14 days a year, with an additional 14 at half the pay
- viii. Maternity leave requires the employer to compensate employees for 10 fully paid weeks, consisting of 4 weeks prior to delivery, and 6 weeks after.

Tax Law

The Palestinian Authority enacted a revision of the Tax Law in 2004². This essentially addressed an easing of taxes assessed to companies, lowering the previous 20% rate, to a 15% flat rate. For individuals, there is a progressive bracket based on personal income that ranges from 5% to 15% (see Table 1).

Table 1. Individuals annual income and income tax bracket

Annual Income	Income Tax Bracket
NIS 10,000	5%
NIS 10,001 – NIS 20,000	10%
NIS 20,001 +	15%

The Value Added Tax (VAT) is a tax based on consumption of local goods and services at a rate of 17%. The following categories address the VAT regulations that apply to enterprises of different sizes:

- Large Companies (Annual sales in excess of \$50,000) must issue VAT invoices to customers, in addition to paying the VAT on purchases. Refund eligibility consists of the difference between the collection of VAT on invoices issued to customers, and the VAT paid on purchases.
- Small Companies (Annual sales between \$12,000 and \$50,000) are not eligible to issue VAT invoices, but must pay VAT on purchases. Thus, their collection and deduction of VAT are on purchases from large companies.
- Micro Enterprises (Annual sales less than \$12,000) are not eligible to issue VAT invoices and are exempt from VAT on purchases. Sales must be declared at the end of every tax year, via a self-assessed report.
 - i. VAT paid for startup costs is refunded within 1-6 months of submission of receipts.

² Palestinian Investment Promotion Agency (<http://www.pipa.gov.ps/taxation.asp>)



- Financial Institutions (Banks, Insurance Companies, etc.) must pay VAT on employee salaries on a monthly basis, in addition to being assessed VAT semiannually or annually on profits.
- Non Profit organizations are exempt from VAT payments.
- Importers are assessed VAT on the stated value of goods.
- Exports are not subject to VAT.

Competition Law

The drafted Competition Law, modeled after EU Competition Laws and the Treaty of Rome, will introduce regulations to prevent anti-competitive practices. It is the Palestinian Authority’s national policy that business activities operate in a market environment where the principles of free competition are guaranteed³.

Intellectual Property

Intellectual property (IP) laws are currently subject to General Agreement on Tariffs and Trade (GATT) and the Trade Related Aspects of Intellectual Property (TRIPS). These international agreements came about after the establishment of the PA. IP laws are comprised of Patents and Designs (separated into inventions and design), Copyrights, and Trademarks. It should be noted that enforcement is somewhat difficult.

2.2 Palestinian Context (Socio-Economic Environment)

Prior to the comparisons with other countries, it is important to establish why certain comparisons are to be made. For example, according to internationally acknowledged organizations such as the World Bank and United Nations, countries are generally grouped together along the lines of geography, politics and governmental structures, or economic activities. In the interests of consistency, these comparisons will be made according to geographic region to reflect the Palestinian economic environment relative to its neighbors.

Table 2. Comparative Indicators from Neighboring Countries

Development Indicators	Population	% of Males	% of Females	Literacy Rate	Youth Population (15-29)	GDP/Capita
Turkey	76,481,847	50.2%	49.8%	95.3%	24.8%	\$10,666
Jordan	6,388,000	51.5%	48.5%	93.4%	30.5%	\$4,945
Egypt	81,600,000	51.1%	48.9%	72%	37.9%	\$3,187
Lebanon	4,0880,000	48.8%	51.2%	96.7%	27.4%	\$9,705
Syria	22,517,750	50.8%	49.2%	79.6%	21.1% ⁴	\$3,289

³ Palestinian Investment Promotion Agency (PIPA)

⁴ Percentage only represents 15-24 year olds



Table 2 shows a set of development indicators (population, %of males, %of female, literacy rate, youth population, and GDP/Capita) for neighboring countries (Turkey, Jordan, Egypt, Lebanon, Syria) considered in the following discussion as target of comparative analysis of the area. Taking the above figures into account, Table 3 outlines some of the main indicators needed in analyzing the socio-cultural environment existing in the West Bank and Gaza Strip.

Table 3. Demographics of Palestinian Territories (West Bank and Gaza Strip)

Demographics	West Bank	Gaza Strip	Total
Population	2,614,594	1,616,490	4,231,084
Gender: Male	1,327,821	820,757	2,148,578
Gender: Female	1,286,773	795,733	2,082,506
Youth Population- 15 to 29 (%)	29.6	29.6	29.6
Elderly Population-Over 60 (%)	4.8	3.7	4.4
% Under 15 Years Old	38.6	43.8	40.7
Average Household Size	5.6	6.3	5.8
Monthly Consumption/Household (JD)	1,045.7	719	934.1
Non-Food Consumption (%)	74.1%	45.6%	52.5%
Cultural Institutions	475	136	611
Literacy Rate	-	-	94.9%
Bachelor's Degree or Higher	-	-	11.3%
% of Computer Users Above 10 Years Old	54.8	51.7	53.7
Fixed Telephone Lines	244,534	115,868	360,402
Number of Hospitals	-	-	76
Number of Hospital Beds	-	-	5,108
Physicians/1,000 People	-	-	2
Dentists/1,000 People	-	-	0.6
Beds/1,000 People	1.2	1.4	1.3
Unemployment Rate (%)	20.4	36.4	27.2%
GDP (Million)	\$4,572.3	\$1,685.6	\$6,257.9
GDP/Capita	\$1,955.3	\$1,061	\$1,593.5

Source: PCBS (2012).

As for the socio-cultural context, it is should be noted that Palestinian society is more homogeneous than other regions such as the US or EU. Indeed, Arabic is the commonly spoken language amongst all its citizens. Another interesting fact is the distribution of religions among Palestinians, with 85.8% being Muslim, and the remaining 14.2% being Christian. Also of note, is the fact that 95% of Palestinians own mobile phones, with 50.9% owning computers, and 30.4% having direct home access to the internet⁵.

As for the Economic Environment, it is important to note that according to the World Bank Ease of Doing Business Report 2013 (World Bank, 2013), the Palestinian Territories have an estimated Gross Domestic Product (GDP) worth \$6.47 billion (Table 4). This amount, when compared to other countries in the region is quite small. For example, in the report, countries compared to the Palestinian Territories include Turkey, Syria, Egypt, Jordan, and Lebanon. The closest economy to Palestinian GDP is that of Jordan, which is estimated at \$28.84 billion. Turkey is the largest economy at \$773.09 billion among the countries compared. In this case, the Palestinian GDP is only 0.8% of that of Turkey's GDP. This shows a substantial lack of economic development, especially when taking into account local

⁵ PCBS's Palestine in Figures 2011, May 2012



businesses operating in the West Bank and Gaza Strip. Furthermore, it is also worth noting the service based nature of the Palestinian economy.

Table 4. Palestinian Territories GDP compared with Turkey, Jordan, Egypt, Lebanon, and Syria

	Ease of Doing Business Rank	GDP (\$ Billions)	GDP/Capita	% of GDP
Turkey	71	773.09	\$10,666	0.8%
Jordan	106	28.84	\$4,945	22.4%
Egypt	109	229.53	\$3,187	2.8%
Lebanon	115	42.19	\$9,705	15.3%
West Bank & Gaza Strip	135	6.47	\$1,529	
Syria	144	59.15	\$3,289	10.9%

Sources: World Bank Ease of Doing Business 2013, World Bank Development Indicators 2012

Table 5. Palestinian Economic Activity per Sector

Activity Sector	Economic Output (\$000)	Employees	Enterprises
Industrial Activities	\$ 2,819,353	72,022	17,090
Construction Activities	\$ 392,047	7,222	587
Internal Trade Activities	\$ 2,622,995	133,156	68,295
Transport & Storage Activities	\$ 106,821	4,256	513
Information & Communications Activities	\$ 681,699	5,418	500
Services Activities	\$ 1,302,108	92,852	29,954
Total	\$ 7,925,022	314,926	116,939

Source: PCBS Economic Survey Series 2012

Figure 3. Employees by Industry - Source: PCBS Economic Survey Series 2012

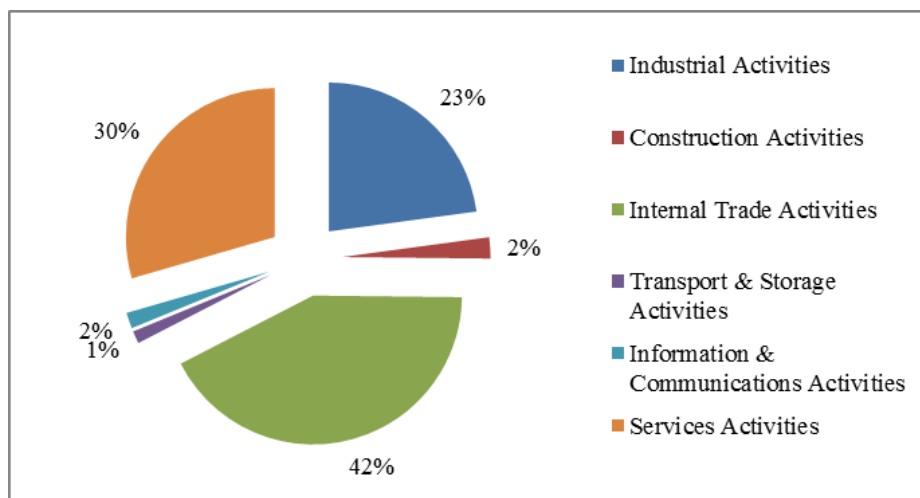
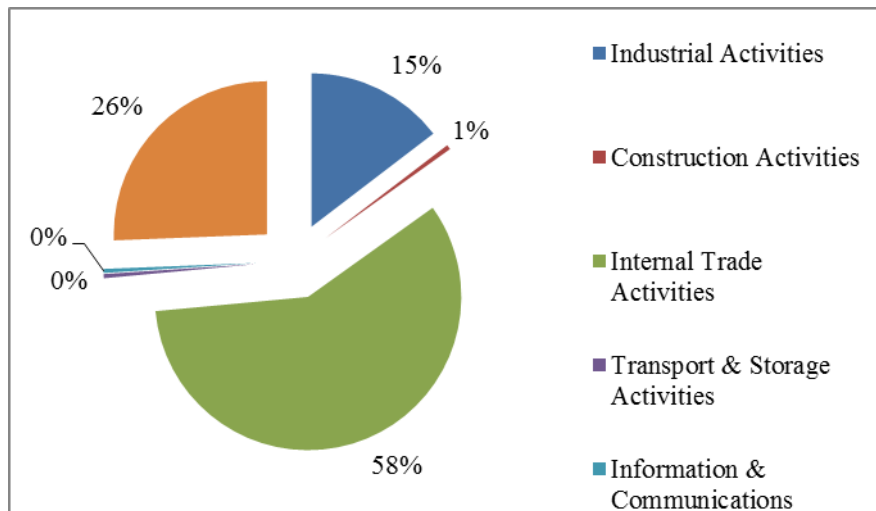


Figure 4. Enterprises by Industry - Source: PCBS Economic Survey Series 2012



As for the economic context it is also of note to understand the nature of the economy, which is essentially service based as shown in Table 5, Figure 3, and Figure 4. The reasons are as follows; first, 64% of economic output in the Palestinian economy is non-industrially based, as seen in Table 1; second, approximately 76% of individuals are employed in industrial activities; third, approximately 85% of establishments that contribute to economic output are non-industrial in nature.

Considering now exports, they are mainly concentrated to Israel and Arab countries such as Jordan and Egypt. However, 2010 realized a significant increase in exports to countries other than Israel and Arab states. In 2010, total Palestinian exports amounted to \$575 million annually. Israel accounted for \$453 million, whereas Arab countries accounted for \$66 million, with the remaining \$56 million being targeted to other countries. Even when dealing with exports, there is a clear dependency on the Israeli economy, which limits opportunities for Palestinian businesses.

Table 6. Palestinian Territories export as % of GDP compared with Turkey, Jordan, Egypt, Lebanon, and Syria

Exports as % of GDP	2008	2009	2010	2011	2012
Palestinian Territories	20%	17%	20%	16%	11%
Turkey	24%	23%	21%	24%	24%
Jordan	57%	46%	48%	46%	46%
Egypt	33%	25%	21%	23%	21%
Lebanon	24%	21%	22%	24%	24%
Syria	37%	29%	35%	NA	38%

Sources: World Bank, PCBS 2012

As for the Research & Development a relevant source of funding is related to foreign grants and investments. Among them, the European Research Area is a European Union initiative to foster cooperative research efforts amongst various countries. This initiative aspires to enhance the level of research and increase the knowledge transfer between different countries

and institutions. The 7th Framework Programme for Research and Technological Development (FP7) is a €50 billion program that is tasked with responding to needs in terms of jobs and competitiveness, while maintaining leadership in the global knowledge economy. One of the core areas addressed is the training and career development of researchers, representing relevant enablers for PA education and scientific institutions, and is in line with the mandate of the Sina Institute, likewise.

Unemployment and the Labor Market

Overall unemployment is estimated to be 27.2% in the Palestinian Territories according to the Palestinian Bureau of Statistics (PCBS) in 2012. Clearly, due to the political situation in the Gaza Strip (GS), unemployment is higher there than in the West Bank (WB). However, to obtain some substantial level of clarity, unemployment alone will not necessarily provide a comprehensive picture of the Palestinian economic environment. Economic systems are based on the use and distribution of resources within a nation. With limited natural resources and an ongoing occupation, it is important to focus on the human resources possessed by Palestinians. As such, by reviewing the unemployment rate, and more importantly, the labor force participation rate, one can learn about the nature of the economy by seeing where demand is strongest and weakest. The mismatch Labor Force Participation Rate (LFPR) and unemployment essentially is an indicator of demand in a given field. Table 7 shows figures from the Palestinian Central Bureau of Statistics (PCBS). For example, when looking at Engineering, one notices that unemployment is at 23.3%, which is below average, and LFPR is 85.7%, which is above the average of 78%. Based on this, demand for engineering can be considered strong.

Table 7. Unemployment, Labor Force Participation Rate for field of specialization in Gaza Strip (GS) and West Bank (WB)

Field of Specialization	Unemployment (%)			Labor Force Participation Rate (%)		
	GS	WB	Total	GS	WB	Total
Educational Sciences and Teacher Rehabilitation	53.2	32.5	39.3	80.6	76.0	77.4
Humanities	38.8	20.0	29.5	76.2	71.8	73.9
Social and Behavioral Sciences	30.9	27.7	29.2	83.0	81.8	82.4
Mass Media and Information	41.1		41.2	88.4		90.2
Business and Administration	37.4	20.3	25.9	79.0	78.1	78.4
Law			22.9			66.9
Natural Sciences	19.1	16.7	17.5	81.5	76.5	78.1
Mathematics and Statistics	32.8	19.1	25.5	76.1	77.9	77.0
Computer Sciences	45.8	17.6	29.0	84.0	77.9	80.3
Engineering	35.6	18.4	23.3	84.4	86.3	85.7
Architecture and Construction	20.0	6.9	11.9	71.2	77.3	74.9
Health	32.8	9.6	19.7	83.4	77.3	79.9
Personal Services ⁶			17.3			72.5
Other	34.0	14.1	24.9	70.9	80.1	74.8
Total	36.4	20.4	27.2	79.7	76.8	78.0

Source: PCBS, Press Report on Labor Force Survey Results, 15/8/2012

⁶ Personal Services Include: Animal Trainers, Caretakers, Ushers, Attendants, Undertakers, Barbers, Cosmetologists, Tour Guides, Concierges, Childcare, Trainers, Instructors, etc.



In the case of computer sciences however, unemployment is reported at 29% and the LFPR is 80.3%. This indicates that there is a mismatch that even with high unemployment, there is still above average participation in the labor force, meaning actively seeking employment, which indicates that there are opportunities available to graduates.

Upon further review, it is also important to identify the nature of employment in the Information Technology (IT) sector. It is important to note that the rate of 81.6% represents the number of individuals actively participating in the labor force for the IT sector. Therefore, out of a potential 18,872 individuals, only 15,400 are engaged in actively seeking employment without success (i.e. unemployed) or employed in this field. Thus, the unemployment rates will be measured against those individuals participating in the labor force. According to the PCBS Labor Force Survey for the 2nd Quarter of 2012, the number of unemployed individuals in the IT sector was 4,700 (30.52%) out of a population of 15,400 individuals for the IT sector. However, the majority of individuals, 9,000 (58.44%) were fully employed meaning that jobs were obtained that met their qualifications and skills, whereas 1,700 (11.04%) were considered underemployed, meaning that their skills possessed exceeded the requirements of their jobs. On average, these employees earned a daily rate of NIS 94.5 or the equivalent of \$25.

Figure 5. Employment in the IT Sector

Individuals status (IT sector)	Number	Rate
Labor Force Participation	15,400	81.60%
Full Employment	9,000	58.44%
Underemployment	1,700	11.04%
Unemployment	4,700	30.52%

Source: PCBS 2012

Finally, in terms of research and development, the PCBS reports that the sum of \$35 million is spent on research and development in the Palestinian Territories. The Royal Society reports that over \$1 trillion is spent globally on research and development, with the US leading the way spending over \$405 billion annually. In other words, Palestinians contribute 0.0035% to global research and development, which is quite despairing. It should be noted that only 2,348 individuals are employed full time in research and development activities, with just over 75% being male, with the remaining 25% being female. The PCBS undertook a survey of 48 enterprises in the West Bank and Gaza Strip engaged in research and development activities resulting in the following:⁷

- Each facility had an average of 14 individuals employed in research and development
- The average monthly wage was \$692
 - West Bank researchers earned an average of \$749 a month
 - Males earned \$833 whereas females earned \$708 on average in the West Bank

⁷ PCBS Statistical Year Book 2012

2.3 Palestinian Context (Technological Environment)

The following points are some of the main challenges faced by Palestinians in terms of ability to apply technologically based solutions.

- *Electromagnetic Sphere Restrictions*: there are restrictions on the frequencies or sections of frequencies assigned to Palestinians in the use of communications technologies on the part of the Israeli authorities.
- *Capacity*: Palestinian access to WiMax and 4G LTE (Long Term Evolution) frequencies has been refused by the Israeli authorities, limiting the content and type of services that could be offered to Palestinians.
- *Infrastructure*: the ability of Palestinian firms to build “switches” or “exchanges” or other infrastructure needs is limited due to Israeli restrictions.
- *Illegal Operators and Goods*: illegal operators continue to exist in the Palestinian Territories which creates a significant disadvantage for official Palestinian firms. An estimated 20%⁸ of all ICT related activities goes through these operators.

The restriction on imports and exports is another problem facing Palestinians. The Israeli authorities can restrict which goods and services may be used and offered by Palestinian firms and institutions to the general population.

3 European Union Context

Apart from Palestinian context, the WP1 aims to widen and revise the R&D strategy of BZU Sina Institute according to the needs of European Union (EU) societies in the area of Arabic/multilingual and multicultural knowledge sharing technologies. In this section we discuss the main findings of the analyses carried out on secondary sources, focusing mainly on socio-economic factors impacting the demand for Arabic/multilingual technologies and capabilities.

As reported by European Commission (2008), Arabic, and in particular the Maghreb Arabic (mainly in France, Spain and Belgium) is one among the wide range of languages spoken by immigrant communities in EU countries. According to the European commission First European Survey on Language Competences Arabic results the most widely taught foreign language in Malta (6th taught foreign language), Netherlands (7th taught foreign language), French Community of Belgium (8th taught foreign language), England (9th taught foreign language). Nevertheless, as reported by European Commission studies (2008), on the one hand, Arabic as other non-indigenous languages have not a formal status or recognition in EU countries; on the other hand, EU provides immigrant communities funding to support integration into their new countries of residence through development programmes (European Commission, 2008).

However, a research by Khader Bichara (2010) of the Centre d'études et de recherches sur le Monde Arabe contemporain (C.E.R.M.A.C.) of the Catholic University of Louvain, looking ahead to 2030, argued that the actual minority of Arab immigrants in Europe and Europeans of Arab origin (estimated around 6 million, in 2010, the minority of Arab immigrants in Europe and Europeans of Arab origin), will double or even triple by 2030, under the effect of natural growth and new immigration flows. As a consequence,

⁸ According to Ministry of Telecommunications and Technology, 2005, 'The National Strategy of Telecommunications and Information Technology 2005-2008'.



Khader Bichara (2010) expected that total Arab population in EU will jump from 350 to more than 500 million; whereas the total population of the EU Member States will stagnate around 500 million. As for the new immigration flows (especially from the Maghreb), the main causes have to be found in the gap between potential supply of work force and job opportunities in the Arab World.

Taking these issues into account, it is worth noting that EU acknowledges the increasing need for skilled workers and talented professionals from outside EU countries borders. Thus, as recognized by Cecilia Malmström, European Commissioner responsible for Home Affairs (Malmström, 2012), considering that without net migration the EU's working age population will have shrunk by 12 per cent by 2030, EU needs to ensure that migration and mobility support economic growth in Europe. Considering, for example, one of the field of interests for the SINA research, the field of information technology is expected to be short of as many as 700,000 workers in three years (Malmström, 2012). However, answers to these challenges, are currently provided both at policy and actions level, e.g., promoting the mobility of people between Arab countries and the EU, by issuing multi-entry visas to researchers and business people (Malmström, 2012). Furthermore, as for immigrant communities, some EU country supports the development of skills in their languages of origin, and their children are taught them at school, bilingual skills being considered a potential personal asset for career possibilities in several fields (European Commission, 2008). Indeed, a study undertaken for the European Commission (2008) pointed out that EU firms, and in particular the small and medium-sized enterprises (SMEs), may lose business opportunities, due to a lack of language skills, being Arabic one of the languages with a growing relevance together with Chinese and Russian. Thus, the study recommended that EU firms take a strategic approach to multilingual communication, developing language skills in their organizations (European Commission, 2008). Accordingly, the study considered multilingualism as an economic growth sector, involving language teachers, translators and interpreters, and creating opportunities for designer and producer of electronic support platforms for computer-assisted or automatic translation systems.

Taking these issue into account, it should be noted that, according to a research reported by the Multilingual Europe Technology Alliance (META Technology Council, 2012)⁹, 57% of internet users in Europe purchase goods and services in languages that are not their native language (first English by French, German and Spanish), and the amount of online content in Asian and Middle Eastern languages has exploded, with more than 55% not in English (META Technology Council, 2012). Finally, besides the above issues showing the EU general growing needs for multilingual initiatives, and in particular for Arabic language, it is worth noting that according to the figures reported again by the META Technology Council, the overall value of the European language industry was estimated at 8.4 billion Euros in 2008, and expected resulting in ca. 16.5 billion Euros in 2015 (META Technology Council, 2012) .

⁹ A Network of Excellence dedicated to fostering the technological foundations of a multilingual European information society (<http://www.meta-net.eu>).



PART II: LOCAL STAKEHOLDERS' NEEDS ASSESSMENT

4 Introduction

In this Part of the document, we detail the results of local stakeholders' needs assessment, suitable to complete the analysis discussed in Part I for the reconstruction of the context of intervention of the Sina Institute. It is worth noting that local stakeholders encompass internal staff to Sina Institute and Birzeit, local and external institutions, and individuals deemed relevant to the scope of the Sina Research & Development strategy definition. The process of assessing the needs of local stakeholders in the West Bank has been carried out through the following step:

- Literature Review (for innovation model identification)
- Stakeholders Interviews (local/internal)
- Peer Institutions Interviews (external)

In the following sections, first we discuss the results of literature review, suitable to be used for the identification of an innovation model appropriate to Sina Research & Development strategy; then we consider the priority needs by local stakeholders; finally, we outline the outputs of the external stakeholders' needs assessment.

4.1 Literature Review

E-Government research is critical to the viability of the Sina Institute, due also to the fact that the Palestinian Authority (PA) is receiving support from donor nations in developing the infrastructure and institutions necessary for the establishment of an independent state. In addition, considering the academic ground of Sina Institute, given the relatively young age of the Palestinian population, education will become an even more important strategic target. Indeed, a large portion of the population is actually under the age of 14, while an estimated 35.8% (471,908 males and 447,816 females) is either 14 or younger¹⁰. As a consequence, the integration of solutions in educational methods administered is expected to directly affect nearly one million Palestinians in the West Bank alone. Healthcare is also a cornerstone of any society, and innovation and technology are extremely important to develop this sector. Initiatives such as the Flagship Project overseen by the Palestinian Ministry of Health (PMoH) and the United States Agency for International Development (USAID) emphasize technological solutions to problems in operating models and quality.

Ultimately, the Sina Institute should not be merely tasked with doing research for technological purposes solely, but rather it should be committed to find outlets for its research to further the societal development and meet the subsequent needs. This can be achieved, for example, if ontology becomes a core element in any of the Sina Institute's research methods, as this solution is essentially applicable to a multitude of applications (among them, the above mentioned: Knowledge Management, E-Government, Healthcare,

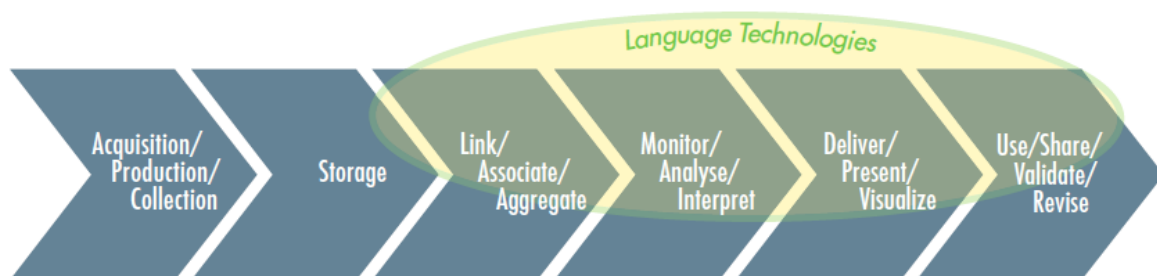
¹⁰ CIA- The World Factbook, 2011

and Education). Indeed, ontology engineering deals with designing, managing, and exploiting ontologies within information systems (Guarino, 1998; Gómez-Pérez et al., 2004; Staab et al, 2004). Therefore, the impact of using ontology as a basis for research would be quite substantial as it would affect a variety of fields, since information systems have essentially been embedded into a number of specialties and fields such as healthcare, business and financial, geographic and other social sciences, to name a few. For example, Figure 6 illustrates the value chain for language technology of the META Technology Council (META Technology Council, 2012). In this figure, the process is a take on Michael Porter's model (Porter, 1985). The concept and figure essentially diagram the primary and supporting activities needed to deliver value to language users. These language technologies are to act as the supporting activities (i.e., machine translation, cross-lingual information access and information extraction) for individuals and organizations to receive value for their desired uses:

- *Acquisition/Production/Collection*
- *Storage*
- *Link/Associate/Aggregate*
- *Monitor/Analyze/Interpret*
- *Deliver/Present/Visualize*
- *Use/Share/Validate/Revise*

At every stage, there are a number of organizational and individual uses and services that can be performed to enhance the process as it ultimately reaches the end user in any form (i.e., blog, article, search engine, tools, etc.). A key factor for this model to be successful in the Palestinian context is how large amounts of data is addressed. Standardization and interoperability are critical to this process. When dealing with multiple languages or localized dialects, the availability and usefulness of the data becomes critical, as it will be handed off from one stage to the next. Therefore, if the data isn't useful, through validity, or relevance, then the process will yield inferior outputs.

Figure 6. Value chain for language technology



Source: Strategic Research Agenda for Multilingual Europe 2020, META Technology Council, 2012

As such, it is quite possible that research and development (R&D) in the fields associated with the use of the Arabic language, such as semantics and ontology, can actually foster innovation in various private and public sector efforts. Some may perceive this use of Arabic language in such fields as a more traditional *technology push* model of innovation represented in Figure 7 as a linear progression from scientific discover (basic science),

through technological development in firms (design & engineering and manufacturing), to the marketplace (marketing and sales). According to this perspective more investments into R&D would result in more successful new products available to the marketplace (Gold, 1987).

Figure 7. Technology push model of innovation



Source: Source: adapted from Noori et al. (1992) and Howells (1992)

However, it is worth noting that enterprises adopting a technology-push oriented strategy may neglect market opportunities, as they tend to remain inward looking, and only external factors may initiate a transition in the firm's approach (Lubik et al, 2013). Also, this often coincides with limited market information, and undertakes endeavors based primarily on prior experiences or instinct (Lubik et al, 2013). As such, the firm or enterprise is operating in a somewhat duplicitous or insincere manner when it comes to truly innovating, as innovations are generally meant to enhance or improve upon a process or product, and the manner in which it can be undergone or used respectively.

Contrary to the technology-push model, is the *market-pull model* (see Figure 8). In this case, the market need is the basis for the model and acts as the trigger in the process leading to research, then design and engineering, followed by manufacturing, and ultimately sales to offer the product or service to the market based on the initial identification of needs.

Figure 8. Market pull model of innovation



Source: adapted from Noori et al. (1992)

However, the two perspectives may find a suitable outcome when integrated in a parallel model of innovation, as shown in Figure 9. This innovation model is based on a portfolio of wide ranging systematic studies and sectors in many countries, seeking to reduce wasteful failures and better understand successful innovations thus utilizing limited resources.

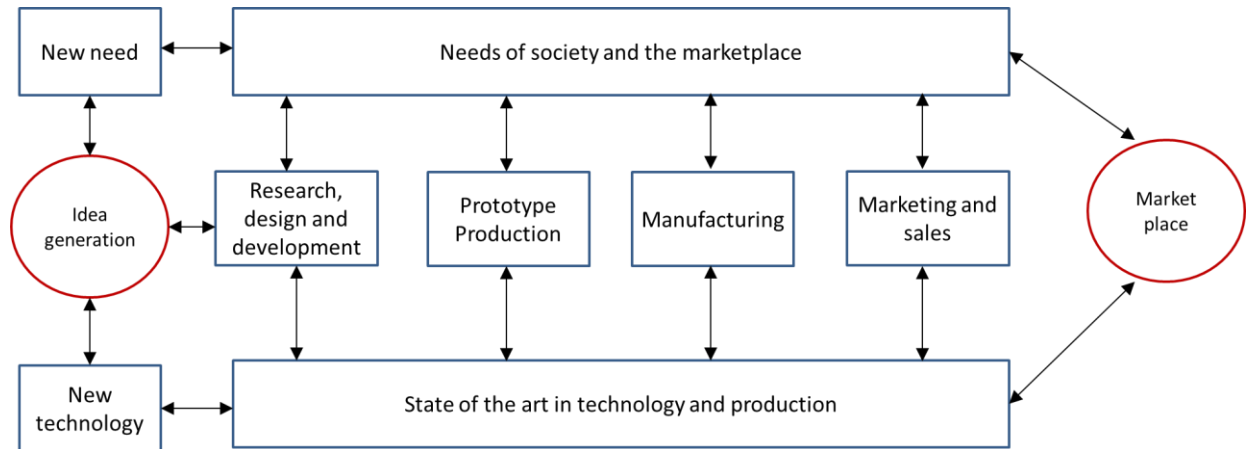
This process might be suitable to be adopted by Sina Institute, according to contextual factors characterizing its R&D environment (see Part I). Furthermore, this process was observed and applied as a result of constraints on resources, thus utilizing all available resources, while seeking a mechanism to bridge the gap between societal needs and existing, state of the art technology. That is due to the fact that rather than a linear model, Figure 9 shows an interactive model of the innovation process, although logically sequential, it's not necessarily continuous, and can be divided into a series of functionally distinct but interacting and interdependent stages (Rudolph and Little, 1989).

However, it should be noted that the integrated model is comprised of three components or spheres; (1) Technology-push (*idea generation* in Figure 9); (2) Transition



from technology-push to market-pull (the central body in Figure 9); (3) Market-pull (*market place* in Figure 9).

Figure 9. An integrated and parallel model of innovation process



Source: (Noori, et al, 2009)

Therefore, when dissecting each component, it is important to understand the nature of linear model in component one (the technology-push), that illustrates how technology drives the creation of product ideas or prototypes. The latter have to be made available to the market with a dynamic being created between

- i) the product ideas and prototypes,
- ii) the finished products available to offer using sales and marketing efforts, and
- iii) the market (the buyers and sellers of these products), with
- iv) the feedback from the market filtering back into the product ideas and prototypes for new offerings or modifying existing offerings.

Table 8. Types of firms moving to technology push or else market pull innovation model

Types of Firms in Sample	Technology-push to market-pull	Market-pull to technology-push	Total
Advanced materials	6	3	9
Displays	2		2
Biotech	2	2	4
Renewable energy	4	3	7
Other clean technologies	1	-	1
Inkjet	-	1	1
Internet security	-	1	1
Total	15	10	25

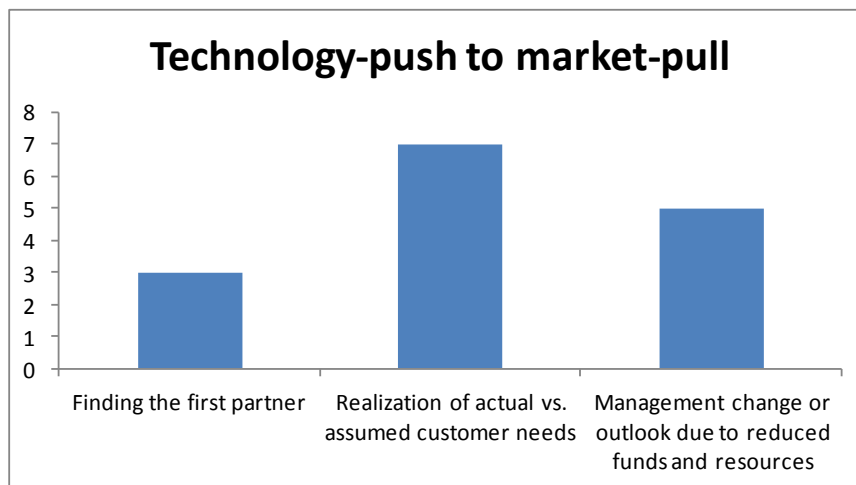
Source: (Lubik et al, 2013)

The second component consists of the transitioning from the technology-push to market-pull. Here, it is noticed that technology is effectively relegated from this equation and the focus is on the cycle from product ideas and types to finished products and the market. Technology

in this case becomes a supporting mechanism for the market-pull component which emphasizes the fundamental shift in focus. The market-pull component begins with the market (the buyers and sellers), which acts as a catalyst for innovation. The market's role is to inspire newer and more far reaching uses and ideas for the product or service. This process filters back to the market in the form of modifications to the finished product and upon reaching the market, restarts the cycle again, looking for newer ideas for the product and its use.

We now provide figures from a case study discussed in Lubik et al. (2013), in order to further identify the factors to be taken into account for an integrated innovation model suitable to be adopted by the Sina Institute. As shown in Table 8, the analysis is based on a sample of 25 firms, 15 of which were considered technology-push and shifted to a market-pull strategy, with the remainder initially being market-pull and shifting to a technology-push strategy. Interestingly enough, in the study, the technology-push firms required an average of 4.2 years to realize any revenues, whereas the market-pull firms averaged 2.9 years. Also of note is the fact that 20 out of 25 firms in the sample were represented in both groups (*technology-push to market-pull* and *market-pull to technology-push*).

Figure 10. Factors driving the shift from a technology-push to a market-pull model

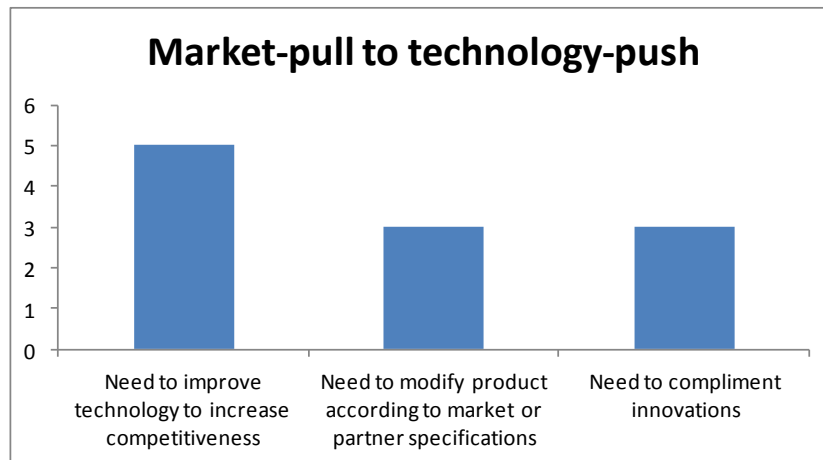


Source: (Lubik et al, 2013)

As shown in Figure 10, technology-push oriented firms in the sample most often realized gaps between what was assumed and what was actually needed by customers. Therefore, pushing technology as a solution wasn't a viable enough option. This reason, coupled with the increased amount of time needed to realize revenues, may allude to the need for the market's input regarding innovation and its ability to be offered through products and services.

This point is important as the Sina Institute offers knowledge and solutions to other institutions through its research. This type of feedback can be vital to identifying the specific areas of research that would be most lucrative to the Sina Institute: a potential target is the service sector, where semantic technologies and Arabic ontologies are strategic for current marketing approaches focused on sentiment analysis and opinion mining for customer experience management.

Figure 11. Factors driving the shift from a market-pull to technology-push model



Source: (Lubik et al, 2013)

Considering now the firms that began as market-pull and transitioned to a technology-push orientation, Figure 11 shows these firms felt the need to focus on technology to become more competitive in offering products and services to the market. Indeed, this group tended to be more successful in realizing revenues. Thus, the technology-push seemed to have contributed to the relative success of these firms. In this case, technological advancements were focused after the assessment of market needs. This is important to note, as if the areas of focus can be identified, the research can serve as a means to support the solution and ensure its attractiveness to stakeholders.

As a consequence of the above discussion and figures, we believe that the parallel model is preferable for the Sina Institute, as it can operate in adverse conditions with limited resources, as well as being oriented towards receiving and integrating market or external information into a more viable or effective manner. Any achievements realized by the Sina Institute in this case, would likely be more in demand relative to its stakeholders and constituents, thus substantiating current funding, and likely to increase funding in future efforts.

4.2 Identification of the stakeholders' needs

The methodology undertaken towards the assessment of local needs of the Sina Institute's stakeholders encompassed several steps. Initially, along with the literature review, meetings were held with senior staff at the Sina Institute in order to ascertain the capabilities. To this end, similar institutes and centers operating in the region or internationally have been considered as benchmarks.

The Qatar Computing Research Institute (QCRI - <http://www.qcri.com/>), and the Kingdom of Saudi Arabia's Computers Research Institute of the King Abdel Aziz Science and Technology City (KACST CRI - <http://www.kacst.edu.sa/en/Pages/default.aspx>) were the centers selected as benchmarks for the Sina Institute, given the focus on Arabic Language Technologies (<http://www.econtent.org.sa/Pages/Default.aspx>), as well as research, and not less importantly, the partners and stakeholders spanning the public sector, private sector, and academia. Accordingly, a review has been carried out regarding the documents available on their website, focusing on their research activities, projects, resources, organizational



structure, networks, funding sources. As a result, the local Palestinian stakeholders were identified in the private sector, public sector, and academia (see Table 9). Thus, the considered interviewees/informants were not just representative of the Palestinian Information Communications Technology (ICT) sector, but also other aspects of Palestinian society that would benefit from enhanced research by the Sina Institute.

Table 9. Local & External Stakeholder Interviews

Name	Organization	Type	Position	Takeaways
Adnan Yahia	Birzeit University	Academic	VP-Academic Affairs	Develop Research Oriented Staff, Integrate Achievements, Focus on Developing Partnerships
Ibrahim Abu Kteish	NZCITE	Outreach/Academic	Director	Develop Partnerships, Foster Cooperative Efforts, Enhance Communication with Private Sector
Marwan Tarazi	Birzeit University CCC	Outreach/Academic	Director	Focus on Core Values and Mission, Develop Staff, Ensure Research Topics are Fundable
Firas Nasr	Iconnect	Private Sector	President	Develop Relationship with Private Sector, Joint Research, Equip Students with Marketable Skills
Suhail Sultan	PPU/BZU	Academic	Faculty Member	Develop Partnerships, Joint and Interdisciplinary Research, Private and Public Sector Involvement
Yousef Ghandour	PEEKS/Lean Startup Circle	Private Sector	Founder	Entrepreneurial Spirit and Innovation are Needed, More Cooperative Efforts with Private Sector, Let the Private Sector Fund Research Facilities
Tamer Issawi	Birzeit University	Academic	Dean-Nursing, Pharmacy, Applied Sciences	Funding is Important, Quality Research Must be Cornerstone of Institute for Success, Staff Development and Student Recruitment, Healthcare Applications Require Technological Solutions
Shady Issa	Ericsson	Private Sector	Project Leader	Equip Students with Skills, Engage Other Universities and Institutions (Private and Public)
Maher Hashwiah	Birzeit University	Academic	Dean-Education	Staff Development, Research, Technology can be an Asset for Education and Educating
Hada Aryan	Muwatin	NGO/Human Rights	Administrative Director	Accessibility to Arabic Language Based Research and Information, Develop More Research Oriented Relationships & Partnerships with Palestinian NGOs, Students &



				Researchers Should Publish with NGOs & Universities
Leila Amer	Sina Institute	Research/Academic	Financial and Administrative Director	Links to the Private Sector & Partnerships with Research Institutions & Universities, Arabic Language Technologies & Translation, Instantaneous Translation
Hiba Olwan	Sina Institute	Research/Academic	Researcher	Cooperative Research Efforts, Arabic Language Technologies Research, Dialects, Translations, Scientific Arabic Content, Develop Scientific Database of Arabic Material
Hadeel Sous	AlMaqdasi	NGO/Human Rights	Public Relations Coordinator	Arabic Content for Social Media and Fundraising Purposes, Reporting and Accurate Translations Required for Validity, Offer More Tools for Facilitation of Services & Networking
Wojdan Farraj	Birzeit University/Career Services Center	Education/Academic	Coordinator	Communication with Students & Trainees to be More Transparent, Arabic Language Search, Offering Materials and Search Engines in Arabic, Connections with Schools & Other Education or Research Based Institutions
Imed Zeitouni	Microsoft	Research/Information Technology	Principal Researcher	Must create linkages to private sector, encourage partnerships through enhanced Intellectual Property and Memorandums of Understandings, Private sector firms to be inexpensive and credible source for data banks to overcome technical barriers, journalism and media to be targeted sectors, Levantine dialects to be emphasized for core competency.
Nizar Habash	Columbia University	Research/Academic	Research Scientist	Translation, Arabic to English MSA & Colloquial, Levantine Dialects, OCR for handwritten Arabic, Private sector and US Government seeking translation services, healthcare for translation needs, Middle East institutions for preservation of integrity of Arabic Language
Christiane Fellbaum	Princeton University	Research/Academic	Senior Research Scholar	Creation of research cooperation with or without bureaucratic steps (i.e., informal), semantic and multi-language tools for e-commerce and tourism, Sina staff development for future



				success, speech recognition and therapy, e-courses for educational needs for distance learning.
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The sessions have been carried out via face-to-face, telecommunication and electronic means (i.e., skype, emails, phone interviews) in a semi-structured method, submitting to the attention of each informant/interviewee a series of talking points regarding common factors faced by those in the industry or in similar situations. In particular, the stakeholders were subject to a series of semi structured questions on:

- Needs of their clients/constituents regarding the Arabic language
- Trends in technology
- Key partners or relationships
- Ranking some of the existing technological needs (i.e., semantic web, grammar checkers, spell checkers, etc.)
- Key factors or drivers in delivering value
- The factors or forces affecting the ability to innovate or deliver value in their respective field or service

The answers were analyzed and were subsequently interpreted to list the research and applicable needs according to the stakeholders. Accordingly, the results were used to establish the basis for a gap analysis (see Table 10), used also in the external stakeholders’ needs assessment, by isolating on the local capacities available in the marketplace, while identifying trends not only in Palestine, but in other parts of the world such as Europe, the Middle East, and the United States of America. It is worth noting that, among the priority identified, a specific relevance has been associated to the need for a more cooperative atmosphere/environment when it comes to research and integrating technological solutions to societal problems.

Since the Sina Institute specializes in knowledge engineering and Arabic technologies, research in these fields becomes the crux of any strategies to be taken to ensure sustainability and viability in any future endeavors. In order to be more effective in the undertaking of any research projects, a cooperative spirit must be present between the Sina Institute, and other universities or institutions focusing on the usage and promotion of the Arabic language in many different related matters such as using solutions to assist in fields such as education, healthcare, research, social media, and so on.

Therefore, work in the Semantic Web (SW) becomes of innate value in embracing and fostering this spirit, as by its definition, Berners-Lee, et al (2001) state that Semantic Web “is an extension of the current web in which information is given a well-defined meaning, better enabling computers and people to work in cooperation.” This spirit of cooperative research can be manifested into cooperative efforts with local and international private firms focused on researching how various technologies can be integrated into different fields for a variety of solutions.

Beneficiary areas resulting from this enhanced research were determined to include, but are not limited to, the following sectors (mostly covering the areas represented in Table 11):

- E-Government
- Education
- Healthcare



- Social Web
- Semantic Web
- News/Media

Table 10. Gap analysis

Action Item	Current Status	Strategic Objective	Achievements/Strengths/Resources	Gap	Remarks/Measures Needed
Arabic Language	High Activity	Point of Reference and Research Leader	Research Publications, Partnerships, E-Governance Institute	Minimal - No Gap	
Healthcare	Inactive	Integrate Technologies in Key Public and Private Hospitals and Institutions	Potential Relationships and Partnerships with Educational and Research Institutions	Large Gap	Speech Recognition and Translation Tools for Transcription and Other Uses for Official Medical Terminology
Education	Intermediate Activity	Integrate Arabic Language Tools and Technologies with Primary, Secondary, and Higher Educational Facilities	Potential Relationships and Partnerships with Educational and Research Institutions	Large Gap	Arabic Language Based Tools to be Developed with Educational Experts to Identify Optimal Methods of Teaching Arabic Language Based Courses and Speech and Educational Therapists to Identify Potential for Learning Disabilities and Conditions
News/Media	Low Activity	Integrating Arabic Search Tools and Templates for Social Media Usage and News Outlets	Potential Relationships and Partnerships with Educational and Research Institutions, Private Sector, News/Media Outlets	Large Gap	Offer Arabic Language Tools for the Uploading and Addition of Arabic Content to Blogs, and Other Media Formats (Social, Traditional, Mobile)
E-Commerce	Inactive	Provide Arabic Language Tools for Private Sector and Integrate into ICT Firms and Services	Potential Relationships and Partnerships with Educational and Research Institutions, Private Sector	Large Gap	Arabic Language Based Tools for Development and to Stimulate Use of Arabic Language Sites and Programs as Opposed to Traditional English Based Formats/Platforms

Moreover, the framework for assessing the local needs of the Palestinian market will reveal core items that will be used in terms of goal setting to enhance the current landscape and build towards future expansion. To this end, the results have been further clustered in four dimensions, representing needs or challenges to be considered by the Sina Institute strategy: innovation, knowledge based staff, awareness of global trends and technology, entrepreneurial spirit. A brief summary for each of them follows.

4.3 Innovation

The participants universally agreed that innovation was an evident need not only for the Sina Institute, but moreover for the development of Palestinian society. Even more so, mechanisms for achieving innovation were severely lacking to build on or further development on existing technologies. Considering the well-known model of innovation diffusion designed by Rogers (1962) the following five groups along a curve may be identified in the innovation lifecycle as a % of the overall population in a given context:



- **Innovators** (2.5%): those with higher levels of education, income/prosperous, and tended to be more risk oriented with consumption or purchasing decisions.
- **Early Adopters** (13.5%): tended to be younger, highly educated, and exhibited community leadership.
- **Early Majority** (34%): somewhat conservative but open to some new ideas, active in community and tend to influence peers.
- **Late Majority** (34%): tended to be older, somewhat less educated, conservative, and tend to be less socially active.
- **Laggards** (16%): highly conservative, lower levels of capital, older, tend to be the least educated.

Thus, although innovators tend to make up a small percentage of any society, as referenced in the above classification, this group is the first step in how products and services are designed, offered, consumed, and developed. Accordingly, this can be both a strategic target and a drivers of the Sina Institute, considering the primary role of university in promoting and diffusing higher education.

Ultimately, the reasoning behind this form of analysis stems from Sina's ability to engage the private sector. If innovators are only 2.5% of the population, historically speaking, for a population of just over 4 million people, a market of roughly 100,000 is established. The question beckons, is a market size of 100,000 individuals enough? If not, this would lead Sina to focus on institutions and organizations with more users, within and beyond Palestine.

4.4 Knowledge Based Staff

Sina Institute's stakeholders reported difficulties in broadening or diversifying staff in their firms or enterprises. The staff retained was generally comprised of very similar specialties or backgrounds, thus making it an arduous process to expand beyond a certain scope of activities. In order to truly deliver value, staff must include some diversity in their fields of expertise to better identify research that is applicable to a multitude of fields. For example, considering projects related to cultural heritage, a staff researcher with a background in history of art should be worth included/hired among the staff members, being more likely able to identify topics and materials of value than his/her counterpart that has only an IT or engineering background (the latter lacking of theoretical knowledge or understanding on cultural heritage related topics).

4.5 Awareness of Global Trends and Technology

Awareness of global trends and technology was another glaring need based on the interviews. Awareness, in this case, is essentially being up to date with state of the art methods and technologies used by other institutions in other regions such as the US, Europe, or East Asia (i.e., Korea, Japan). This was often tied to a lack of true interaction with other institutions or firms outside of Palestine. For example, many software firms simply perform outsourcing or offshoring tasks for foreign companies. Although demand might be present for the services of local firms, it is simply about implementing a component or a series of components for another company's product. This restricts the amount of time or resources that could be dedicated to researching new trends or applying newer technologies.



4.6 Entrepreneurial Spirit

A need for entrepreneurial endeavors, both in research or competent solutions that can be used in delivering value to clients are essential to further develop the Information and Communication Technology (ICT) sector. Entrepreneurs tend to identify current and future marketable solutions because they tend to understand those needs which generally results in new product or service offerings to markets. Often, these individuals or institutions are more adept at communicating with different markets and addressing requirements resulting from the need to have newer solutions or offerings and the ability to convey them in an attractive manner. This is often accompanied by innovation, as this arises from a perceived opportunity and the ability to profit or prosper from that opportunity.

5 Assessment of the external stakeholders' needs

Stakeholders outside of Palestine were interviewed to i) identify opportunities and areas in which the Sina Institute could exploit, and to ii) more effectively create synergies among the Sina Institute's efforts, in terms of solutions and problems being faced. The stakeholders were selected as a result of their extensive research experience and accomplishments working with institutions and experts around the world.

The following summary represents the opportunities identified from the external stakeholder interviews:

- Generally speaking, the stakeholders stated a preference and interest in the Arabic language in general, especially among students and researchers in the USA and Europe.
- Various groups provide direct assistance in research efforts regarding the use of the Arabic language in technological solutions:
 - Universities and Interdisciplinary Programs
 - The United States Government
 - Private Sector Firms such as Google and IBM
 - Middle Eastern Governments (Qatar, KSA)
- Tools for the use of the Arabic language using technology-based solutions are still few and rare relative to demand.
- Cooperative efforts and partnerships with education, healthcare, news and social media outlets for information and practical applications of research.
- Enhanced OCR for Arabic language, especially for handwritten Arabic.

The opportunities existing in the fields listed above provide the Sina Institute with a potential path for current and future research endeavors, in domains such as: Arabic Language (Dialects and Methods of Translation), Healthcare, Education, News/Media, and E-Commerce.

Table 11 Applications for Sina Institute’s strategic areas of action (Needs/Opportunities)

Strategic Domains	SIERA FP7 area	Needs/Opportunities	Applications
Arabic Language	-Multilingual Web -Public Services	Translation, Standardization, Localization (Dialects)	Simultaneous Translation, Dictionaries, Localized tools (i.e., Levantine, Egyptian-Cairo vs. Upper Egyptian Dialects)
Healthcare	-ICT for healthcare -Public Services	Therapy, Bioinformatics, Dictation, Translation/Communication	Physician Dictation (i.e., local dialect vs. MSA), Speech & Hearing Therapy, English to Localized Arabic Dialect to MSA for Reporting
Education	-Digital Libraries -Public Services	E-Learning, Grammar, Semantics, Identification of Learning Disabilities and Levels	Distance Learning through E-courses, Aptitude Assessment in Grammar or Semantics, Predictive Text (Non-Native and Native Arabic Speakers)
News/Media	-Digital Library -Multilingual Web	Arabic Users/Readers, Blogs and other Social Media for Posting and Reading	Dictionaries for Primary Use of Arabic Language in Posting News and Social Media Usage, Predictive Text, Semantic Web Tools, Localized vs. MSA for Type of News/Media Use
E-Commerce	-Smart Mobility and Energy Efficiency -Multilingual Web	Tourism, Logistical Management, Intermediaries, Banking, Finance	Booking and Registrations, OCR for Checks, Contracts, and Policies, Ability to Translate Using Legal Terminology in Different Countries.

Table 11 shows for each domain the potential applications of the Sina Institute research activities with regards to contextual needs and opportunities. Furthermore, for each domain is pointed out the corresponding areas of emphasis according to SIERA WP7. Upon completing the stakeholders interviews, key areas for emphasis regarding the Sina Institute's efforts were identified. These areas are also in line with various EU initiatives and address the needs of Palestinian society either by exposing opportunities, or focusing on demographic realities such as educational and healthcare needs. It is of note however, that below a summary of applications for each area is provided.

5.1 Healthcare

In terms of healthcare applications, the conclusions drawn from the stakeholders interviews seemed to indicate both general and specific fields in which the Sina Institute’s research



could be applied. In terms of general applications, specific dictionaries or tools equipped with medical terminology can be of great use to visiting physicians that need to communicate with patients.

In addition to this, a speech to speech translator, English to Arabic for example could be quite effective in bridging the communication gap between these parties. Therapeutic solutions for speech and hearing were also stated as being useful avenues for the research undertaken by the Sina Institute in Arabic semantics and ontologies.

5.2 Education

The educational situation in the Palestinian Territories has become increasingly important, as an estimated 40% of the population is under the age of 15 years old. So the integration of Arabic language technology and solutions in teaching becomes attractive as there is a large group of beneficiaries, an estimated total of 1,129,538 (49.8% are males and 50.2% are females) school children in total throughout the West Bank and Gaza Strip.

Table 12. Level of Education in the Palestinian Territories (West Bank and Gaza Strip)

	West Bank	Male Only	Female Only	Co-ed	Gaza Strip	Male Only	Female Only	Co-ed	Total
Basic	1,249	412	365	472	543	240	158	145	1,792
Secondary	770	264	325	181	145	62	74	9	915
Total	2,019	676	690	653	688	302	232	154	2,707

Source: PCBS

The breakdown of students among basic and secondary educational levels is also relevant (see Table 12), as the more elementary school children may be a more immediate target with specific solutions in teaching the Arabic language through the use of technology.

Table 13. Curriculum for Schools in Palestine (1st to 4th grade)

Course subject	Weekly Periods in Each Grade			
	1 st Grade	2 nd Grade	3 rd Grade	4 th Grade
Islamic Education	3	3	3	3
Arabic Language	8	8	8	8
English Language	3	3	3	3
General Science	3	3	3	3
Mathematics	5	5	5	5
Social Sciences	2	2	2	2
Arts and Crafts	2	2	2	2
Physical Education	2	2	2	2
Free Activities	1	1	1	1
Civics	1	1	1	1
Total	30	30	30	30

Source: UNESCO World Data on Education 2010/2011

There are 980,213 (50.4% are males and 49.6% are females) children enrolled in grades K-8 in the Palestinian Territories, accounting for 86.8% of all school children. In government



schools, the vast majority of the courses are taught in the Arabic language (Table 13 and Table 14 show, respectively for 1-4 and 5-8 Grades, the weak periods dedicated to each course subject). Therefore, it is important to have an understanding as to the nature of the courses, while identifying the number of students that could be directly impacted, as well as the courses that are subject or have the potential for integration.

Table 14. Curriculum for Schools in Palestine (5th to 8th grade)

Subject	Weekly Periods in Each Grade			
	5 th Grade	6 th Grade	7 th Grade	8 th Grade
Islamic Education	3	3	3	3
Arabic Language	7	7	7	7
English Language	4	4	4	4
General Science	5	5	5	5
Mathematics	5	5	5	5
Social Sciences	3	3	3	3
Arts and Crafts	2	2	2	2
Physical Education	2	2	2	2
Free Activities	1	1	1	1
Civics	1	1	1	1
Technology and Applied Sciences	2	2	2	2
Elective (Language, Economics, Health/Environmental Science)	-	-	2	2
Total	35	35	36	36

Source: UNESCO World Data on Education 2010/2011

As stated before, educational applications include a tool for teaching Arabic to students who are both native speakers and non-native speakers of Arabic. Another application can be used to identify weaknesses present in students, especially in younger students such as grades 1-4, in terms of grammar or semantics. This can lead to the potential discovery of learning disabilities such as dyslexia, or other ailments.

Having a more interactive tool using hearing or speech can also lead to improved performance and oratory skills. Solutions such as online courses or e-learning become attractive given the fact that student teacher ratios exceed 30:1 in many schools as can be gleaned from the above table. Also, teaching tools such using the Arabic language pursuant to the Sina Institute's research to predict grammar, or even assistance with enunciation become quite viable solutions.

5.3 Language

In terms of solutions for the Arabic language, based on the responses from the interviews, applications essentially revolve around simultaneous translation of Arabic to English and English to Arabic. Also, Modern Standard Arabic (MSA) should be differentiated from localized dialects. This can have broad research appeal, as dialects including Levantine and Gulf. Interestingly enough, the work in Hebrew was cited as a point of reference, due to the



OCR needs, and the right-to-left nature of the language. Also, OCR should not only be dependent on letters, but the other accents on those characters are particularly important in determining the semantic nature of the word.

5.4 News/Media, E-Commerce

E-business and social media and news outlets are other beneficiaries of the Sina Institute's research. Due to the nature of the Palestinian economy, being service based, e-businesses are encouraged, especially for intermediation services. For example, management and financial consulting, logistical management, tourism, and media are all viable avenues for the research undertaken by the Sina Institute.

Due to the emphasis on the Arabic language and its use with technological resources, applications and solutions can be offered to various firms and institutions for these types of services. These businesses would be able to depend the Sina Institute for the research either directly or indirectly by way of other local firms offering these solutions, as opposed to incurring R&D expenses in-house. Partnering with media outlets is also a suggestion as it would provide a wealth of data for researchers to use.

As shown in Table 11, the above strategy areas the Sina Institute is has to address, cover the areas of emphasis according to SIERA WP7. Due to the role of Sina Institute in the design of the conceptual model and the production of the ontology at the base of the Palestinian Interoperability Framework - ZINNAR (<http://zinnar.pna.ps/>), it is worth noting that an emphasis should be given to multilingual web, in particular for supporting semantic interoperability in public services provision in Palestinian Territories and Arab speaking countries in the large, but also for enabling interoperability between these latter and European Public Services. Also not to be neglected, are fields such as open data mobile services, which seems to be a likely area in which Sina might integrate its tools and achievements into.

Therefore, to ensure the success of the Sina Institute, the following areas must be focused on, as they are based upon areas of strength:

- *Fundraising*
 - The ability to link funding to research topics will provide donors and partners with the necessary confidence to engage the Sina Institute in future cooperative efforts and enhance the level of work.
- *Staff Development*
 - Existing and future staff should have entry level tasks and duties to track tangible progress and be able to direct the staff into specific research areas to further add value to themselves, the Sina Institute, and its output of solutions and research.
- *Specialization and Expertise in Research Areas*
 - The ability to undertake research in areas where need is not only evident, but critical to the sustainability and further development of the Sina Institute and Palestinian ICT sector. These areas are defined below, as per the analysis of the stakeholders interviews which highlighted not only their needs, but future needs of themselves and their constituents:
 - i. Arabic Ontology and Semantics
 - ii. Arabic Search
 - iii. E-Government



- *Environmental Alignment*
 - Further development of partnerships and relationships with other entities (such as private sector, public sector, academic and research based institutions primarily based in Palestine) to enhance the research of the Sina Institute, by focusing on areas that could provide immediate impact. Segments such as education and healthcare will continue to take on increasing importance in Palestinian society, thus requiring the Sina Institute to engage members of these segments, and others as deemed necessary. Basically, having the ability to integrate solutions and achievements into societal needs such as education or healthcare is what is intended here.

The results of both the society and the stakeholder's needs are the input to the revised Sina R&D strategy discussed in the Part III of this document.



PART III - REVISED SINA R&D STRATEGY

6 Introduction & Motivation

The analyses of the Palestinian Context and assessment of stakeholders' needs discussed in Part I and Part II serve as core components for the revision of the research and development (R&D) strategy for the Sina Institute for Knowledge Engineering and Arabic Technologies (Sina Institute) in accordance with the stipulations of the project entitled Integrating Sina Institute into the European Research Area (SIERA) #295006. In particular, as shown in Part II, the participating stakeholders have been afforded the opportunity to provide feedback regarding the factors affecting the Information and Communications Technology (ICT) sector, as well as others related to the viability and sustainability of the Sina Institute, in order to draft a tangible strategy allowing for future research and cooperative efforts that will contribute to the overall credibility of the research and efforts to be undertaken. Furthermore as also discussed in Part II of this document, an external stakeholders analysis was undertaken for the Sina Institute. The stakeholders provided valuable feedback regarding the opportunities present for the Sina Institute in order to maximize the benefit of its research in the most immediate way possible. We now exploit these results in the definition and production of the revised research and development (R&D) strategy for the Sina Institute.

6.1 Strategic Planning Framework

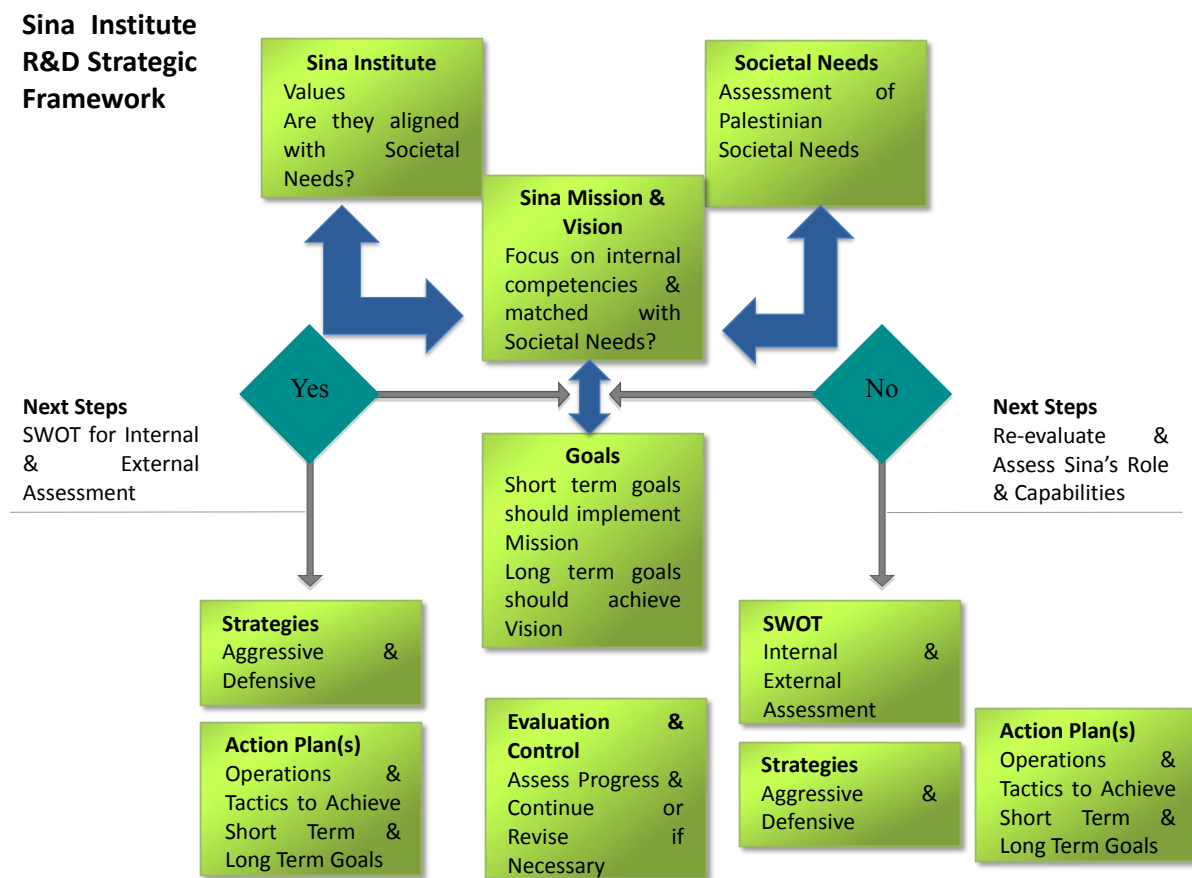
The framework adopted in preparing the R&D Strategy for the Sina Institute is based on a simple question; *"Are the Sina Institute's activities aligned with the societal needs of Palestine?"* The answer lies in Sina's values, which form the basis for the mission and vision of the institute. Accordingly, these factors shape the goals that Sina aspires to achieve, both in the short term and long term. Subsequently, achieving the goals set forth by the Sina Institute will be determined by the strategies to be adopted. A proven technique to formulate a base for the strategies is to undertake a SWOT analysis whereby internal (within Sina's control) and external (beyond Sina's control) factors are identified, studied, and addressed.

The strategies will address aggressive stances and defensive stances. Aggressive stances are based on using strengths, internally based competencies and matching them to opportunities existing in the local and international (specifically Europe) marketplace or environment. These stances can be acted upon rather quickly and allow for growth, as there are current strengths or internal capabilities or competencies possessed by the Sina Institute that allow it to act on the opportunities available in the marketplace or environment.

On the other hand, defensive stances are based on identifying external threats in the local and international (specifically Europe) marketplace or environment, while also identifying internal weaknesses the Sina Institute currently faces. That is any actions or strategies recommended are done so to protect the Institute from these forces, while attempting to survive non-advantageous situations or conditions, such as the current instability in the local political and economic environment. Also, in the event of a financial crisis, much as the deep recession has recently globally and particularly in Europe, funding for activities is reduced, thus adding further strain on institutions requiring this funding. Such strategies can be used to build the organization from within while eliminating needless or unnecessary expenses or outlays. As such, a restructuring or redistribution of tasks and responsibilities can yield positive results without adding more costs to the operating activities

of the Sina Institute. For example, rather than hiring additional staff, student researchers, consultants, and existing staff can expand their roles and responsibilities, enhancing their skill sets and emphasizing a systematic manner in which transactions or activities are undertaken or recorded. An accounting student may be used to record some of the more mundane or rudimentary tasks, while being supervised by the financial director or officer, thus ensuring the work is done properly, without hiring additional staff. This is especially important as the action plans to be drafted are contingent upon the strategies to be adopted. Therefore, the action plans are to identify immediate results to be achieved, along with the Critical Success Factors (CSF) needed for achieving those results. Moreover, targets will be set in order to measure the progress, with Key Performance Indicators (KPIs) measuring that progress. Upon that, all efforts will be evaluated by first, seeing whether or not the action plan has been adhered to by meeting or exceeding the targets set, or not. In either case, they are to be evaluated against the cornerstones of the strategy, the values, mission, and vision, and their alignment with the needs of Palestinian society. In the following we discuss mission, vision, objectives of the Sina Institute R&D strategic framework, before moving to situational and SWOT analyses.

Figure 12. Strategic Planning Model of the Sina Institute





As can be seen in Figure 12, the changes adopted include using the term values instead of operating principles, having Sina's vision feeds the situational analysis, and then having the situational analysis feeding the priority areas sequentially, rather than doing so simultaneously. This is necessary as the situational analysis, primarily consisting of a SWOT analysis, is going to lead to a more judicious allocation of funds, due to limited resources. The action plans are then to be based on the priority areas, in order to achieve specific objectives in implementing the mission in a value based manner, while marching towards the vision of the institute.

Mission

Sina Institute is dedicated to advance human knowledge with innovative research and applications in Knowledge Engineering and Arabic Language Technologies, with attention to the Palestinian and Arab society needs; enabling an environment for faculties and students to realize their highest potential of intellectual development, as well as enriching the pedagogical process of the University with advanced and multidisciplinary courses.

Vision

Sina Institute aspires at becoming a world-class research institute and a primary reference for research focusing on Knowledge Engineering and Arabic Language Technologies.

Objectives

- *Scientific Objectives*
 1. Create innovative knowledge and applications, considering the Palestinian and Arab needs.
 2. Share and publish scientific output, through reputable scientific journals and conferences.
 3. Establish close cooperation with national, regional, and international research centers.
- *Pedagogical Objectives*
 4. Establish Master and PhD programs, and co-supervise theses in cooperation with international universities.
 5. Facilitate an inspiring environment for faculties and students, and enable them to produce quality research.
 6. Introduce new courses and organize summer schools in advance and multidisciplinary sciences.
- *Outreach Objectives*
 7. Provide Birzeit University departments & institutes with innovative IT solutions to support their R&D needs.
 8. Enrich the Palestinian public and private sectors with innovative technologies for a socio-economic welfare.
 9. Transfer knowledge and encourage research among other universities and societies.
 10. Represent the University and facilitate its participation in international committees and standardization bodies.



6.2 Situational Analysis

It is imperative to understand the findings in this section stem from both local and external stakeholders' needs assessments. A comprehensive SWOT analysis detailing the more relevant internal and external factors that affect the Sina Institute and its ability to engage in various research efforts have followed the assessments. It should be noted however, that analyzing the situation also addresses the inclusiveness that the Sina Institute and its work can represent along gender lines. If one looks at the where women in Palestine are employed, it is clear that the services sector provides the most opportunities, relatively speaking. Also, in terms of the occupations, women comprise nearly half of employed professionals, technicians, associates, and clerks. Many ICT related positions fall into this category, representing opportunities for women in Palestine.

6.3 Women in the Palestinian Labor Force

In the Palestinian Territories, the trend of women participating in the work force has evolved dramatically. The participation of women in the labor force, according to sector is found in Table 15.

Table 15. Working Women by Economic Activity

Economic Activity	Working Women (%)
Services and Other Branches	61.8%
Agriculture	21.4%
Commerce, Hotels, and Restaurants	8.1%
Mining, Quarrying, and Manufacturing	7.5%
Transportation, Storage, and Communication	0.9%
Construction	0.3%

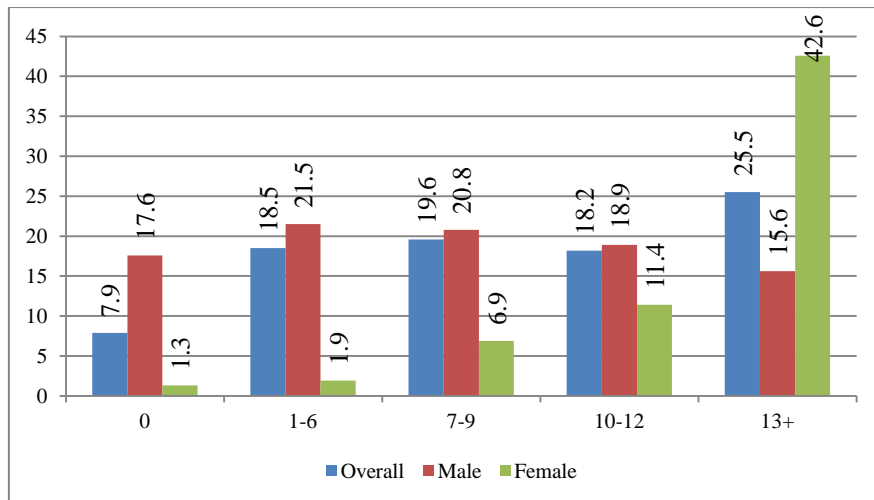
PCBS Labor Force Survey 2010

However, at first glance, when assessing the impact women have on the Palestinian labor force, several facts are shed light as to the degree of this impact:

- Employed women in the West Bank only receive 65% of their male counterparts wages
- Of all establishments, women owned establishments comprise less than 6% of the total
- A third of all public sector jobs are held by women in Palestine
- Overall, the participation rate of women in the labor force is 17.2% in the West Bank, and 10.2% in the Gaza Strip, resulting in an overall figure of 14.7%
- The overwhelming majority of women (61.8%) are employed by the service sector

Figure 13 shows the years of schooling and unemployment rate by gender. It is quite clear that women with higher levels of education have greater opportunities for employment. At the same time, women with higher education have a higher rate of unemployment compared to less educated women. This should be a cornerstone of any strategy employed to strengthen women empowerment in Palestine.

Figure 13. Years of Schooling and Unemployment Rate



Source: PCBS, 2012 Labor Force Survey

Therefore, the next step is to assess the education rates and breakdown of employment according to sector for women in selected governorates. This is vital due to the fact that the level of education of women can be determined, as well as the sectors where women are currently employed. As an example, Table 16 shows the level of education by gender. It should be noted that higher differences concern the percentage of illiterate among women compared with male population. Whereas, higher education figures show a prevalence of women with a diploma (7.4% women, 4.4% men) and a reduced gap with regard to women with at least a bachelor degree (12.7% women, 15.7% men). Thus, a strategic fit may be possible to identify opportunities, and design programs that would facilitate and accelerate this process of integrating the greatest number of women possible into the Palestinian workforce in an effective manner.

Table 16. Level of education by gender

Level of education	Females	Males
Illiterate	8.2%	2.1%
Basic Reading & Writing	5.6%	5.1%
Elementary	13.5%	15.2%
Basic	32.8%	37.9%
Secondary	19.9%	19.6%
Associate Diploma	7.4%	4.4%
Bachelor's & Above	12.7%	15.7%

Source: PCBS 2011

For example, in Ramallah, the educational gap shrinks when viewing the post-secondary education levels in Ramallah. Here, males with at least a bachelor's degree only outpace women in the same educational level by 3%. The motivations for this advance in post-secondary education can be related to the availability of academic institutions such as, e.g., the University of Birzeit close to Ramallah. Furthermore it should be related to growth for Ramallah in estimated women owned businesses. shown in Table 17.



Table 17. Estimated Women Owned Businesses

	2000	2009	Growth	Estimated Women Owned Businesses 2009
Jerusalem	580	2,163	272.9%	34
Gaza	9,840	11,150	13.3%	175
Nablus	4,900	8,036	64.0%	126
Hebron	5,270	7,300	38.5%	115
Ramallah	3,451	6,463	87.3%	244
Jenin	2,755	5,421	96.8%	23
Bethlehem	918	2,660	189.8%	44
Qalqilia	939	2,320	147.1%	10
Tul Karm	993	2,115	113.0%	33
Toubas	540	2,194	306.3%	34
Salfit	480	1,514	215.4%	24
Jericho	342	545	59.4%	9
Northern Hebron	NA	1,141	NA	18
Southern Hebron	NA	3,900	NA	61
Total	31,008	56,922	83.6%	950

Source: Palestinian Business Women's Forum, PCBS 2010

The advance in education leads to increased opportunities for women in other sectors such as, e.g., the education sector (actually 59% women, 41% men), social work (actually 51% women, 49% men). As to these issues, Table 18 shows a reduced gap in the distribution of employed persons by occupation for Legislators, Senior Officials, & Managers (4.2% women, 5.1% men), and a significant spread for Professionals, Technicians, Associates, & Clerks (49.5% women, 22.1 men).

Table 18. Distribution of Employed Persons by Occupation

Distribution of Employed Persons by Occupation	Male	Female	Total
Legislators, Senior Officials, & Managers	5.1%	4.2%	5.0%
Professionals, Technicians, Associates, & Clerks	22.1%	49.5%	26.8%
Service & Sales Workers	20.0%	11.2%	18.5%
Skilled Agricultural & Fishery Workers	4.7%	18.7%	7.1%
Craft & Related Trade Workers	18.3%	6.0%	16.2%
Plant & Machine Operators & Assemblers	10.0%	3.6%	8.9%
Elementary Occupations	19.8%	6.8%	17.5%

Source: PCBS, 2011

Next, the issue that takes precedence is that of number women owned businesses are currently operating in Palestine (see again Table 17). According to the ILO Report “Building Safe Passage for Women’s Employment in the West Bank and Gaza Strip” Country Brief 2, 1.5% of all members of the various Palestinian chambers of commerce are women. Thus, this offers an opportunity to estimate the number of female owned establishments in 2009 to set a base for identifying the impact women have in different areas of Palestinian society.



Ultimately, Palestinian women and their high rates of education as reported in Table 16 are resources that could be used for research and development purposes. In addition to this, the highest number of female entrepreneurs in Ramallah makes it an attractive target for cooperative efforts in addition to its proximity to Birzeit University and the Sina Institute, not to mention the high rates of participation in services and education which further suggests an appropriate match to Sina's needs for more research and cooperation.

7 SWOT Analysis

The following analysis is based on the assessment of the Sina Institute according to meetings with senior management and staff across several sessions of discussions in identifying internal and external factors deemed relevant to its ability to function and deliver upon its stated mandate (found in the Mission and Vision).

Table 19. SWOT Analysis for the Sina Institute	
<p>Strengths (S)</p> <p>S1 Arabic Language Technologies</p> <p>S2 Published Research</p> <p>S3 Credibility from Birzeit Univeristy Affiliation</p> <p>S4 Attractive to Research Partners</p> <p>S5 Access to Talented Students & Researchers</p>	<p>Opportunities (O)</p> <p>O1 Demand for Arabic Langugae Technologies & Research</p> <p>O2 Access to Research Programs through Birzeit University</p> <p>O3 Joint & Cooperative Research within Birzeit University (Across Specializations)</p> <p>O4 Joint & Cooperative Research Outside Birzeit University (Palestinian and Non-Palestinian Institutions)</p>
<p>Weaknesses (W)</p> <p>W1 Low Overall Number of Staff</p> <p>W2 Lack of Diversity Across Gender or Specialization</p> <p>W3 Lack of Sufficient Resources Dedicated Exclusively for Research</p> <p>W4 Constraints & Bureaucratic Procedures Often Limit the Scope of Activities</p>	<p>Threats (T)</p> <p>T1 Lack of Stability, Economic & Political</p> <p>T2 Lack of Spirit or Atmosphere Encouraging Cooperative or Joint Efforts Locally</p> <p>T3 Lack of Awareness & Visibility of Sina's Efforts beyond Interested Parties & FP7 Partners</p>

The SWOT (Strengths, Weakness, Opportunities, Threats) analysis in Table 19 summarizes the resources currently available for the Sina Institute, the areas in need of development, the situations by which the Sina Institute can exploit to advance itself, and the factors that pose challenges to further development.



7.1 Priority Areas and Goals

The following goals are outlined for the Sina Institute to support the objectives set forth in the SIERA Project. It is important to note that due to the participation of women in the Palestinian labor force, particularly in the service based sector, it is important to emphasize their role in participating in the development of Sina's research cooperation. This is also due in part to the high rates of education amongst Palestinian women as highlighted in the Situational Analysis. With a lack of opportunities in other sectors such as manufacturing, commerce and trade, it is important to provide and take advantage of the resources available.

- *Enhance research and development strategy*
 - By assessing the needs of local and external stakeholders, the Sina Institute can identify areas in the most immediate need of research. This can be the basis for fostering development and efforts of staff. Certain tracks and facets within topics such as education, e-commerce, healthcare, Arabic language, and so on, must be allocated based on staff capacity.
- *Foster joint research and cooperative efforts*
 - Upon identifying the needs of the local and external stakeholders, partners can be targeted for cooperative efforts, as similar or certain topics can be used to attract other researchers and institutions. Therefore, by emphasizing prior efforts with the visually impaired, the Sina Institute makes itself an attractive research partner to other healthcare faculties or institutions, inside the Palestinian Territories and beyond.
- *Facilitate co-supervision of PhD candidates with partner institutions*
 - In undertaking a multitude of research efforts, students and researchers are able to be more qualified in pursuing graduate and post graduate studies. Thusly, the Sina Institute would then have a collection of research expertise and as such, post graduates who would be able to mentor and supervise other PhD candidates in accordance with partner institutions.
- *Offer joint summer programs and courses*
 - As with the point above, the enhanced level of research and staff would make Birzeit University an attractive location for joint programs with other partnering universities.
- *Develop competency of Sina Institute to facilitate its participation in FP7*
 - The competency doesn't stem from research alone, but rather the type of research and its relevance to FP7 in terms of fostering competitiveness and leadership in technological research endeavors. This research should be applicable to the Palestinian market or society.
- *Enhance the visibility of Sina Institute regionally and internationally*
 - Through research in various areas such as healthcare, education, and even specific areas in the Arabic language such as dialects, the Sina Institute can position itself as an expert, or a collective of experts in such fields. Therefore, these experts would participate in conferences and workshops, thus sharing their knowledge with other institutions locally, regionally, and internationally.



8 Action Plan- Revised R&D Sina Strategies

The Sina Institute's ability to undertake relevant activities and yield tangible results will be reflected in the Action Plan. The Action Plan is essentially the third tier of analysis undertaken so far (see Part I and Part II of this document), or rather a synthesis of the analysis from internal sources (i.e., Sina efforts and Sina staff), external sources (Needs Assessment, Environment, Demographic and so on), and the convergence of these sources into a unifying template (SWOT). The results were applied in order identify efforts for the Sina Institute to pursue in order to further emphasize its role in advocating the use of Arabic Language Technologies in a host of settings and enhance its use and role amongst users, both current and potential. Accordingly, the following action plan is comprised of four higher levels of analysis for the Sina Institute.

The first level is the strategic objective, which is intended to implement and realize the vision of the Sina Institute. The second level is the annual objective, which enables the Sina Institute to achieve this strategic objective. The third level is the key performance indicator (KPI) to be used as a measurement instrument in achieving this annual objective. The fourth and final level is the target, which serves as the desired level of effort regarding the KPI.

1. *Strategic Objective: Delivering value through enriched research applications focusing on the Arabic language.*
 - a. Annual Objective: Further development and progress of existing and future joint research projects
 - i. KPI: The number of research projects in process with other universities or institutions
 - A. Target(s): Two joint research projects
2. *Strategic Objective: Leader in delivering service applications using the Arabic language.*
 - a. Annual Objective: Present and promote these applications in local and international conferences
 - i. KPI: Number of staff participating in conferences
 - ii. KPI: Number of conferences participated in
 - A. Target(s): Research staff to participate in at least one conference locally and one internationally
3. *Strategic Objective: Administrative development of the Sina Institute emphasizing good governance and functional structure*
 - a. Annual Objective: Develop the organizational structure and identify areas in need of staff development
 - i. KPI: Percentage of staff actively engaging or participating in developmental training courses
 - A. Target(s): 100%
 - ii. KPI: Development of guide or handbook for employee procedures
 - B. Target(s): Completion of guide with financial, human resource, and organizational aspects addressed and made clear to staff regarding expectations and contributions

However, the above action plan requires further action items with Critical Success Factors (CSF) necessary to achieve those action items, along with targets and Key Performance Indicators (KPIs) to measure progress made along those action items. Indeed, the action plan



is designed to support the objectives of the Sina Institute, while taking into account societal needs and the competencies possessed by the staff, while adhering to the EU FP7 framework and guidelines, and addressing the priority areas summarized above.

The detailed Action Plan of the Sina Institute's Revised R&D Strategy can be found in Table 20. It is worth noting that each "Goal/Priority Area" in Table 20 is related to one or more specific strategies for the above strategic objectives (1, 2, 3 in the "Strategy/Strategies" column of Table 20). Furthermore, the types of possible strategies are linked to the SWOT analysis, that is, e.g., an aggressive strategy encompasses strengths and opportunities (SO); whereas a defensive strategy encompasses weaknesses and threats (WT).



Table 20: Action Plan -Sina Institue's Revised R&D Strategy

Goal/Priority Area	Strategy/Strategies	Action Item(s)	Requirements/Resources	Critical Success Factors	Key Performance Indicator(s)	Target(s)	Steps to be Taken	Time Frame	Progress Tracking
Enhance R&D Strategy	Precursor	Needs Assessment, R&D Strategy, Revision of Mission, Vision, Values, Goals, SWOT	Sina Staff, Market Consultant, FP7 Guidelines, SIERA Partners	Interviews with various subject matter expert in different fields needing Arabic Language Content	Number of interviews, different fields of expertise, gender	15-20 interviews, four varied fields, one-third of interviewees to be female	Sina staff to undertake desk review, identify key sectors yielding opportunities, internal assessment of existing competencies, identification of potential fields	1 year	Weekly Meetings with Sina Staff, Monthly Meetings with SIERA Partners
Joint Research & Cooperative Efforts	SO1,SO2, SO3, WT2	Turn Research into Funded Projects, Expand into Different Areas, Partner with International Companies in Cross Functional Capacities, Attract Current Staff & Researchers Opportunities to Develop	Sina Staff, SIERA Partners, Local Researchers, International Researchers	# of Quality Research Efforts, Journals, Partners, # of Different Fields, # of Staff, # of New Research Topics, # of Private Sector Links, # of Workshops, Conferences, Training Sessions,	# of Accredited Published Works, Experts from Different Fields, # of Staff, # of Links to Private Sector, # of New Research Topics, # of Workshops, Conferences, Training Sessions	Two research efforts per year with different partners. At least one new expert to initiate a new stream of research focus per year Add at least four research assistants per year (50/50 gender distribution), one new research topic per year, participate in at least three	Use R&D Strategy and Needs Assessment to Reach Out to Partners and Identify Priority Areas	3-5 Years	Monthly Meetings with Sina Staff, Quarterly Meetings with Research Partners



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						workshops or conferences per year (at least one international or regional)			
Facilitate co-Supervision of PhD Candidates	WT1, WT2, WT3	Draft Talented Students, Attract Current Staff & Researchers Opportunities to Develop, Link Researchers to Higher Degree Seeking Programs	Sina Staff, SIERA Partners, Local Researchers, International Researchers	Budget or Financial Aid for Students, # of Workshops, Conferences, Training Sessions, Researchers Pursuing Higher Degrees	# of Research Assistants, Specialties, # of Workshops, Conferences, Training Sessions, # of Researchers Seeking Higher Education	Four research assistants per year (two male, two female) with each being from a different specialty At least three workshops or conferences per year (at least one international or regional) Two researchers seeking higher education per year (one male, one female)	Screen Candidates for PhD Programs, Partner Institutions, Needed Specialties	3-5 Years	Semi-Annual Meetings with Partner Institutions, Monthly Meetings with PhD Candidates
Joint Programs & Courses	SO2, WT3	Expand into Different Areas, Link Researchers to Higher Degree Seeking Programs	Sina Staff, SIERA Partners, Local Researchers, International Researchers	# of Different Fields, # of Staff, Researchers Pursuing Higher Degrees	# of Accredited Published Works, Experts from Different Fields, # of Staff, # of Links to Private Sector, # of New Research Topics, # of Researchers Seeking Higher Education	At least one new expert to initiate a new stream of research focus per year Two researchers seeking higher education per year (one male, one female)	Identify Partner Institutions, Identify Program Needs, Align with Research Expertise and Acumen	1-3 Years	Quarterly Meetings with Partner Institutions,
Develop	SO1, WT1, WT2	Turn Research	Sina Staff,	# of Quality	# of Accredited	Two research	Identify Staff for	1-3	Monthly



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Competency of Sina		into Funded Projects, Draft Talented Students, Attract Current Staff & Researchers Opportunities to Develop	SIERA Partners, Local Researchers, International Researchers	Research Efforts, Journals, Partners, # of Workshops, Conferences, Training Sessions,	Published Works, Experts from Different Fields, # of Research Assistants, Specialties, # of Workshops, Conferences, Training Sessions	efforts per year with different partners Four research assistants per year (two male, two female) with each being from a different specialty At least three workshops or conferences per year (at least one international or regional)	Proper Trainings, Conferences, and Workshops, Align with Skills and Research Background	Years	Meetings with Sina Staff, Quarterly Meetings with Research Partners
Enhance Visibility of Sina	SO1, SO2	Turn Research into Funded Projects, Expand into Different Areas	Sina Staff, SIERA Partners, Local Researchers, International Researchers	# of Quality Research Efforts, Journals, Partners, # of Different Fields, # of Staff	# of Accredited Published Works, Experts from Different Fields, # of Staff,	Two research efforts per year with different partners Four research assistants per year (two male, two female) with each being from a different specialty	Promote Interdisciplinary Efforts, Attract Talented Students, Use of Social Media and Other Promotional Instruments (i.e., Hosting Conference, Workshops, etc...)	1-3 Years	Weekly Meetings with Sina Staff, Monthly Meetings with Research Partners, Quarterly Meetings with Private Sector/Donors

9 Conclusion

In this document we have discussed the results of the Workpackage 1 (WP1) of the project entitled *Integrating Sina Institute into the European Research Area (SIERA) #295006*. In accordance with the stipulations, the goal of WP1 is to revise the research and development (R&D) strategy for the Sina Institute for Knowledge Engineering and Arabic Technologies (Sina Institute) of the Birzeit University (BZU). The Sina Institute is a research unit within Birzeit University and technically a part of the Faculty of Information Technology. The center is the largest research center dedicated to the Information Communication and Technology (ICT) field in Palestine. In addition to this, achievements include being awarded grants and support from Google™, the European Union Tempus program, and actually the SIERA project.

The WP1 aims to widen and revise the R&D strategy of BZU Sina Institute according to the needs of the regional and EU societies in the area of Arabic/multilingual and multicultural knowledge sharing technologies. Accordingly an assessment of both society and local stakeholder needs (Task 1.1: Assess society needs) have been carried out to identify the relevant to final revised R&D strategy of BZU Sina Institute (Task 1.2). Thus, the deliverable has been structured in three Parts: in Part I (*Society Needs Assessment*), and Part II (*Local stakeholders' needs assessment*) we discussed the results of the activities carried out in Task 1.1, while Part III presented the revised SINA R&D Strategy, and its action plan.

Considering society needs assessment (Part I), as for the Palestinian context, challenges has been identified with regard to Research and Development (R&D) and IT sector, as for unemployment rate, fulltime employment, and the Palestinian contribution to global research and development (0.0035%). However, these figures represent also an opportunity for Sina Institute to build a research infrastructure, on the one hand, promoting higher education and absorbing its graduate and post graduate as specialized workforce; on the other hand, acting as an innovation hub connecting Palestinian R&D expertise to European academic and related practitioners networks. Furthermore, considering EU society needs assessment, other opportunities for SINA have been founded in the growing diffusion of Arabic languages in EU countries, due to natural growth and immigration flows, together with the acknowledged need by EU to ensure that migration and mobility support economic growth in Europe. Accordingly, other prospects come from the growing importance of European language industry, and its needs for multilingual technologies.

As for Part II (*Local stakeholders' needs assessment*), among the identified priorities, a specific relevance has been associated to the need for a more cooperative atmosphere/environment when it comes to research and integrating technological solutions to societal problems. In order to be more effective in the undertaking of any research projects, a cooperative spirit must be present between the Sina Institute, and other universities or institutions focusing on the usage and promotion of the Arabic language in many different related matters such as using solutions to assist in fields such as education, healthcare, research, social media, and so on. Moreover, the framework for assessing the local needs of the Palestinian market shown core items used in terms of goal setting to enhance the current landscape and build towards future expansion. To this end, the results have been further clustered in four dimensions, representing needs or challenges to be considered by the Sina Institute strategy: innovation, knowledge based staff, awareness of global trends and technology, entrepreneurial spirit.



As for revised strategy and action plan (Part III), it is worth noting the relevance of the potential contribution of the Palestinian women labor force to Sina activities. Considering, their actual high rates of education, Palestinian women represent a relevant resource that could be used for research and development purposes. In addition to this, the highest number of female entrepreneurs in Ramallah makes it an attractive target for cooperative efforts in addition to its proximity to Birzeit University and the Sina Institute, not to mention the high rates of participation in services and education which further suggests an appropriate match to Sina's needs for more research and cooperation. Taking these issues into account and the priority areas resulting from a SWOT analysis, the identified action plan is comprised of four levels of analysis for the Sina Institute. The first level is the strategic objective, which is intended to implement and realize the vision of the Sina Institute. The second level is the annual objective, which enables the Sina Institute to achieve this strategic objective. The third level is the key performance indicator (KPI) to be used as a measurement instrument in achieving this annual objective. The fourth and final level is the target, which serves as the desired level of effort regarding the KPI.

Table 21. Indicators and values for the self-evaluation (Task 1.3)

Indicators	Values
Number of participants in the society needs assessment	17
Number of reviewers of the R&D strategy- internal	2
Number of reviewers of the R&D strategy- external	3
Percentage of females interviewed for the purpose of the society needs assessment	35%
Addressing gender issues in an appropriate section of the revised R&D strategy	Yes

In conclusion, the Sina institute is expected to deliver value through enriched research applications focusing on the Arabic language, becoming a leader through a constant involvement and interaction with the international research environment, and by further improving internal governance and organizational structure. As a final remark, in Table 21 we provide Figures as for the self-evaluation (Task 1.3).

As for number of participants in the society needs assessment (17 people), it is worth noting that, on the one hand, their involvement also contributes to complement and guide the research of secondary sources of evidence for the analyses carried out on the Palestinian context; on the other hand, they provide primary sources of evidence for the stakeholders' needs assessment. Furthermore, it should also be noted that the percentage of females interviewed for the purpose of the society needs assessment (35%) allows to have relevant insights and an important perspective to address gender issues in an appropriate section of the revised R&D strategy.

Finally, as for the number of reviewers the R&D strategy, they have been chosen both at the internal (2 reviewers) and external level (3 reviewers) from both within and outside Palestine who are academic research experts or strategic planning consultants, in order to have a quality control from different perspectives. All reviewers have provided their Quality review evaluations in a timely manner. In average, the overall quality evaluation was good-very good and most reviewer's comments revolved and touched upon on the same issues that is the document needed some restructuring in terms of format and some subsections in PART II



and PART III of the document required revision. The final deliverable report D1.1 is the results of revisions that have considered the comments of the reviewers.

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Annex-1 – Table of acronyms

Acronym	Description
BZU	Birzeit University
CSF	Critical Success Factor
eG4M	e-Government for Mediterranean countries
EU	European Union
GATT	General Agreement on Tariffs and Trade
GDP	Gross Domestic Product
GS	Gaza Strip
ICT	Information and Communication Technology
IP	Intellectual property
IT	Information Technology
KPIs	Key Performance Indicators
LFPR	Labor Force Participation Rate
MSA	Modern Standard Arabic
NIS	Israeli new shekel
OCR	Optical character recognition
PA	Palestinian Authority
PCBS	Palestinian Bureau of Statistics
PEST	Political, Economic, Social and Technological analysis framework
PLC	Palestinian Legislative Council
PMoH	Palestinian Ministry of Health
R&D	Research and development
SO	Aggressive strategy (i.e., Strength+Opportunity)
TRIPS	Trade Related Aspects of Intellectual Property
US	United States of America
USAID	United States Agency for International Development
VAT	Value Added Tax
WB	West Bank
WP1	Work Package 1
WT	Defensive strategy (i.e., Weakness+Threat)

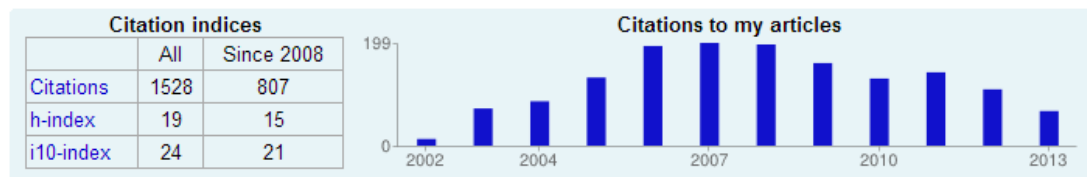


Annex-2 – Sina Institute research areas, roles, core activities, main projects, key researchers, and publications related to the main research topics.

<p>Sina has two research groups; the Arabic Ontology and Semantic Technologies Group (Onto group) director by Dr. Mustafa Jarrar, and the Arabic Language Technology and Information Retrieval Group (ALTIR group) director by prof. Adnan Yahya. More details on each group are in the table:</p>		
	<i>OnTo Group</i>	<i>ALTIR group</i>
<i>Research area</i>	<ul style="list-style-type: none"> • Arabic Ontology Engineering • Knowledge Management • Semantic Web and Web Data Management • eGovernment Interoperability • Database and Information Systems • Data Modeling, Logic ,Business Rules • Legal Ontologies 	<ul style="list-style-type: none"> • Natural Language Processing • Information Retrieval • Artificial Intelligence • Reasoning • Computers and Society
<i>Professors</i>	<p>Mustafa Jarrar (phd) Mamoun Abu Helou (Msc) Samer Zain(Msc)</p>	<p>Adnan Yahya (phd)</p>
<i>Student</i>	<p>Mamoun Abu Helou (PhD) Dima Taji (MSc) Mohammad ZeinEddin (MSc) Rana Rishmawi(MSc) Mohammed Melhem(MSc) Diam Fuad(MSc) Muma Ayyash(MSc) Slam trkuman (MSc)</p>	<p>Ali Salhi (MSc)</p>
<i>Projects</i>	<ul style="list-style-type: none"> • MOSAIC EU-FP7 project • SIERA – Integrating Sina Institute into the European Research Area Page: http://sina.birzeit.edu/SIERA • PalGov – e-Government Lifelong Learning Consortium Page: http://egovacademy.ps • GovSeer Page: http://sites.birzeit.edu/comp/GovSeer/ • MashQL: A novel approach for querying the Data Web Page: http://sites.birzeit.edu/comp/mashql/ • Arabic Ontology Page: http://sites.birzeit.edu/comp/ArabicOntology/ 	<ul style="list-style-type: none"> • SIERA – Integrating Sina Institute into the European Research Area Page: http://sina.birzeit.edu/SIERA • Wojood -A group of projects that aims to serve the Arabic language, the projects aims to build a well designed Arabic search engines with language support packages Page: http://sina.birzeit.edu/wojood/ • SATEMSAD A Suite of Automated Tools for Efficient Management and Search in Web-based Arabic Documents Page: http://sina.birzeit.edu/SATEMSAD/ • MITVI Mobile Information Technology for the Visually Impaired Page: http://sina.birzeit.edu/MITVI/ • Model Generation for Selected Applications Page: http://sina.birzeit.edu/ModelGeneration/

The key researcher at Sina publications impact

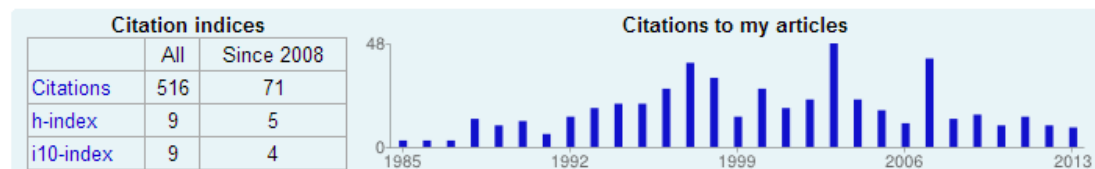
- 1** Mustafa Jarrar
Associate Professor and Director of Sina Institute, Birzeit University
Department of Computer Science , Faculty of Information Technology, Birzeit University
Research interest : [Ontology Engineering](#) - [Arabic Lexical Semantics](#) - [Semantic Web](#) -[Conceptual Modeling](#) - [Database](#)
[Homepage](#)



src: <http://scholar.google.com/citations?user=HiUpTkcAAAAJ&hl=en>

- 2** Adnan Yahya
Vice President for Academic Affairs, Birzeit University, Birzeit, West Bank, Palestine.
Full Professor, Department of Computer Systems Engineering, Faculty of Information Technology, Birzeit University, Birzeit, West Bank, Palestine.

Research interest : [Artificial Intelligence](#) - [Natural Language Processing](#) - [Arabic Information Retrieval](#).
[Homepage](#)



src: <http://scholar.google.com/citations?user=PfRrnBMAAAAJ&hl=en>

Main research topics and related publication :

- Ontology Engineering
 - (Arabic/Multilingual) Ontology Engineering, Logical Foundations, Lexical Semantics, Modeling Methodologies, Tools [1,2,3]
- Semantic Web,
 - Data Web, Linked-Data, OWL, RDF, SPARQL, Web 2.0, Data Mashups [4,5,6,7]
- Knowledge Management [8,7,9,14]
- Data Modeling Logic and Business Rules [10,11,12,13]
- Legal ontologies [14,15]
- Arabic Natural language processing:
 - tools and algorithms to parse, process, and understand Arabic text [16,17]
- Information Retrieval:
 - algorithms and APIs for multilingual information search and retrieval. [17,18,19]
- Artificial Intelligence and Reasoning:
 - data logs and deductive databases. [20]
- Computers and Society [21]



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Annex-3 – Interview Questions for Needs Assessment

Sina Institute Needs Assessment Interview Questions

1. Where does the value of the Sina Institute reside?
 - a. Resources
 - i. Staff
 1. Number
 2. Skills
 3. Specialty Areas
 - ii. Equipment/Tools
 - iii. Partnerships/Relationships/Agreements
 - b. Innovation
 - c. Stakeholders
 - i. Internal
 - ii. External
 - d. Other
2. To date, how would you rate the Sina Institute's progress on a scale of 1-10?
3. What have been the major achievements?
4. What are the objectives yet to be achieved?
5. What is needed to achieve those objectives?
 - a. Resources
 - i. Staff
 1. Number
 2. Skills
 3. Specialty Areas
 - ii. Equipment/Tools
 - iii. Partnerships/Relationships/Agreements
 - iv. Financial Support
6. How would you describe the Sina Institute in seven words or less in terms of:
 - a. What it does
 - b. Who it serves
 - c. How it delivers value
7. What is/are the component(s) or factors that differentiate the Sina Institute from other centers within Birzeit University?



8. Where should the Sina Institute focus its efforts in the next five years (Please rank on a scale of 1-6, 1 being the most important and 6 being the least important):
 - a. Languages ____
 - b. Fine Arts (i.e., History, Art, etc...) ____
 - c. Business and Economic related fields ____
 - d. Technology ____
 - e. Healthcare ____
 - f. Other (Please Specify _____) ____
9. Does the Sina Institute possess the necessary tools currently to engage in these fields?
10. Can current staff be developed to address these fields?
11. What practical solutions can be offered by the Sina Institute to these fields?
12. What trends do you envision would impact the Sina Institute the most in the coming three years?
 - a. Local
 - b. Regional
 - c. Global
13. What do you envision the Sina Institute to represent in:
 - a. 5 years
 - b. 10 years
 - c. 20 years
14. Prior to the Sina Institute, what other centers, institutions, or sources of references met your needs for obtaining insight or assistance in matters relating to the Arabic Language?
15. How did you come to know about these sources?

External Stakeholders

1. Currently, what are the topics or areas you find most in demand from your clients or stakeholders?
2. Are your services primarily delivered in Arabic or in another language such as English?
3. Do customers of these services or products require emphasis or concentrated efforts to have them offered in the Arabic language?
4. How is this currently done?
 - a. Through the use of a translator on staff or outsourced?
 - b. Some other way?
5. In the last five years, please describe the needs of your stakeholders regarding these types of products.



- a. Have these applications or tools been embedded into software or have they been stand alone?
- b. Are they web-based?
- c. Are they using other technologies such as cloud, etc...?
6. What do you expect the trends to resemble in the next five years?
7. Where are the areas of concern, in your opinion regarding the use of tools targeted towards applications using the Arabic language?
 - a. Is the language's integrity and heritage being preserved?
 - b. Do enough users know how to structure messages or statements in Arabic for research purposes, or do they require help in doing so?
8. Have any organizations or tools been offered to alleviate these concerns?
9. How do you think these issues can best be addressed?
 - a. Government intervention
 - b. Grass roots level
 - c. Cooperative efforts initiated by NGOs
 - d. Other
10. Have there been any success stories of note that you can share?