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R&D AWARENESS CAMPAIGN

Information collected to be used for the Campaign
Final Report

August 25, 2008

This publication was produced for review by the United States Agency for International Development. It was prepared by Nesreen Barakat and Rula Dajani - To Excel Consulting Associates.

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Final Report

USAID JORDAN ECONOMIC DEVELOPMENT PROGRAM

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INTRODUCTION

The present report comes in response to the need to organize an awareness campaign on the advantages of R&D as a tool to increase competitiveness and profitability to companies. The rationale behind the assignment can be summarized as follows:

- In order for Jordan to create an innovative culture, there is a need to increase awareness on the importance of R&D, and increase investment in R&D by all economic sectors.
- In order for companies to increase investment on R&D they need to understand what R&D is, and where R&D can effectively intervene in their businesses.
- Companies also need to be aware of the national entities that support R&D that they can rely on, and to realize R&D benefits for their business growth.

OBJECTIVE

As stipulated in the TOR for this mission, this report covers the information required for conducting the awareness campaign.

Tools that can be used in the campaign include:

1. **Leaflets** – Definition of R&D, R&D indicators and R&D as a tool for competitiveness.
2. **Brochure** - Information about national competencies and funding entities.
3. **Media campaign** – on the importance of R&D for business development.

OUTPUT

To prepare information for the campaign, the following methodology was used:

- As far as the R&D funding is concerned, direct contacts were made with stakeholders, hence details of funding mechanisms were documented (**Annex I**).
- Compilation of ten successful national and international (R&D) case studies (five for each), with particular emphasis on the manner by which an R&D project increases competitiveness of a business (**Annex II**). To prepare the five national cases; a total of eight cases were approached;
 - One of which was found to be a case of localizing an international product for local purposes,
 - The other two national cases were initially researched only to realize that the delay and unresponsiveness in getting the required information has rendered the research for that specific case to be not useful. Hence, two other alternative cases were indentified.
- Documentation of the opinions of key personalities on issues related to R&D policy, priorities, constraints, etc. based on a questionnaire which was prepared for this purpose (**Annex III**).
- Documentation of the latest news on R&D in Jordan from the local media (**Annex IV**).

Annex I

Information for the Brochure: National R&D Funding Structures

1. Higher Council for Scientific Research

Institutional Setup

The Higher Council for Science and Technology (HCST) was established in 1987 to institutionalize science and technology activities under a national umbrella that would set science and technology policy, strategies, plans and programs coming there from.

The Jordanian Government provides the HCST with an independent budget through which the council supports research and development projects and programs. This includes activities that contribute to strengthening the channels of communication, increasing coordination and cooperation among the various national institutions, thereby providing the basis for enhancing the role of Science and Technology in development.

Objective

HCST main objective is to increase awareness of the significance of Research and Development (R&D) by providing the necessary funding and direction toward developmental priorities. The Council is also entrusted with the establishment of specialized centers for Research and Development (R&D), and represents the Kingdom in local, regional and international Science and Technology activities.

Areas of Support

In realization of the HCST objective of building a national science and technology base supporting the economic, social and cultural development of Jordan, the HCST offers financial support to research and development projects. The supported projects should fall within the national R&D plans and be under one of the national R&D priorities.

Application Mechanism

Target beneficiaries are not specific to any sector. Call for R&D proposals is done for Jordanian Science and Technology community institutions (Universities, Research Centers, and R&D Units in some public institutions), in accordance with national research and development priorities set by HCST in cooperation with all concerned parties.

Evaluation Criteria and Process

Evaluation of proposals is carried out through a process of well-established principles regarding quality, transparency, equality of treatment, impartiality, efficiency and speed, and ethical consideration. Eligible proposals are further evaluated with the assistance of technical committees of independent experts chosen and formed for this purpose. Evaluation is carried out against a set of criteria and within an available budget upon which projects to be funded are selected.

For more information, please check; <http://www.hcst.gov.jo>

2. Industrial Scientific Research and Development Fund

Institutional Setup

The Fund was established in September 1, 1994 under the umbrella of the HCST.

Objective

The Fund provides direct financial support to technical advice, research and development and studies in industry for the purpose of raising awareness on the importance of R&D in improving productivity and hence increases competitiveness. Therefore, beneficiaries are any locally registered industrial establishments who have been in operation for at least one year. Funding is contingent upon cooperation between industry and academia.

Areas of Support

The ceiling for support of an R&D project is JD 30,000 or 75% of cost of projects (whichever is lower). A Request for Support Form has to be completed. Support is directed towards research, development and training activities that contribute to the increase in competitiveness of Jordanian industries in the following areas:

- Product development and quality enhancement,
- Production process development and productivity increase,
- Developing human resources,
- Developing local technology,
- Developing and enhancing effectiveness of maintenance and management systems,
- Improving and enhancing maintenance and management effectiveness in industries,
- Any other area that the Board of Management deems as appropriate.

Application Mechanism

Management of the Fund is comprised of a President, a Vice-President and ten members. The Board of Management establishes a technical committee comprised of members that meet at least once a month to; (1) evaluate projects for funding, (2) approve funding and (3) communicate with upper management for final approval of funding.

The following comprises general conditions for support:

- A completed Request for Support Form with all relevant information on the project and a detailed description of the problem that needs to be solved with recommendations.
- The beneficiary should not have more than 2 projects (funded from the Fund) running at the same time.
- Compliance with Funds priorities
- Applicability of the project.
- Project's clear and credible objectives.
- Importance of the project at the level of industry and its relevance to other industries.
- Innovative aspect of project.
- The beneficiary's record on R&D spending

- Cooperation between the beneficiary and R&D entities.
- Number of times the beneficiary has applied for support from the Fund.

Evaluation Criteria and Process

Depending on the project, the technical committee evaluates and provides recommendation on funding. Once funding is approved, 40% of amount of funding is provided. The second and third payments are contingent upon evaluation reports conducted by the industrial establishments and evaluated by an evaluation committee.

For more information, please check; www.irdf.jo

3. Scientific Research Fund at the Ministry of Higher Education and Scientific Research

Institutional Setup

The Scientific Research Fund is within the Ministry of Higher Education and Scientific Research. The Fund was established as per article (13) of the Higher Education and Scientific Research Law no. (4) for 2005 and its amendments. The Fund would be managed by a Board and its financial resources are derived from one percent of the net annual profits of public shareholding companies. The purpose behind establishing the Scientific Research Fund is (a) to support scientific research, (b) to find solutions to those problems that impede the development of scientific projects in the various sectors, (b) to adopt innovative projects and enhancing its competitiveness capabilities.

Objective

The Fund aims at:

- Providing financial support for the scientific research projects submitted by the Jordanian universities.
- Offering assistance to solve the technical problems faced by the Jordanian companies in developing their products and competitiveness capability, in cooperation with the Jordanian universities.
- Cooperating with local, regional and international companies and organizations to coordinate in supporting scientific research.
- Using knowledge and science in scientific research in order to advance technology and direct it towards solving problems, including research centers and business incubators which are geared toward developing innovation and commercialization of scientific research results.
- Encouraging national companies and corporations to increase their budget for R&D activities.
- Creating an appropriate ambience for universities, scientific and research centers to link their R&D activities with the needs of Jordanian companies and corporations.
- Supporting outstanding students through scholarships, research grants, and supporting their research work in the post-graduate program, as long as it is pursued on a full-time basis.

Targeted applicants include:

- Researchers in public and private Jordanian Universities.

- Researchers from public and private institutions.
- Students pursuing higher education.
- Researchers from industrial establishments or in partnership with academic institutions.

Areas of Support

The national priorities for the Scientific Research Fund for the year 2008 include:

1. Scientific Research: Energy, Water, Environment, Technology Applications, Humanities, Social and Educational Studies, and Innovative subjects of national interest.
2. Other: outstanding postgraduate student support, IPR, journals and conference support and management funds.

Application Mechanism

Interested applicants submit a pre-proposal electronically to the Ministry after which a detailed proposal will be required by the relevant entity (3 hard copies) and one electronic copy on a CD. A summary in English should also be submitted in the event that the research was written in Arabic and vice versa. The Board would establish a Technical Committee that would consider the original forms submitted to the Fund and the applicant is informed of the decision. The following comprises the conditions for applying for the Fund:

- Project or research should be submitted by a researcher or group of researchers who have been nominated by their relevant institutions.
- Relevant institutions that have submitted the project or research should have the capability to ensure implementation of the research project.
- In the event that the researcher or group of researchers attend a private university, the allocated funds related to R&D in the University's budget for the previous two years should have been met.
- In the event that the applicant is a public shareholding company, obligations to the Fund by the company should have been met in the previous two years.

Proposals for research projects would be submitted twice a year. For the first term, pre-proposals are due by December of every year and for the second term by June of every year. A response for both terms in the form of submitting proposals will be communicated to the applicant by February for the first term and August for the second term of every year.

Funds will be disbursed (a) according to the financial plan of the project upon its approval from the Board and (b) upon receiving technical and financial reports by the researcher as to the manner by which the project is proceeding.

Funds are disbursed in the form of;

- Financial incentives and bonuses for the researchers and those assisting in research.
- Equipment.
- Consumer goods.
- Reallocation and travel costs to conduct research or to participate in specialized international conferences.
- Publication costs in refereed journals and books.

Evaluation Criteria and Process

The Scientific and Research Fund is managed by a Board.

- In the event that the pre-proposal is accepted, a detailed proposal is requested and later submitted by the applicant according to the prepared form. An Evaluation Committee that is entrusted with considering and evaluating the proposals and submitting appropriate recommendations. Recommendations are in turn communicated to the Technical Committee which consequently submits the final recommendation to the Board of the Fund for the final decision.
- After considering the recommendations, the Board makes the decisions with regards to the amount and type of funding to be provided along the stages of the submitted project.

For more information, please check; www.srs.gov.jo.

4. Faculty for Factory Program

Institutional Setup

The project was initiated in cooperation with the University of Jordan, Amman Chamber of Industry and the Higher Council for Science and Technology and is supported by a number of local entities.

Objective

The Faculty for Factory program was initiated in 2003. The main objective of this program is to connect University faculty members with the industrial sector in order to assist the latter in identifying solutions to problems or to enhance development of a business. This is done by:

- Applying faculty expertise to a specific need of the industrial sector and propose solutions,
- Introducing the private sector to useful local resources of ongoing technical expertise or services.

Hence, the objective of this program is to develop a practical framework of cooperation between industry and academic institutions. This cooperation would allow (1) for the use of the advantage of the untapped wealth of knowledge of exceptional professors through their participation in developing and implementing technical and managerial programs for industry and (2) to enhance their own knowledge and expertise in practical fields. The latter would contribute to the adoption of practical skills of the graduates. The faculty may invite selected students to work on the project and will share their practical experience as case studies with students in their classrooms, stimulating interest in the real world of business.

This program is widespread over many universities and departments and has become a national project in which many Jordanian universities are now participating.

Areas of Support

The program involves the interaction of the three main players that are essential to the success of the program:

- The universities with the researchers who have at their disposal the information necessary to tackle problems in industry,
- The Industry who is the main beneficiary of any development and improvement ,
- The program and its supporters which acts as the host for the relationship between the universities and industry.

The program is funded by a number of donors and other entities (among which are BDC/Tatweer, HCST, NAFES, Nuqul group, JPM, Industrial Development Bank, Amman Chamber of Industry, Jordan Chamber of Industry, Ministry of Higher Education and Scientific Research Fund).

The program provides incentives to attract leading practitioners to develop and support industrial enterprises. The program shares part of the cost of hosting a professor at any industrial enterprise.

Application Mechanism

1. The factory (an SME) interested in the FFF program that is seeking a faculty member should submit a request for FFF committee. All the Jordanian SMEs are eligible for this program conditioned by the approval of the support organizations/ agencies/ centers.
2. An interested faculty member is identified and informed in advance about the program objectives, its procedures, and the nature and extent of their involvement with the company.
3. The faculty member conducts several visits to the factory for investigation and to prepare a preliminary diagnostic study. This step includes the establishment of clear expectations for faculty members, the time commitment required, the necessary framework in order for a faculty member to complete a project, and a procedure for reviewing the outcome of the project. The output of the diagnostic study should describe the assignment in greater detail with special emphasis on benefits to be accrued to the factory on one hand and the faculty member on the other hand.
4. After the initial diagnostic, a joint proposal and a plan that describes the current needs of the selected SME from the faculty member should be submitted to the FFF committee.
5. The faculty member meets with key personnel in the selected companies to help in cooperation with the managers to carry out the specified assignments/projects.
6. The faculty member conducts the plan of the project during the summer time (three months).
7. The FFF program director (the author) meets periodically with the faculty members to ascertain that their work is progressing as planned, that both parties' needs and expectations are being met, mutually agreements on adjustments in the project's schedules are reached, and to provide feedback on the participants' performance.
8. The faculty member prepares a final report that includes the project execution with a list of the existing problems and suggested plan/projects for future cooperation, and a systematic method and technique to solve the determined problems with details in the form of actions, charts, maps, tables, lists, and diagrams.

9. Two questionnaires (one for the company and one for the faculty member) need to be filled at the end of the program cycle to assess the level of satisfaction of the participants and companies with the process and outcomes of the program.

Evaluation Criteria and Process

In order to investigate experiences of faculty members and gain feedback on the value of such experience from companies supporting such a program and suggestions for improvement a questionnaire was developed. The questionnaire contains data supplied by Jordanian companies that participated in the program. Each contact person who worked closely with the faculty member who participated in the program received a copy of the questionnaire to be filled.

For more information, please check; www.just.edu.jo/fff

4. Support to Research and Technological Development and Innovation Initiative and Strategies Project (SRTD)

Objective

The SRTD project is funded by the European Union with 4 million Euro to help the innovation and R&D sectors of the Jordanian economy. The project aims to increase Jordan's scientific and technological capacity by fostering research and innovation linked to private sector and by accelerating the kingdom's integration into the European Research Area.

The Higher Council for science and Technology and Jordan Enterprise Development Corporation are co-funding some activities implemented by the project.

Mainly, the project operates through direct financing of two key elements:

- Support the participation of Jordanian research sector in research programs in Europe such as through info point, awareness, etc. This cooperation is done with European projects funding R&D.
- Direct financing of two types of grants; the Research Grant Scheme, and the Start Up Grant Scheme. It is envisioned that 30 grants for each scheme be disbursed during the duration of the project. The Research Grant Scheme is targeted towards universities and research institutions; it encourages researches to participate in difference types of research in the different scientific and technological areas, especially those of priorities to Jordan.

For the Start Up Grant Scheme, it is targeted towards the Jordanian research and innovation sector to increase participation in innovation- based business activities, including commercialization of innovative ideas, and establishment of successful and profitable businesses.

Target beneficiaries/entities include:

- Students,
- Engineers,
- Universities,
- Researchers,
- Manufacturers,
- Industrialists,

- Private business entrepreneurs,
- SMEs supporting organizations,
- Investors,
- Development agencies.

Areas of Support

Research Grant Scheme; Up to a 15,000 JD grant in the form of assisting in the coordination and cooperation with European researchers and networks. The sectors and themes covered include the execution of research in the technology related areas with topics having potential for development into innovative services and products.

Start Up Grant Scheme; Up to 15,000 JD grant in cooperation with incubators that host start up entrepreneurs. This grant connects financing with the incubators who in turn would provide consulting, logistics, and strategic and operational support services. The following sectors will be covered:

- All areas of agriculture, including animal and plant production, food processing, agricultural economics, and soil & water;
- Information & Communication Technologies, in particular for start-ups;
- All areas of engineering, health, energy, environment, etc;
- Innovative activities (services and products) developed by women;
- Innovative services, especially in the tourism sector and for industries.

Application Mechanism

Applications must be submitted using the application form available in electronic format on <http://www.hcst.gov.jo> and <http://www.jic.jo>.

Applicants must apply in English.

In order to be eligible for a grant, applicants must:

- Be a natural or a legal person, and
- Be resident/registered in Jordan and
- Be directly responsible for the preparation and management of the project (Research Grant).
- Be directly responsible for the preparation and management of the project that must be implemented within one of the Business Incubators of the JIC network (Start up Grant).
- Applicants may act individually or with partner entity/s, in such case the above criteria for partners are enlarged to all resident/registered in the EU-ENPI.

An applicant may not submit more than 1 proposal under this revolving call for proposals. An applicant may however re-apply if the first proposal has not been accepted.

Evaluation Criteria and Process

For the Research Grant Scheme,

The applied Evaluation will be according to the following criteria:

Qualification of Researchers/ Partners	25
Scientific Value of proposed action	30
Project Description ((Project scope, Project Methodology)	15
Action Plan with Time schedule	10
Costs/effectiveness of proposed budget	10
Impact of Project on the Competitiveness of Businesses	10

Applications received under the Start Up Grant Scheme but believed to have a need of additional R&D before going to the market, can be channeled to the Research Grant Scheme. They shall be transmitted to the Scientific Committee, under the PMU supervision, for evaluation and possible integration into the Research Grant Scheme.

For the Start Up Grant Scheme, The evaluation will follow four stages:

- Proposals will be opened by the PMU, verified for administrative compliance and distributed to the selected JIC. The Contracting Authority reserves the right to propose to the Applicant different JIC in case the selected one does not have sufficient capacity to receive additional projects.
- The Selection Committee of the appointed JIC first evaluates the technical merit of the proposals and, if successful, applicants are invited to discuss a pre-feasibility business plan and fill the JICs Incubatee Admission Application forms.
- The Selection Committee then evaluates the project proposal as a whole.
- The proposals accepted by the JIC's Selection Committee will be passed on to a Final Selection Panel of the SRTD Project PMU, which meets bi-monthly, for its definitive approval and awarding.

The applied Evaluation will be according to the following criteria;

Qualification of Tenants/ Partners	35
Business Value of the Project	30
Project description ((Project scope, Project Methodology)	15
Action Plan with Time schedule	10
Costs/effectiveness of proposed budget	10

The proposals with excellent technical potential, but that could need some more research to mature to the service/product development phase, may be passed on to the Research Grant Scheme.

For more information, please check; <http://www.hcst.gov.jo/En/srtd/srtd.php>

6. Jordan Innovation Centre (JIC)

Institutional Setup

Jordan Innovation Centres Network (JICsNetwork). Jordan Innovation Centre Network, operating under supervision of the Jordan Enterprise Development Cooperation (JE), and supported by the European Union funded project; The “Support to Research and Technological Development & Innovation Initiative & Strategies in Jordan (SRTD)”

The JICsNetwork includes five business incubators:

- Agro-Industry Business Incubator at the University of Jordan (Faculty of Agriculture): its activities cover all areas of agriculture.
- iPARK at the Higher Council of Science and Technology (HCST): its activities nurture Information & Communication Technologies start-up community.
- The JIC for Engineers & Industrial Enterprises at the Royal Scientific Society: its activities cover all areas of agriculture including animal and plant production, food processing, agricultural economics, plant production, and soil & water.
- JIC at El-Hassan Industrial Estate: its activities promote innovation in communication technologies, services to industries (e.g. textile), etc.
- JIC at the Philadelphia University: its activities cover all areas of engineering.

In addition to two new business incubators under construction:

- Jordan Forum for Business & Professional Women: its activities will be focused on innovative services and products developed exclusively by women.
- Jordan Innovation Centre at Al Husain Ben Abdullah Industrial Estate/Prince Faisal Centre for Dead Sea, Environmental and Energy Research (Mutah University): its activities will be mostly related to innovative services activities, for instance tourism and/or use/studies of dead-sea minerals innovative utilizations, etc.

Objective

JIC's mission is “to help turn innovative ideas into wealth by supporting entrepreneurs to start sustainable enterprises, support spin-off ideas, develop value-added products, identify and exploit markets, hire skilled staff, and graduate as viable stand- alone businesses.”

Areas of Support

Jordan Innovation Centers Network through the innovation centre provides capacity building and a wide spectrum of services to the tenants including:

- Management Consulting services such as preparing business plans and business establishment.
- Business development services including legal and marketing consulting.
- Direct tenants to financing opportunities.

- Provide offices for tenants with PCs, office equipment, laboratories with a feasible rent fee.
- Training.
- Networking and promotion activities.
- Start-up grants (co-funded by the EU).

Application Mechanism

Any person with an innovative idea is able to apply for a place in the JIC. To apply, applicants must describe the idea, the application of that technology, the market to be targeted, implementation team and the financial needs. The application form is available on the website www.jic.jo.

Evaluation Criteria and Process

The incubator selection committee evaluates the ideas against strict and open criteria. Successful applicants are invited to become tenants and are helped to finalize their business plans outlining the first two years of their project.

For more information, please check; www.jic.jo

6. King Abdullah II Design and Development Bureau (KADDB)

Institutional Setup

The King Abdullah II Design and Development Bureau (KADDB) was established by a Royal Decree on the 24th of August 1999 to provide an indigenous capability for the supply of independent, high-quality, efficient and cost-effective scientific and technical services to the Jordan Armed Forces (JAF).

Hence, KADDB is an independent Governmental / Military agency existing within the Jordan Armed Forces (JAF) tasked with operating to best business practices with predetermined performance targets and is financed through the defense vote as well as by income earned from the sale of technology, product and services.

Objective

KADDB is an indigenous, self-sufficient and commercially viable research and development facility which acts as a catalyst within Jordan for the design and manufacture of defense and commercial equipment and services. Manufactured equipment is intended for use by both the JAF and for the civilian and military export markets elsewhere in the Middle East. KADDB's primary service to the JAF is the supply of timely, expert advice on all issues relating to the acquisition or development of appropriate defense capabilities.

Areas of Support

KADDB supplies a wide range of scientific and technical services to the JAF and other customers in the areas of:

- Corporate (generic) research,
- Applied research,
- Policy and technical advice and support,
- Operational assessments and studies,
- Assistance in the formulation of statements of user capability requirements,
- Concept definition, design, development, prototyping,

- BATCH manufacturing of special purpose and armored vehicles,
- Project support,
- Equipment trials and Evaluation,
- General support to the Jordan Armed Forces.

KADDB supplies a range of scientific and technical services to other Government ministries and departments. The Bureau also supplies these services to meet customer requirements; both national and international, where this results in an overall benefit to the Hashemite Kingdom of Jordan and does not conflict with KADDB's primary responsibilities.

Application Mechanism and Evaluation Criteria and Process

KADDB supports R&D for both its employees and opportunity seekers in Jordan. All received applications are seriously considered by the Applied Research Programme Department, where evaluations for the projects are done and hence the funding is decided.

For more information, please check; www.kaddb.com

Annex II Five National Success Stories

I. SUWAGH, Jordanian Pharmaceutical Manufacturing Co. PLC.

Idea Generation

The drug release out the solid dosage forms such as tablet is either immediate or sustained depending on the pharmaceutical excipients incorporated in the solid dosage forms. There are many sustained release formulations. These formulations are drug dependent i.e. they are not universal to all types of active materials.

The idea was introduced first via the General Manager of the Jordanian Pharmaceutical Manufacturing Company (JPM) Dr. Adnan Badwan. Research and development is considered a natural trend in JPM Company. JPM's management believes in the scientific arm that feeds the manufacturing arm in the pharmaceutical industry.

The reason behind the idea was the need to have a single component system or a pharmaceutical additive that is readily compressible and controls the release of most the active materials i.e. a universal matrix system.

Idea Application

JPM feels this will have a great impact on the level of the pharmaceutical industries. The idea will be of high application for pharmaceutical industry when a company wishes to make a sustained release product. Any pharmaceutical industry is willing to have a single component easily produced system and retards the release of their drugs.

Idea Development

JPM worked on this idea and selected different polymeric materials. JPM ended up with a two matrix systems depending on the drug chemical structure. Each matrix system is composed of mixture of polymers that have a synergistic power and capable of being used as a universal sustained release matrix system.

This invention is now translated from the scientific phase into the following application phases:

- Patenting the ideas, development of the products in small-scale, and scale-up, doing pilot in-vivo studies on humans, pivotal batches and stability testing.
- Full bioequivalence studies, registration in different countries such as Jordan, Tunisia, Eritrea and finally production of the product.

JPM has also negotiation with different European Pharmaceutical companies in exporting or manufacturing such products.



Idea Generation

Integrated Technology Group (ITG) is a Jordanian IT company established in Jordan in 1989. Since its early days of establishment ITG was focused on building its own intellectual property (IP) through the development of innovative products and solutions for various business areas.

R&D has been a main part of ITG's activities since its establishment. This has allowed the company to maintain technological lead. Coupled with a deep understanding of both industry and market trends, ITG is able to compete strongly in the global markets.

IP was one of the major factors in ITG's growth and success. It was because of ITG's innovative ideas, technologies, and products that it was able to enter and compete in the global markets including Europe and the US, through its own IP. The company's growth translated into higher revenue, which was continuously re-invested in the research and development of new ideas and products, therefore increasing the value of ITG, and resulting into further growth.

Since its establishment in 1989, ITG had realized the significance of IP as a differentiating factor in the software industry, and has worked since its early days to develop its IP strategy in alignment with its business development plans.

Based on its long term vision and planning, analysis of future industry and market trends, and R&D activities, ITG made strategic restructuring plans in 1999 that would drive its focus towards building and developing its IP in two key sectors; education and government.

The development of one of its most successful products, its award winning e-Learning Platform; EduWave® is the subject of this case.

ITG initiated its R&D efforts to develop its IP for the educational sector, and in specific for e-learning. ITG was able to identify the following as significant gaps in this global e-learning industry, according to which the company would focus the development of its product EduWave.

- Lack of comprehensive e-learning solutions that address the whole spectrum of the educational cycle. There were a large number of solutions in the market; however none could serve the rising need for educators and learners to work under a single comprehensive solution. The educational sector had to work with several solutions at the time in order to serve their requirements, thus facing higher costs, and increased integration problems.
- Lack of K-12 focused solutions that are holistic enough to adapt for the various educational models. Most available solutions were designed to fit the higher educational model rather than schools, and were not suitable to many of the educational models followed throughout the world.
- Lack of solutions that are designed to handle large scale & countrywide deployments where millions of users need to be served. Available products were designed for schools and not larger school systems. Thus scaling was always an issue that created problems and increased costs, as none was designed for large scale deployments.

Idea Application

Based on the above needs and related market analysis, the results showed great potential and a global need for a solution to fill in these market gaps.

Idea Development

ITG then started working on developing the related business plans based on which budget requirements for the development of EduWave were identified. Securing external funding was an option, but one with many challenges. At the time, there were no local government funding schemes that are focused on R&D/IP development, and approaching commercial entities or private investors then would have included many compromises and challenges which the company was not ready to get into including possible joint-ownership of IP. Hence, ITG decided to fund the development of EduWave through internal investment. EduWave has become a Jordanian success story, with over two million users in the Middle East and the US, two countrywide deployments in Jordan and Bahrain, and international awards including the UN World Summit Award and the Microsoft Ingenuity Point People's Choice Award. EduWave is recognized in the global markets as a leading educational solution, and continues to bring regional and international recognition not only to ITG, but also to Jordan.

III. Remote Weapon Station, KADDB

Idea Generation

The idea is developing a remote weapon station, fully funded by KADDB that can fire machine gun and anti-tank missile; the system can detect the target and deal with it in optimum way. The idea was realized due to the background of the person working on the subject. Since, developing new ideas is part of KADDB's business culture; the main driving force behind the idea is KADDB's need for an efficient and cost effective defense system. The idea found success as it has strategic and commercial potential.

Idea Application

As a result of this innovation, impact achieved for KADDB is in terms of national security and a new market opportunity.

Idea Development

Major challenges/obstacles faced when moving from idea generation to application included some technical challenges and technological barriers but everything was sorted out at the end. Cooperation with national and international universities and research centers was established in the process of developing this station.

To enhance the R&D culture the following should be adopted;

- Initiating an R&D policy by the public sector together with increasing funds. Also, the public sector has to prioritize certain type of research that has an impact on Jordan's future.
- Investing more in R&D and to allocate funds on the part of the private sector. Also boosting the cooperation between private sector and public sector is essential.

- Having more funding agencies.
- Jordan's universities to lead on R&D and to try to find solutions to technological problems.
- International cooperation is very important.

IV. BIDAYA Educational Toys, JIC



Idea Generation

The objective of *BIDAYA Educational Toys* is to design and manufacture children's educational toys and tools locally in Jordan. The nature of the toys designed appeals to the child from different age groups (0- 12 years of age), his family, care-giver and teacher.

The idea behind BIDAYA Toys was a result of strenuous and continuous work by, the owner, who came up with the idea around 20 years ago and who has worked extensively with children. Importance of the idea came as a result of the following realization by the owner;

- Importance of toys in enriching the lives of children together with the benefits they bring to their development.
- Unavailability of the right toys locally and regionally.
- Significance of toys in entertaining, developing the full potential, and assisting in the emergence of a positive attitude towards learning of the children to make them learners for life.

The interactive toys that BIDAYA produces are bound to help parents and teachers to build the right bond and attachment with children through sharing play. This would add value to the children's emotional and social capabilities. There have been many international educational debates about the impact of building attachments with children on the quality of life for a country.

Currently, most of the toys present in the market now are spectator toys. Spectator toys have the limitation of not inciting the curiosity, thinking or team work of the children.

Idea Application

There are immense applications for the toys in the daily routine of every child and every parent and every teacher.

- Mainly, the toys represent the activity itself. When parents and educators aspire to reach certain objectives with children, such as teaching them reading and writing from an early age, or introducing them to a number of concepts or to any other holistic objective in term of social emotional development, Bidaya Toys would be off immense assistance.
- When any behavioral problem arises and the adults around the child need to build a sound relationship and attachment, Bidaya Toys can offer just that. Thus, such toys can prevent behavioral problems from arising in the first place because of their interactive nature.

Idea Development

BIDAYA Educational Toys saw light and was given much support from the Jordan Innovation Centre for Engineers and Industrial Enterprises at the Royal Scientific Society. As a result, BIDAYA toys were able to be sold in Jordan and soon regionally. Also, currently, the next move is to expand into BIDAYA's own premises with a factory that can produce the toys with the quality of production to cater for the educational value of the toys of BIDAYA (feasibility study is in the works). This was a result of the limitation of the production and manufacturing opportunities to produce such toys with the necessary quality envisioned in Jordan.

As a result of the two years research and development in the educational toys, growth and export opportunities are in the horizon. Although the cost of research and development was incurred by the owner and funds were extended for the production of 14 toys with limited scale through JUMP.

Testimonial from the owner;

"To be able to reach the stage where citizens themselves in Jordan are researchers, each in his own little domain, and life, we need to start from the bottom with long term objectives. We need to start developing our children to be small observers and thus small researchers. Facilitating an environment of enquiry, experimenting and encouragement is essential here. And this is the major role played by BIDAYA Toys and their effect on children and families. "

V. Palestine Industrial Establishment for Automation and Electronic Control (PALCO)

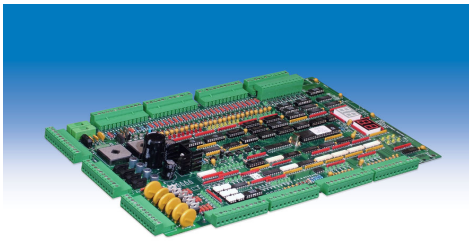


Idea Generation

The high demand for elevators in the local, regional and international markets was the driving force behind the generation of the idea of this case study. The innovator, who at the time owned an international agency for elevators, had a dream that he shared with his colleagues. The dream was to study the dynamics of elevators and to build locally produced models for the local market.

Idea Application

As a result, the innovator established Palestine Industrial Establishment for Automation and Electronic Control (PALCO) specialized in the field of automation with three employees dedicated to finding the starting path for the company. The company was established after two years of research in Palestine Engineering Establishment. After a few months of study and research led by Eng. Radwan Abu Taleb, it was realized that the main feature of an elevator is the UIC Controller.



Therefore, the mission of the company was identified; “to build up a UIC controller by a Jordanian company.

Idea Development

The first step to achieving the above mission was realized by building the first UIC board which passed the entire laboratories test. Subsequently, it was decided that to start building up the UIC controllers for the local market.

Later PALCO went to the market and installed the first UIC controller in one piloted project. However, at that stage, PALCO faced its first challenge when the project did not meet expectations. As the UIC Controller was working in the lab, the same was not realized at the site of the project prompting a number of tests and trials on the elevator. However, these tests and trials produced no results.

At this stage, PALCO used extensively all the resources at hand to try to figure an answer to the shortcoming of the elevator at the site of the project. Resources used were the internet, universities researches, international and regional companies, but none produced positive results. PALCO resorted to testing the UIC controller in an international lab. The results were positive; the UIC controller is free of any problems.

PALCO at this stage was sure that the manufacturing of the UIC controller was done in the right way but that the problem was beyond their abilities. Hence, it was decided to terminate the pilot project regardless of the significant amount of expenses and investments already undertaken. However later the team located a resource in the form of a research from the USA that displayed similar problem encountered in the early 90`s. Hence, it was decided to approach the researcher as a final attempt on the piloted project. The efforts to locate the researcher materialized. The researcher recommended a book which took PALCO again great efforts to bring to Jordan. The book became the new manual and the last chance for the company to keep running and to reach its mission.

As a result of this new source of information, a new UIC controller was built with precautions taken and checks after each step conducted. The new UIC controller was installed in a pilot site and checked 24 hours for efficiency and effectiveness. After encountering a brief challenge in the form of noise distortion, the UIC controller was ready to be marketed. It should be noted that so far on this path towards developing its mission, PALCO bear all costs with no returns. Therefore, at this stage PALCO applied to Ministry of Industry to register the UIC controller as a patent. The patent was filed and after going through procedures it was registered.

Afterwards, PALCO's UIC controller was able to enter the market as a Jordanian product. Currently, demand for this controller in the local market is 80%. Recently, PALCO achieved the CE marking certificate which would enable it to export to the European Union (EU). PALCO envisions having 20% of the EU market by the end of 2008.

PALCO owes its success to its dedicated team of skilled labors and expert engineers who have worked relentlessly to overcome challenges and achieve the above mission. Hence, PALCO's major achievements over the years since the idea generation are ISO 9001,2002, UIC Patent and CE Marking certifications, which are recognized and accepted worldwide as a sign of design and manufacturing quality.

Annex II

International Success Stories

I. SoftBatteries™, Enfucell Ltd

Idea Generation

The following case describes the success story of Enfucell Ltd. as the developer of an environmentally-friendly and economical battery for miniature electronics called SoftBatteries™.

Founded in 2002, Enfucell really began to make the headlines in 2007, when it became the first Finnish company to receive a Technology Pioneer award at the World Economic Forum in Davos. It was also highlighted by Red Herring as one of the 100 most promising technology companies in Europe, the Middle East, and Africa.

Seventeen years ago, Chinese scientist Xia-Chang Zhang came to Finland, where he proceeded to invent a nearly paper-thin battery. The company, with 15 employees, is headquartered at the Innopoli building in Otaniemi Science Park in Espoo, and was set up around Dr. Zhang and his battery innovation.

Idea Application

Enfucell Ltd. produces thin flexible SoftBatteries™ as a power source for applications like cosmetic patches, smart cards, RFID tags, music playing greeting cards, transdermal drug delivery patches and LEDs on paper. Future applications include electronic paper, displays and mobile sensors. Enfucell has developed a novel manufacturing method based on traditional paper printing and lamination technology.

The advantages of SoftBatteries™ when compared to conventional button cells are:

- Extremely low cost
- Environmentally friendly
- Landfill safe
- Flexible size and shape
- Easy integration into devices
- Roll form deliveries on demand
- Processability – SoftBattery™ is manufactured in roll form for easy adaptation into current production lines. Easy-to-convert surface material.
- Wide working temperature: -25 °C to + 50 °C (-13 F to +122 F).
- Works in wide humidity range.



The batteries are thin, printed on film, and are slightly smaller than a business card. The batteries can be any shape at all, and they can be bent and crumpled without causing damage. It is set to help reduce the burden on the environment. The thin and flexible SoftBattery technology will be particularly welcomed by the retailer sector, which will benefit

from major increases in logistics efficiency, theft-proofing and savings resulting from the prevention of spoiling of refrigerated products.

The thin and flexible battery can be used as a power source for applications such as radio frequency identification (RFID) stickers, cosmetic patches, medicated plasters and electronic paper. Compared with conventional button batteries, the paper battery is extremely cost-efficient and environmentally friendly. It comes in a variety of sizes and shapes and is easy to integrate into many devices. An added bonus is that it can be disposed of with household waste. SoftBattery technology can also be used in temperature sensors attached to refrigerated foods to make sure the cold chain is unbroken and the product has not gone off.

SoftBatteries can be used in a very wide range of new applications and locations, much wider than conventional batteries. Areas that immediately come to mind as potential applications include RFID and sensor-based tags, cosmetics and pharmaceutical products, such as transdermal drug delivery patches, electronic printing, and intelligent packaging.

An RFID sensor powered by a SoftBattery incorporated into food packaging, for example, could be used to monitor that products do not pass their sell by date on a supermarket or warehouse shelf – or to ensure that they are always transported and stored at the appropriate temperature.

Idea Development

In the health care area, SoftBattery technology has the potential to make a valuable contribution to improving the rate at which wounds heal. Studies in the US and elsewhere have shown that electricity can speed up healing significantly, and SoftBatteries could easily be integrated into bandage and plaster products to provide this benefit, anywhere any time.

Following some five years of technology work, Enfucell signed its first commercial contracts in summer 2007, and is currently in discussions with a number of leading companies worldwide to introduce its technology in their products.

So far, Enfucell has operated on financing from national research funding, provided mainly by the Finnish Funding Agency for Technology and Innovation (TEKES), and the Aloitusräahoista Vera fund. TEKES appears to expect that the batteries will prove to be a major technological breakthrough. After the product development financing, the company is looking for private risk financing in order to reach the commercialization phase. Large capital funds usually get interested when there are clear results in the development of products.

II. iPod, Apple

Idea Generation

What began as a new product quickly became a revolution; iPod, powered by Apple, introduced in 2001, combines outstanding design, easy-to-use interface, superb performance, and an experience like no other.



Apple assumed the world's number one innovative company position and held it again in 2006 in large part due to the exponential growth of iPod – aptly called the iPod phenomenon.

iPod is considered by far one of the best commercial innovation seen in the last few years, and one of the best innovation from Apple. Apple then created new innovations in the business model with the launch of iTunes online service enabled by strategic partnerships with the Music, TV and Movie industry.

Idea Application

2006 marks five years of iPod innovations.

Apple's team of engineers designed and built the first iPod in less than a year, and it was unveiled by CEO Steve Jobs on October 23, 2001 as a Mac-compatible product with a 5GB hard drive that put "1,000 songs in your pocket."

Since then, Apple has introduced fourteen different models of iPods in various colors, displaying photos, downloading and playing videos, branded and signed by U2, with numerous forms and shapes, different capacities for holding songs, pictures and videos, with connectors, next generation models with better wheels, and more.

According to PC Magazine, "In the years since (2001), the iPod's market share has grown tremendously, iPods have shrunk in size, Apple's iTunes Music Store has taken the lion's share of legal digital music downloads, and the iPod accessory market has exploded and taken on a life of its own."

Idea Development

In the quarter ending September 2006, Apple sold 8.7 million new iPods, generating \$1.5 Billion in sales, a third of Apple's total quarterly sales.

By the end of 2006, there will be over 67 million iPods in the world; Apple is poised to eclipse the 100 million iPods mark in 2007. iPod has revived Apple from the depths in 2001 when annual sales had plummeted to \$5.36 Billion and Apple was losing money.

Apple's shares were under \$10. Compare this to 2005, when Apple had sales of \$13.9 Billion, and profits of over \$1 Billion. Apple's shares have climbed sixteen folds. The Apple machine is kicking into high gear, in large part due to iPod Innovation Revolution. iPod's halo effect is even evident in the latest quarter when Apple sold more Macs than it has ever sold before: 1.61 million.

In 2007, Apple sold 52.7 million iPods, an increase of over 15% from the 45 million iPods sold in 2006. In the latest quarter ending December 2007, Apple sold 22.1 million iPods representing five percent unit growth and 17 percent revenue growth over the year-ago quarter.

III. Nokia Wireless Loopset for T-Coil equipped Hearing Aid users, Nokia

Idea Generation

There are an estimated 600 million people worldwide who have a recognized disability, in addition to others with needs for improved accessibility, whether in regards to vision, hearing, and speech. Nokia has a range of products and related accessories to help improve accessibility for people with disabilities. The Nokia Wireless Loopset, an accessory designed specifically for improved mobile communications for people with hearing aids, is the subject of this case.

Prior to the introduction of the first loopset, the Nokia LPS-1, more than a decade ago, people with hearing aids has faced difficulties in using digital mobile phone in noisy environments or due to interference picked up from the radio transmission of the phone. The Nokia LPS-1 loopset was the first product of its kind in the world, enabling people with T-coil equipped hearing aids to use a digital mobile handset.

Nokia is a leading supplier of mobile, fixed and IP telecommunication networks including related customer services. Nokia also supplies solutions and products for fixed and wireless datacom, as well as multimedia and computer monitors. In 2007, Nokia's net sales totaled EUR 51.05 billion. Headquartered in Finland, Nokia is listed on five European Stock Exchanges and on the New York Stock Exchange (NOK.A), has sales in over 130 countries.

Nokia's continuous high investment in R&D is one of its key success factors. As of April 1, 2007, Nokia had R&D centers in 11 countries and employed 14,500 people in research and development, representing approximately 32% of Nokia's total workforce. Nokia's R&D expenditure totaled EUR 5.65 billion in 2007, representing 11.07% of its net sales in 2007. In addition, Nokia maintains strong global contacts to monitor and influence technological developments, and it actively participates in R&D projects in cooperation with universities, research institutes, and other companies.

Idea Application

The Wireless Loopset is a device designed to hang around the neck that basically turns a t-coil-equipped hearing aid into a Bluetooth headset. The device is best suited for people who use cochlear implants or T-coil equipped hearing aids the accessory is compatible with any Bluetooth-enabled mobile phone and allows users to make calls wirelessly, via their hearing aid. Nokia Wireless Loopset features a call-button, a comfortable neckloop, vibrating alert, optimized volume range, frequency response and easily-adjustable sidetone level, for the best possible clarity and voice control.

Idea Development

The design and development of the wireless loopset has been inspired and developed by Nokia employees.

Consequently, Nokia R&D specialists and engineers managed through extensive R&D efforts to develop the new Wireless Loopset, is well-developed to provide interference free acoustic to people with hearing aids.

The product will be commercially available by the first quarter of 2009. It is noteworthy to mention that Nokia has received the Access Innovation Award from the Association of Access Engineering Specialists for the Wireless Loopset.

IV. The Customer Connection: The Global Innovation 1000 by Barry Jaruzelski and Kevin Dehoff¹

Booz Allen Hamilton's third annual analysis of the world's 1,000 largest corporate R&D spenders analyzes the world's top 1,000 public corporate research and development spenders which continue to be the most comprehensive effort to assess the impact of R&D on corporate performance. The study tackled spending on innovation and corporate performance giving insights into how organizations can get the greatest return on their innovation investment.

The following comprises the main findings;

- Research and development spending among the companies studied ranges from the nearly \$ 8 billion spent by the Toyota Motor Corporation(#1) to the \$47 million spent by Meidensha Corporation(#1000) a Japanese manufacturer of electronics and power generation equipment.
- The total amount spent on innovation by this group in 2006 was \$447 billion representing fully 84% of worldwide corporate R&D spending. Total spending by these companies was 10% greater than the 2005 total of \$407 billion, which is a growth rate double that of the previous 5 years. The overall sales total of this group was \$11.8 trillion and grew just as fast, at 10%, a rate that tracks with the 5 year average.



The 2006 ratio of R&D spending to sales, a measure of the intensity of a company's innovation efforts stood at 38%, meaning that corporate R&D spending as a percentage of sales leveled off last year, ending a four-year decrease. Hence, for the first time in four years, the pace of R&D spending in 2006 caught up to the rate of sales growth among these companies.

- North American headquartered companies led the way with a 13% increase; India & China are rapidly boosting their R&D investment, but their share of total spending remains small North American headquartered companies led the way with the largest increase in absolute spending; R&D investment in emerging markets continues to grow rapidly, but remains a relatively small percentage of the global total.
- In terms of;
 - I. **The geographic breakdown** companies headquartered in North America, Europe, and Japan continued to account for the vast majority of the group's total R&D spend-95% this year, the same as in 2005.
 - Much of the growth in spending came from North America-based corporations in particular, which increased spending 13 percent, nearly double the five year average.
 - R&D as a percentage of sales was highest for these North American companies, followed by Japanese and European companies respectively.

¹ 2007 Booz Allen Hamilton Inc.

- Although China, India and the rest of the developing world represent a tiny portion of overall corporate spending on R&D(5% in 2006), their five year average growth rate suggest their desire to catch up quickly. China and India grew their 2006 spend by 25.7% over last year, in keeping with a five-year average rate of growth of 25%.
- II. **The industry by industry breakdown**, (a)computing and electronics,(b) health care, and (c) auto companies made up more than two-thirds of the total absolute R&D spend, whereas the software and Internet sector and the health-care sector remained the top spenders in terms of R&D intensity. The lowest -intensity industries were telecom and chemicals and energy.
- Three distinct corporate innovation strategies, for effective innovation, were identified through analysis of a subset of this year's 1,000 top R&D spenders. Most companies adopt one of the three strategies with no one of these three strategies consistently outperforming the others:
 - **Need Seekers** — are those who identified their innovation priorities as being first-to-market through concentrating their R&D efforts on engaging current and potential customers and getting direct feedback from them while shaping new products, services and processes.
 - **Market Readers** — are those who carefully study their markets, but prefer to maintain a more cautious approach, focusing largely on driving value through incremental change and being fast followers into markets.
 - **Technology Drivers** — are those who rather than follow the market or engage customers, take a technology forward approach to innovation generating product ideas by deploying technological skill and relying on unarticulated customer needs for product inspiration.
- The highest performance in all three groups identified two priorities;
 - (a) Strategic alignment; aligning innovation strategies to overall corporate strategy, and
 - (b) Customer focus; paying closer attention to customers in every phase of the innovation value chain.
- Analysis confirmed the major finding from prior studies that R&D spending alone cannot buy effective innovation or lead to smarter spending or better results. Hence, there are no statistically significant relationships between R&D spending and the primary measures of financial or corporate success, including sales and earnings growth, gross and operating profitability, market capitalization growth, and total shareholder returns. Hence comes the importance of improving and concentrating on the innovation processes. This implies the proper managing of the innovation process along the elements of innovation: ideation, project selection, product development, and commercialization.

V. Management and Coordination Agency of Japan; R&D in Japan's Small and Medium sized Manufacturing Firms (SMMs)²

The following comprises the main findings from a broad survey conducted on 5,029 SMMs by the Management and Coordination Agency of Japan. ³

² Based on the article Small Firms Keep R&D Vibrant; Stay competitive despite limited resources, by Charla Griffy -Brown, Graziadio Business Report, 2002, Volume 05, Issue 1

³ Small and Medium sized Manufacturing Firms (SMMs) are those with 300 or fewer employees.

- During periods of growth, manufacturers took advantage of economies of scale to grow. However, two factors highlighted the importance of innovation (a) fierce competition as there was an influx into Japan of products from around the world and (b) consumers' needs and desires growing more diverse. Both these factors have rendered the traditional system of production geared towards mass production as inappropriate. As a result, SMMS have been putting more emphasis on R&D in recent years.
- Furthermore, the importance of total factor productivity (TFP) has also grown. Since TFP is an econometric tool that measures the impact of variables such as advances of technology and qualitative improvements in capital and labor on productivity R&D's importance as a driver for growth in SMMs arises.
- The innovation task for SMMs is imperative for survival with the type of innovation undertaken no less difficult yet different than larger enterprises.
- Resource constraints alone make the most appropriate kind of innovation for SMMs to be incremental rather than revolutionary. Incremental improvements cover developing new products and services, developing new sources of demand and continuing business activities and improving efficiencies.
- SMMs R&D focus is more on process innovation rather than product innovation. This would consequently lead to reduce cost. SMMs' objective is related more on design rather than an innovative new product. This would consequently reduce risk.
- A small R&D unit proved to be the best form to implement this type of research and development. The role of such a unit is to push the design frontier while following the technology frontier. The focus would be on enhancing performance characteristics of a product and performance.
- Three critical impediments cited from respondents of the survey as to the establishments of such units were; financing, difficulty in recruiting researchers and engineers, and the multiple responsibilities assumed by personnel in SMMs.

Annex III Interviews with five distinguished Jordanian personalities

I. Mr. Walid Tahabsem - President & CEO

**Ms. Batoul Ajlouni- VP/Business Development,
Integrated Technology Group**

The following comprises the main points raised during the interview;

There is a constant misconception to the definition of R&D, the idea of it going beyond pure academic research of professors at universities needs to be introduced. The government could stand as a start-up point highlighting the significance of R&D; however it cannot carry sole responsibility. All involved stakeholders, including the academic sector and the different industries, hold the same weight of importance. The awareness campaign could start at ICT sector as the foundations already exist to some extent, and the concept is starting to root in. Therefore, the pay off of disseminating information of R&D would be most effective.

Interviewers believe that there is an existent concrete policy in R&D for the Information Technology sector, just waiting to be implemented. As R&D is one of the major pillars in the ICT strategy. Since the Ministry of Higher Education and Scientific Research is the owner of the R&D Fund, it is thus identified as one of the key players in regards to R&D.

The IT and Pharmaceutical sectors have the biggest potential for R&D projects in Jordan due to their nature and relatively higher level of awareness. Although laws and regulations related to R&D and IPR are already stipulated in Jordan, however, some of these laws need to be reviewed and better applied within Jordan to further serve R&D.

In the light of the National Agenda putting Jordan at 0.36% of total annual spent on R&D as a percentage of GDP and with the following ambitious targets; 1% by the year 2012 and 1.5% by the year 2017, the interviewees commented on some of the areas involving R&D. These areas include recourses, infrastructure and management.

In terms of resources, one of the most vital resource is human capital. However, in the Jordanian case it is a major constraint which we are trying to overcome as a sector. The constraint being the absence of a true R&D culture and barely enough focus on research in our education. As for the financial resources, there are some available funds for R&D such as the Funds at the Ministry of Higher Education and Scientific Research, HCST, and others. However, the main challenge in this area is the application of these funds in proper areas that are related to applied R&D and not only academic research, or to general training as it is in many cases applied.

There are good enough financial resources to start with for the IT sector for the current year, but more resources need to be identified and spending needs to increase as awareness and activities in R&D increase. With that comes the need for incentive programs to be set to encourage R&D activities within Jordan.

The challenge in which the IT sectors faces is with the management and coordination between the various efforts and initiatives that are taking place in order to maximize results.

Various owners and stakeholders are involved; these include the Ministry of Higher Education, Ministry of Information and Communication Technology, the Higher Council for Science and Technology, business associations, the private sector, universities, among many others. The interviewees believe that efforts should be definitely coordinated and streamlined, and that the Ministry of Higher Education and Scientific Research, has a major role to play in linking R&D to professors and academia.

R&D is very beneficial to the industry when it is linked to products development and commercialization. Although this requires higher investment, the return on that investment is much higher than that resulting from services, and as such it positively affects the overall economy on the long run.

Furthermore, there is a general lack of trust in the local industry which makes it significant to for an increased level of awareness and understanding. Also, industry in general is not aware of the benefits of R&D to their business in terms of value added. There seems to be small interest in that field due to this lack of awareness. Furthermore, there are not enough spending on R&D through allocations in the budgets of these businesses. Therefore, there is a need for a long term campaign since time is required to change mindsets about the benefits of R&D and hence justification of amount of investment in that regards. The campaign should also reach universities and other education sectors (schools). Hence, the campaign should have three levels; government, academia and the private sector, in addition to the public at large.

Other reasons behind not having an active private sector in R&D include the

- R&D is unfortunately misunderstood, and is seen by many businesses as extra costs that they avoid going into.
- The business culture in Jordan has mostly been trade based, and the value of “added value products” is not clear to many.
- The IPR regulations’ lack proper enforcement.
- The educational sector need to focus more on R&D related aspects.

In order to achieve successful introduction of R&D, as highlighted earlier, cooperation between the academia and the private sector is of extreme importance. The problem is the relationship between the academia and the private sector is almost non-existent. However, within the IT sector some initiatives are starting to take place in order to increase such cooperation and strengthen Industry-Academia ties for the benefit of R&D.

II. Dr. Ibrahim Badran- Advisor to the President for International Relations & Scientific Centers – Philadelphia University

The following comprises the main points raised in the interview;

The starting point of the awareness campaign should be the government and universities. At the government level, solutions to the main issues of strategic importance to Jordan should be addressed by scientists or researchers in the relevant field as opposed to administrators working at various levels of government.

With the progress of time, the critical threshold of R&D to become effective goes higher. This relates to the fact that in 1980 as a result of the Conference on Science and Technology, it was proposed that developing countries should increase their spending on R&D to 1% of

GDP in ten years. However, Jordan (also Arab countries) lagged behind. Therefore, to achieve impact, and to increase threshold, a higher percentage is required now.

With globalization, the private sector does not feel the necessity to pursue a path where there are challenges such as investing in R&D. It is easier in this case to import technology. Unless the framework of thinking changes, currently it is not providing incentive for the private sector to invest in R&D. The private sector has been affected by the public sector's attitude towards research and innovation. The reluctance of the public sector to pay attention to science, and researchers and R&D that resulted in the notion that research is limited to universities. The public sector should provide the model of turning to those in specialized areas when tackling any issue. However, that is not the case in Jordan. Hence, unless this framework of thinking changes it is otherwise not giving message to private sector that R&D is good and invest in it. R&D in universities needs to be given attention as to its wider context of meeting social, economic and technological problems as opposed to the prevalent narrow context of publishing.

R&D should be concentrated in those sectors of national importance. Concentration has to cover the entire value chain of the sector. There are no coherent policies for R&D. There are some documents referring to policies but not a well defined clear policy approved and adopted by the state /government/MoHE/or any university. The culture of innovation and research at the national level is not adopted or addressed by anyone. There is no critical mass of researchers and there does are no research centers in the context understood in the West. The Higher Council should take on areas that are currently not tackled by the research centers; for example, translate research papers into applied research. The role of the Higher Council should revolve around connecting researchers. For the Higher Council to be an umbrella for R%D in Jordan, it has to go beyond the role that it played so far to that of filling the gap of transferring research papers into applications. The Higher Council should tackle areas not covered by research centers/institutions and try to fill the gaps.

The main issue is professors do not relate between knowledge or their specialization and life in general. The majority of professors chose this line of work as a job and not as a career. Professors/researchers are not thinkers in their own specialization. There is an absence of thinkers in the field of specialization. Professors are consumed with two things; (1) teaching and (2) research for the purposes of promotion.

There are around 6200 faculty members with 60-65% of them in the humanities field and 35% in the sciences and applied sciences. In 5 years a mere 30 patents have been filed.

The level and quality of education does not encourage or produce inquisitive minds. The question remains is how do you make the academia respond to its obligations towards society. Also to make research respond to problems of society, for example, who is tackling the issue of water given that the scarcity of water is a major challenge to Jordan?

III. Omar Abu Wishah –Deputy Managing Director- Petra Engineering Industries Co.

It is crucial to have a national R&D policy in Jordan that sets out clearly priorities for the industry needs and challenges. Currently, according to the interviewee there is no policy or strategy for R&D. The major roles and responsibilities of all involved parties for formulating a national R&D policy are as follows:

Universities and research centers

- Modify the scientific research approach to be focused on applied and practical research rather than pure scientific and theoretical projects.
- To meet the needs and challenges facing the industry.
- Work directly with industry and business environment.

- Being as partners with industry to achieve together success stories.
- Working towards bottom line “keeping our Jordanian industry competitive”.

Funding Agencies

- To have a steering council from private sector and other related parties from the government that governs the projects, outcome, approach, budget and progress when deciding about any future projects.
- To set a practical, rational and doable programs that suit the Jordan environment and could have a good impact on the business competitiveness and profitability.
- To establish a real key performance indicator that will measure the progress of the funding projects at any stage.

Public Sector

- To establish an awareness campaign that will promote the importance of the R&D to Jordan industries.
- To build bridges of trust and cooperation with the public sector.
- To set the rules and the legislation requirements that will encourage and serve the R&D activities.

Private Sector

- To assign a certain profit percentage for the R&D activities.
- To open their facilities for any cooperation projects in R&D with other parties.

The interviewee suggests assigning a competent and independent body to manage centrally the strategy and to set the priorities of the R&D in Jordan. The proposed priorities should be as follows:

- Engineering Industries
- Pharmaceutical Industry
- Agriculture

In terms of the status/advantages/disadvantages/recommendations in the following areas:

- Human resources: Still needs to be improved and especially the graduates from the schools and universities
- Financial resources: Currently the financial resources is ok, but later on when we start having an applied researches we believe that it needs to be increased.
- Infrastructure (R&D facilities and equipment); not enough. Before deciding in what is missing for the R&D facilities in Jordan it is highly recommended to study the needs of the industry and the current challenges facing it. Also, it is recommended to prioritize the missing R&D facilities based on the country's policy.
- Management: the management of the R&D institutions should have good experience in business development, technology transfer, scientific research and marketing. The management of the R&D institutions should work with all parties cooperatively to improve and to support the implementation of the R&D national plans.

In terms of the problems facing R&D commercialization in Jordan, the following were suggested; (1) the awareness of the importance of the R&D to the industry is still not mature. (2) There is a very limited experience in the business development area in different sectors. Hence, an awareness campaign should be launched.

Business owners do not recognize the importance of the R&D and do not understand that the R&D is an investment to their industry which will build on its competitive advantage. This can be reversed by (1) explaining the impact of not having a genuine R&D and (2) by showing the business owners the value of the opportunity cost if they do not adopt the R&D.

The relationship between the private sector and the academia still needs more efforts and cooperative programs to be enhanced. It can be improved by competent leadership and determination of all parties related to the R&D.

The factors that hinder the international R&D cooperation in Jordan are as follows:

- Absence of MOUs and agreements with the R&D centers for cooperation.
- The cooperation of the research centers in the world is still humble.
- The concentration of the researchers in Jordan is on the theoretical scientific research not the applied research.

Suggestions for improvement are to determine needs and priorities for the R&D then communicating the specialized R&D centers for future cooperation.

IV. Omar Hamarneh –Director- iPARK

An S&T (Science and Technology) Policy in which R&D is a component does exist in Jordan, however challenges arise in its utilization and implementation. However, one way to encourage its implementation is through the motivation to adopt aspects of it such as R&D priority areas (sectors). A national innovation policy cannot be entrusted to just one entity given that there are a number of stakeholders involved such as ; schools, NGOs, Ministry of Higher Education and Scientific Research, etc.. Furthermore, there currently exists an R&D strategy in Jordan led by the Higher Council for Science and Technology (HCST). The HCST is the responsible entity for R&D in Jordan nationally whereas the Ministry of Higher Education and Scientific Research is at the universities level.

The focus should be on investing in those vibrant sectors that can have a high return with R&D rather than the mere focusing on increasing R&D spending as a percentage of GDP. When focused on the vibrant sectors, trickle down effect would take place in other sectors. Hence, Jordan should focus on funding, for example water and energy sectors, which would ultimately spin off benefit into other sectors.

Human resources do not pose a challenge or obstacle per say for R&D in Jordan. However, there should be more focus on training for human resources to rehabilitate them to be better equip them to undergo R&D. In terms of financial resources, although they are not enough given amounts required for some sectors such as the pharmaceutical sector, having the Scientific Research Fund at the Ministry of Higher Education and Scientific Research comprises a good start.

The Government should encourage the direction of R&D support to be towards those priorities identified at the national level. Although the private sector is aware of the benefits of R&D, there still is room to turn the awareness into investments. On the other hand, the academia 's stance towards R&D is jeopardized by the current situation at universities were (a) professors are overwhelmed with teaching hours which limits time available for applied research and (b) the nature for promotion which is contingent on basic research. A reference is made to the important role of the universities in countries that invest in R&D, were the universities stand alone research centers lead to the creation of companies and investors.

V. Dr. Moayad Samman –Executive Director- King Abdullah Bureau Design and Development

The following comprises the main points raised during the meeting;

- “Without R&D at KADDB, we cannot be where we are right now. Investing in R&D is a strategic decision to be in this business and compete with the giants. If we are not up to date, we will be behind. KADDB is a unique case in this matter since it was established to serve Jordan’s defense industry and one of its values is innovation and excellence. Hence, R&D for us is not a luxury but necessary for continued survival and for achieving competitive value added. “
- The current status of R&D in Jordan;
 - Efforts are usually driven by individual companies or institutions.
 - There is room for much improvement in terms of the current status of the academia. Efforts in that regards have to start from schools.
 - Cooperation between the private sector and universities internally and internationally is somehow non- existent.
- The Higher Council for Science and Technology has to be the umbrella for R&D in Jordan since it already has the infrastructure, resources, and facilities. Furthermore, communication with the universities is a must.
- It would be unfair for Jordan to re-start the process of supporting R&D. What is needed is to fit the current initiatives such as the Fund at the Ministry of Higher Education and Scientific Research for specific purposes and to make connections and networking among all initiatives.
- Priority sectors for R&D should be in the following sectors; engineering, pharmaceutical and agriculture.
- The current status of resources for R&D include;
 - Financial resources to fund R&D are not a problem now since currently research is done at a small scale. However, with the development of business in Jordan, a need for more financial resources would arise.
 - Human resources need to be directed in a much proper way to result in its engagement in R&D.
- Importing technology and investing in R&D have to go hand in hand (parallel with each other).
- Universities and research centers need to open up further and concentrate on applied research to benefit industry and the private sector. The relationship has to be interactive with daily contacts between industry and the private sector on the one hand and universities and research centers on the other hand.
- As to the role of the private sector;
 - Private sector has to be the initiator and cooperate with government and the academia.
 - Private sector has to partner with the academia and research centers.
 - There is a big responsibility on the private sector to fund this process.

Annex IV Latest R&D News Section

This section provides a brief summary of the latest news on R&D in Jordan. The main aim of this section is to reflect the developments in R&D awareness/projects/initiatives that have been taking place during the period of conducting the study.

- Official launch of a \$ 10 million Middle East Science Fund at this year's annual event of Petra Conference of Nobel laureates. The mission of the fund is to assist academic and scientific institutions in the region and help research and studies that will reflect on sustainable development. An initiative by His Majesty King Abdullah, the fund will support the research of students pursuing master's degrees in the sciences. Priority fields of research include energy and renewable energy sources, water management, environment, health and technology. The fund will particularly target research endeavors to cope with some of the Middle East's most pressing, transnational development challenges. The Fund would start channeling support to graduate student research projects in sciences during the 2008-2009 academic year. www.MESFund.org.
- Launch of the Jordan Nuclear Energy Commission to assist the Kingdom in energy research.
- Establishment of Design Jordan (DJ) which is a new venture dedicated to raising the quality and competitiveness of Jordanian products in the local and global markets by offering tailored industrial and product design services to the private and public sectors. Design Jordan will not only provide innovative design solutions for the industry, but will also promote awareness towards a design culture in Jordan. Design Jordan offers innovative design services for products, packaging and environment. From strategy and concept generation, through to complete product development, DJ provides solutions.
- Queen Rania Center for Entrepreneurship (QRCE) launches "Made in Jordan Competition (MIJC)". This national competition aims to disseminate innovation in Jordan by channeling scientific research in Jordanian universities, specifically graduate projects and thesis studies, towards developing industrial or software prototypes to solve real-life technological and engineering problems in the region and exploit their results to promote business and develop new high market value products. The competition will cover three categories: graduation projects of undergraduate students in their final year, academic and graduate researchers at universities and research centres, and finally professionals and technicians representing themselves, provided that they do not receive funding from their employers. The competition covers the following technological fields: automotive technology, software engineering, materials science/chemical engineering, mechanical engineering, petroleum geology & engineering, power engineering, renewable energy sources/green technologies, robotics & automation technology and water desalination. (Al-Rai Newspaper, 24-6-2008). King Abdullah II Fund for Development (KAFD) announced its sponsorship of Made in Jordan Competition organized by Queen Rania Center for Entrepreneurship. Since launching the graduation projects support program in 2004, the Fund has sponsored 90 graduation projects benefiting 300 male and female students from various Jordanian universities. This national competition is part of "Made in the Arab World" Competition, organized by Arab Science and Technology Foundation (ASTF). (Ad-Dustour Newspaper, 22-7-2008).
- Jordan University of Science and Technology has signed an agreement with American Lap Co. to establish the first phase of a "biotechnological" complex which will be funded by the American Foundation for Finance and Investment abroad. The agreement includes establishing a "biotechnological" complex and a specialized research centre to develop new medicines for such incurable diseases as cancer and immunological and viral diseases, and manufacture insulin in Jordan. The financial support that will be given to this project is expected to total about \$30 million. This agreement exemplifies the academic and industrial cooperation that aims to promote scientific research. (Al-Ghad Newspaper, 27-5-2008).

- A Jordanian cardiovascular medical team composed of Dr. Mahmud Zreiq and Dr Mazen Sidqi, in cooperation with Eng. Yossri Taher, managed to invent a device, which is the first of its kind in the world. The medical team has been granted a patent for this device from Britain and America. This device is expected to bring about a qualitative change in following heart disease patients wherever they are, as it is equipped with a technology that can, by placing the device in front of the patient without it touching any part of his body, transmit his heartbeat and breathing functions data to anywhere in the world through a cell phone. The medical team unveiled this device after four years of continuous work. This device can transmit the ECG data to any cell phone or computer anywhere in the world wherever the patient is. In addition, it contains the complete patient's file to obtain information about his medical conditions, which will be transmitted through an phone message (sms) in seconds. The device has a storage capacity to store ECG data and the complete files of thousands of patients. (Al-Rai Newspaper, 22-5-2008).
- Sajid Mohammed Saeed Saif, the Jordanian researcher, has invented a device to protect from crashing into bridges. It is a multi-benefit warning traffic safety device that protects drivers and citizens from dangerous bridge collision incidents and prevents the collapsing and cracking of all kinds of bridges (cars, pedestrians and ships), which are considered among the most important infrastructure and a cultural landmark.
- Four Jordanian students have participated in Intel International Science & Engineering Fair (ISEF) in Atlanta, Georgia, in which more than 1500 students from more than 50 countries participated. The four students have won three grand awards. Mohammad and Abdurahman Ibrahim Alzorgan/ Tafilah School for Boys- Tafila Directorate of Education, received the fourth place award for their collective project "Integrated System for Irrigation and Frost Protection". Mahmud Emad Darawsheh/ Modern Systems Schools- The Directorate of Private Education, received the third place award for his project "Desalination of Sea Water Using Solar Energy". (Al-Rai Newspaper, 30-5-2008).
- The Middle East Science Fund, launched at the Fourth Annual Petra Conference of Nobel Laureates, will support scientific research aimed at achieving tangible progress in energy, renewable energy, water, environment and technological resources management. The Fund, which operates under the umbrella of the King Abdullah II Fund for Development, is working towards implementing transnational activity to support science projects in the Middle East by adopting a participatory approach that focuses on exchanging experiences and adopting proposed projects to deliver measurable benefits that positively affect each country. (Al-Rai Newspaper, 17-6-2008).The fund, with a current capital of JD10 million, donated by His Majesty King Abdullah II upon the establishment of the Fund last year, will support the scientific research aimed at achieving tangible progress in energy, renewable energy, water, environment and technological resources management. (Al-Rai Newspaper, 19-6-2008).
- After many trials, Mohammad Asender has invented a new stronger, more efficient engine with less capacity. Eight prototypes of the invention were implemented before the new engine in its current form was designed. The "wonder engine" is a four power stroke engine with 800CC capacity with roll-on/roll-off system and air cooling which can use all kinds of fuel. He expects that the new engine will reach 20 times of the traditional engine power output, therefore reducing fuel consumption by 60-70%. In addition, the engine pieces do not exceed 154, compared to 3000 pieces in the usual engine. It is expected that the commercial production of the new engine will start before the end of this year at the latest, after completing all the necessary tests to prove its efficiency. Asender says that he will then produce a new gear that commensurate with the new engine, pointing out that applications to register patents in 45 foreign countries have been filed, explaining that the registration process will end within the next six months. (Al-Rai Newspaper, 29-5-2008).
- Aqaba Special Zone will host the first house that uses the energy in the most optimal and cost-effective way in building design and construction in Jordan. The Aqaba Residence Energy Efficiency Project is designed by the Dutch architect Florentine Visser and is

being developed by Tariq Emtairah, in coordination with the Center for the Study of the Built Environment. Joud al Khasawneh, the Design & Planning Officer at the Center for the Study of Built Environment, said that the building project, which will be funded by the European Union, is a special residence situated in the 9th residential area of Aqaba to demonstrate the cost effectiveness of energy efficient design and construction techniques for a residential building in a hot, dry climate. Khasawneh indicated that the Aqaba Residence Energy Efficiency Project has been recently selected by MED ENEC program as an example of the efficient use of energy in building design and construction in the Mediterranean and North Africa. (Ad-Dustour Newspaper, 24-6-2008).

ATTACHMENT – ARABIC VERSION OF THIS REPORT (SEPARATE DOCUMENT)

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