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INTEGRATED INFORMATION NETWORK FOR EFFECTIVE MANAGEMENT OF RESEARCH AND DEVELOPMENT INSTITUTIONAL ACTIVITIES

DP/EGY/88/031

THE ARAB REPUBLIC OF EGYPT

Terminal report*

Prepared for the Government
of the Arab Republic of Egypt
by the United Nations Industrial Development Organization,
acting as executing agency for the United Nations Development Programme

Based on the work of Mieczyslaw Muraszkiewicz,
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Vienna

* This document has not been edited.

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Explanatory Note

Value of the local currency "Egyptian pound"
1 US $ = 3.38 Egyptian pounds (December 1994)

Abbreviations

CD-ROM	Compact Disk - Read Only Memory
CTA	Chief Technical Adviser
DPI	Dots per Inch
DTP	DeskTop Publishing
FTP	File Transfer Protocol
HD	Hard Disk
INTIB	Industrial Technology Information Bank
LAN	Local Area Network
MB	Mega Bytes
MoI	Ministry of Industry and Mineral Wealth
PC	Personal Computer
RAMSES	Research-Access data Management System for Engineers and Scientists
RAM	Random Access Memory
R+D	Research and Development
SIS	Special Industrial Services Programme
SMEs	Small and Medium Entrepreneurs
UNDP	United Nations Development Programme
UNIDO	United Nations Industrial Development Organization
USD	United States Dollar

ABSTRACT

This terminal report presents the results of the project: "Integrated Information Network for Effective Management of R+D Institutional Activities (DP/EGY/88/031) which started in November 1989 and was completed in December 1994. The project was executed by the team of 3 consultants on the part of UNIDO and by the Industrial Information Center of the Ministry of Industry of Egypt. The term *RAMSES* is used as a shortcut of the project name.

The main objective of the project, as stated in the original Project Document, was to design and establish an Information System on Management and Coordination of R+D Activities for effective management and coordination of R+D institutional infrastructure of the Ministry of Industry of Egypt. However, as a result of a political and economic reform in the country towards the liberalization of the economy and consequently the change of the Ministry's role the objective of the project had to be redefined in the course of the project execution. In general, the concept of the network of R+D institutions governed by the Ministry turned out not to be relevant. Now, the Ministry and its information system are more focused on issues which are the key factors when establishing a viable national industrial framework. All the reformulated RAMSES objectives were reached.

RAMSES generated tangible outputs such as the Ministry information technology staff trained, hardware acquired, examination and evaluation of the industrial community in the country in terms of information resources and needs, promotion of industrial information technology and awareness creation as well as acquisition of general experience regarding the development of complex information systems. However, in the new situation it does not provide satisfactory facilities for serving new categories of users and to meet the emerging needs, especially on the part of SMEs and business concerned agents.

Therefore, it is proposed to start immediately an SIS project in order to bridge a relatively narrow gap between the functionalities and services offered by RAMSES as it is nowadays and the requested system addressing the needs of businesses and industries in Egypt.

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INTRODUCTION

This terminal report presents the results of the project: "Integrated Information Network for Effective Management of R+D Institutional Activities (DP/EGY/88/031) which started in November 1989 and was completed in December 1994. The project was executed by the team of 3 consultants (Dr. W-D. Bauerfeld, Consultant in Design and Establishment of Computer Networks, in particular for Information Exchange and Management, 11-51; Dr. M. Muraszkiewicz, Expert in Design and Establishment of Management Information Systems 11-01, CTA and W. Page, Consultant/System Analyst in R+D Management, Technology Transfer 11-02) on the part of UNIDO and by the Industrial Information Center of the Ministry of Industry of Egypt (till the end of 1993 the direct counterparts were Eng. Nagwa Zayed Abdel-Aziz, Manager of Industrial Information Center of MoI and Eng. Shams El Den Mohamed Salem, Supervisor, and the new Director of the Center, Eng. Nadia Gaber Barakat and Prof. I.M. Shabraka, Supervisor in 1994). The term *RAMSES* (Research-Access data Management System for Engineers and Scientists) was coined and has been used as a shortcut of the project name.

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All the reformulated RAMSES objectives were reached.

RAMSES generated tangible outputs such as the Ministry information technology staff trained, hardware acquired, examination and evaluation of the industrial community in the country in terms of information resources and needs, promotion of industrial information technology and awareness creation as well as acquisition of general experience regarding the development of complex information systems.

However, in the new situation RAMSES does not provide satisfactory facilities for serving new categories of users and to meet the emerging needs, especially those of SMEs and business concerned agents.

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Methodologically the report follows the requirements for terminal reports as formulated in the manual "Project Monitoring, Reporting and Evaluation", Section 30605 (Terminal reporting) by UNDP. In particular, as advised in the manual, the report "does not present a historical narrative", it is rather focused on "forward-looking, ... describes the outputs according to the latest version of the Project Document and conclude with recommendations concerning the next steps the country should take as a follow-up to the project".

* * *

Acknowledgments

A great deal of very helpful opinions, suggestions and valuable contributions were received from the counterpart specialists during the project execution. Their role in designing and setting up RAMSES was crucial for the final success of the project. Thanks to their commitment and acquired experience the RAMSES system has a good chance to become an efficient information tool for meeting information demands generated at MoI and to be a firm basis for the further development of the information infrastructure.

DEVELOPMENT PROBLEM

The general objective of the project was to strengthen the information technology infrastructure of the Ministry of Industry (MoI) and the R+D institutions subordinated to MoI in order to make the process of managing the R+D activities carried out in Egypt more effective. To this end, as stated in the original Project Document, the project was aimed at

> *"the design and establishment of a nucleus of the integrated information network in order to provide facilities for efficient management and co-ordination of R+D institutions belonging to the research infrastructure of the Ministry of Industry of Egypt".*

However, as a result of a series of changes at the macro level (reform of the economy and administration in the country) and the micro level (reform within the Ministry of Industry and the network of its subordinated institutions) the immediate objective was reformulated in the Amendments to the Project Document done in January 1994 as follows

> *"Information System on Management and Co-ordination of R+D Activities and related issues (RAMSES) designed and established for effective monitoring and evaluation of R+D projects and related events carried out in Egypt and in the selected countries".*

The difference between the two project objective formulations might be briefly summarized as follows:

- no "star" network governed by MoI;
- more stress on monitoring and evaluation than on co-ordination and management;
- the system coverage enhanced towards new categories of users and other countries.

The rationale for modifying the project objective is given below.

1. With the advent of market oriented economic environment and liberalization of law towards the free market economy in Egypt, the role of the Ministry of Industry has dramatically changed, in particular regarding its managing and supervising responsibilities. Now, MoI is more an entity which operates at a macro level focusing on elaborating strategies, generating law and monitoring general trends, than a bureaucratic unit aimed at supervision and management. However, the modified management and coordination functions, in particular regarding R+D activities, still occur in the Ministry mandate.

The restructuring process within the Ministry coincided with the RAMSES project execution over the period: end of 1991 through the end of 1993.

2. At present, MoI is concentrated on the issues which, according to the Government economic programme, are the key factors when setting up a viable industrial framework. A special concern and attention are devoted, inter alia, to privatization, export (African countries were given a high priority), SMEs, standardization and quality assurance and control of domestic products. In this context, the provision of up-to-date information on products, technologies, services, markets and business opportunities to the agents (private and public) who are involved in production, trade and also in R+D activities becomes a crucial pre-requisite for carrying out industrial and/or business operations.

3. Since the R+D institutes have not already been subordinated to MoI, the on-line telecommunication link between them and MoI has not been necessary and economically justified. However, the institutes, on a voluntary basis, may input the data related to their work on their local computers under the RAMSES software and send this data periodically to the main RAMSES database located at MoI through diskettes or by the FTP service on the INTERNET.

4. MoI has been more interested in increasing the efficiency of its internal information process, therefore, such issues as office automation, electronic archiving, establishment of an e-mail service have been proposed to be covered by RAMSES.

5. The staff originally appointed to participate in the RAMSES project and trained on-the-job and abroad left the Ministry. Thus, the problem of rebuilding the team came out. Starting from the beginning of 1994 the new staff was gradually hired and trained. Now, the RAMSES team is in control of the whole system.

It has to be stressed that a leading principle adopted when redefining and redesigning RAMSES was to protect, as far as possible, the existing investment and to conform to open systems standards, in order to provide MoI with a full choice and a firm foundation for future growth of RAMSES. Another rule was that the project budget could not be affected by the proposed changes.

OUTPUTS PRODUCED

RAMSES generated tangible outputs of the various types. Below the outputs are structure in five categories.

Information technology human resources development

A vital component of the RAMSES project was to provide skills, know-how and knowledge to the RAMSES concerned agents, especially to the staff of the Ministry. The following on-the-job training were organized:

- design, analysis and evaluation of information systems by Mr. W. Page, over the period of 2 months for 5 employees of MoI;
- architecture and technical issues of the packet switching telecommunication networks (based on X.25) for implementing distributed information systems, e.g. RAMSES, by Dr. W-D. Bauerfeld over 2 weeks for 3 employees of MoI;
- on MICRO CDS/ISIS database software by Dr. M. Muraszkiewicz over all his missions to MoI for 3 employees of MoI.

The software and hardware vendor organized short training courses for 8 persons at the premises of MoI:

- on the HP equipment, telecommunication and X.25, PowerHouse database software by ORASCOM company (based in Cairo);
- on the OASIS archiving software, image processing and office automation by the TEKMARK company (based in Cairo);
- on the MINISIS database software by the International Development Research Center (based in Ottawa, Canada).

The abroad training was organized

- on designing and implementing information systems under MICRO CDS/ISIS for 3 fellows from MoI at the Institute for Computer and Information Engineering (Warsaw, Poland) in 1991;
- on designing and implementing information systems under MICRO CDS/ISIS, programming in ISIS/PASCAL and database administration for 3 fellows from MoI at the Institute for Computer and Information Engineering (Warsaw, Poland) in 1994.

It has to be stressed that the abroad training was conceived not only as training *per se* but also as the training of trainers.

In addition, 4 study tours to European countries on the management of distributed information systems of senior MoI information technology staff took place in 1991 and 1994. Also some short consultancy and evaluation visits to UNIDO were paid by the National Coordinator of the project.

Survey and evaluation of the industrial community in the country in terms of information resources and needs

At the first stage of the project implementation Mr. W. Page developed a questionnaire for collecting the data on the R+D institutions being the subject of the project. Afterwards, the data was collected through personal visits of the UNIDO experts and the counterpart representatives. Altogether some 35 organizations were examined. The evaluation of existing potential in terms of human resources and equipment and the information needs combined with the need already articulated by MoI allowed for establishing the architecture of RAMSES and its data model (structure of the database). The major conclusion of the survey was that the R+D community was very much interested in the RAMSES system and supported its establishment. Roughly speaking, the need for two types of information was identified: first, the factual data, in particular financial information on the institutions and the projects was requested; secondly, bibliographic information on the reports and other documents generated by the projects was demanded.

Technical facilities (hardware/software)

A great deal of technical devices was provided to MoI and some of the R+D institutes. Office facilities (video recorder, overhead projector, slide projector) and air conditioner are of course of minor importance. The main effort was focused on the computer hardware and software.

Hardware

In 1991 the HP 3000 minicomputer surrounded by 4 Vectra HP PCs and X.25 telecommunication equipment was purchased and installed at MoI. The network based on this equipment was operational and ready to support the distributed version of RAMSES. However, since the concept of the telecommunication network was dropped (see the previous Chapter) the physical network was dismantled. Now, the HP 3000 is used for some heavy pre-processing at the Industrial Information Center of MoI. The PCs are used as stand alone workstations for auxiliary work, mainly text processing and simple spreadsheeting.

Having reformulated the scope and coverage of RAMSES at the end of 1993, additional computer hardware was bought and installed at MoI. 2 powerful IBM PCs (RAM 8 MB, HD 512 MB) equipped wit a fast A4 scanner with automatic page feeder, optical mass memory drive, CD-ROM drive and a laser printer 600 DPI for advanced database applications, desktop publishing (DTP), office automation, archiving and image processing. In addition 2 additional PCs will be delivered to MoI, most likely by the end of 1994. All the PCs will be linked by the LAN NOVELL 3.11 network (the skeleton of the network is already working).

Software

The following major application software packages along with documentations were delivered and install on the RAMSES computers.

- PowerHouse; relational 4th generation language database software for HP Vectra;
- Advanced Link and NS X.25 3000/V Network Link and Network Services; telecommunication software for the HP 3000 and HP Vectra PCs;
- MICRO CDS/ISIS, ver. 2.3 and ver. 3.07; information-retrieval software for PCs;
- ACCESS, ver.2.0 for Windows, for PCs;
- MINISIS; information-retrieval software for the HP 3000;
- OASIS; archiving package for PCs;
- MS-WORD, ver. 2 for Windows, for PCs;
- EXCEL for Windows, for PCs;
- NAFITHA; an Arabic overlay on DOS applications for PCs.

Databases

The following databases constituting the RAMSES information core were designed and implemented on both the PC and HP 3000 side.

- ORGANIZATIONS; on R+D institutions;
- PROJECTS; on R+D projects carried out by the organizations;
- EXPERTS; a roster of R+D and related experts;

- REPORTS; a bibliographic database of R+D reports and related documents;
- INQUIRY; a database storing the queries and answers already addressed to RAMSES;
- SOFTWARE; information software used by R+D institutions;
- LIBRARY; a database for managing small libraries of R+D institutions.

The sample of actual data was collected and input for testing into the RAMSES databases on the PC side. Next, the transfer of data through X.25 from a PC to the HP 3000 and *vice versa* was successfully accomplished.

Promotion of industrial information technology and awareness creation

From the very beginning of the project implementation the promotional aspect was taken into account. Through the visits to the R+D institutions covered by RAMSES the main concepts of the system were explained. Some 100 persons were informed about RAMSES. 3 one-day seminars bringing the representatives of some 15 R+D institutions were organized at MoI. Those institutions were provided with the prototype of RAMSES software and trained on how to install and to use it ("hands-on training"), in particular, on how to input the data.

Demonstrations of the RAMSES prototype were given to the representatives of the Government and UNDP office in Cairo.

General experience regarding the development of complex information systems.

RAMSES has been a complex project combining the various types of hardware and information technologies. This is why it created a unique opportunity to the MoI staff to learn cutting-edge design and implementation techniques and, which is of special importance, how to put them together. Especially, through on-the-job training the MoI employees learned in a very practical way how to devise and set up distributed and heterogeneous information systems. They also got acquainted with the most advanced software tools suitable for designing and implementing databases and office automation systems. It is however regrettable that the majority of the trained personnel left the Ministry of Industry.

The details regarding all the aforementioned facts are in the technical reports of the UNIDO experts and in the project files at MoI, UNDP office in Cairo and UNIDO HQ in Vienna.

OBJECTIVES ACHIEVED

The main objectives achieved through the implementation of RAMSES are as follows.

1. The kernel of the RAMSES system established and operational. It consists of the hardware, software, databases and human resources presented in the previous Chapter. Thus, the Ministry received an efficient tool for carrying out its statutory activities regarding the R+D and related issues.

2. The RAMSES network based on the HP 3000, Vectra PCs and X.25 telecommunication devices was set up and data transmitted between the server and the nodes. Although this network was dismantled (see previous Chapter), it constituted the evidence that a complex, heterogeneous and distributed information system was feasible in local conditions.

3. Technical tools and methodologies for day-to-day system maintenance and further development of RAMSES set up and available.

4. Specialists to operate and maintain the system and also to participate in the RAMSES further development, if any, trained and available.

5. Awareness on the RAMSES role and functionalities among the R+D institutions and Government decision makers to a large extent created. It is an important achievement since it facilitates the decision making process regarding launching the information technology projects in the country.

FINDINGS AND LESSONS LEARNED

This Chapter contains two Sections, *viz.* the first one gives general findings and proposals which occurred especially at the last stage of the project execution lifetime, in particular regarding a new challenge for RAMSES which is its enhancement towards the Business Opportunities Information System; the second Section brings more specific comments and lessons learned over the project implementation.

Findings

1. It has been observed that a small and medium size business has been growing rapidly in Egypt for some years. It is a fact now that companies, SMEs, entrepreneurs and managers in order to provide competitive products and services look for up-to-date, rapid, timely, credible and relevant business information, including company and product information, market research data, business news, etc. Also the enterprises seeking to start up or to develop their production need information on where and how to find and mobilize domestic and foreign capital and to attract local and external investors. Unfortunately, their demand in those respects is hardly satisfied. The same is true for foreign entrepreneurs interested in local business opportunities, conditions and constraints.

2. Currently there is a need:

   - for state-of-the-art computerized facilities to support the information requirements of the main categories of SMEs, in particular industries;
   - for competent and trained business and industrial information professionals to undertake information processing assignments;
   - for current publications, technical information and communication with abroad services;
   - to keep up with rapidly changing technology;
   - for identifying and making available the sources of technology and industrial information which exist locally and in the relevant international community;
   - for bringing together various information technology professionals and business end users scattered throughout the private sector, as well as, government agencies in order to share knowledge and skills;
   - for providing a uniform, widely accessible platform for information exchange among business partners;
   - to add value to the minimal raw data now extracted;

- for governmental policies to ensure that information flow into the business and industrial sector is happening;

- for installing a performance cost method for the provision of information services;

- to bring the required information directly to where it is used.

Specifically, the examination of the present situation in terms of industrial and business information gives rise to the following conclusions.

(i) A strong unsatisfied demand was found for domestic and international information on new technologies, machinery and equipment, upgrade of technologies, markets and business opportunities.

(ii) Existing facilities in terms of information resources available, access procedures, services offered, completeness, reliability and timeliness are inadequate to meet the information needs. Also, the horizontal co-operation of information concerned institutions is poor, therefore the facilities available are isolated from each other.

(iii) A very positive response to the need for a business information organization was noted among business and technology concerned agents. The following types of information services are expected by the prospective users, inter alia, (a) Enquiry Services; (b) Extension Services which include Information Consultancy, Customized Research, Market and Technology Reports, Business Opportunity Bulletins, Company Matching services, Seminars and Workshops; (c) Network Services which include Database Access and Electronic-mail.

(iv) Awareness that information per se and information services are commodities was noted among the industrialists, entrepreneurs and businessmen. They are ready to pay for information services. The amount of E.P. 35 (approx. USD 10) for an answer to a simple query (e.g. addresses of manufacturers of soap in Pakistan) or amount of E.P. 500 (approx. USD 150) for a more sophisticated service (e.g. state-of-the art of milk pasteurization technologies) are acceptable for an average industry related user.

(v) In order to create an efficient and effective organization dealing with business and industrial information, mainly addressed to SMEs, one has to provide it with an interface consistent with the private sector ways of operation. Hence, it is recommended that this organization will be settled as an autonomous unit within the Ministry of Industry enjoying a special status (in particular, salary scale); appropriate legal arrangements are supposed to be provided by the Ministry.

(vi) The unit has to work out such routines and patterns that it will become economically viable and self-sustaining after 3-4 years of its operation.

3. Due to the fact that RAMSES was originally designed in 1991 (before the redefinition of the Ministry role), it has been mainly aimed at the management of country-wide R+D activities by the Ministry. During the last phase of the project execution, RAMSES was somewhat modified to match to the largest possible extent the changes within its environment. However, its chief function is still not relevant to the new mandate of the Ministry which makes the RAMSES usefulness rather limited.

4. It has to be stressed that RAMSES itself and other project outputs such as the Ministry information technology human resources development, hardware acquired, examination and evaluation of the industrial community in the country in terms of information resources and needs, promotion of industrial information technology and awareness creation as well as general experience regarding the development of complex information systems constitute a firm platform for developing under the auspices of the Ministry of Industry an information system addressing the needs of businesses and industries in Egypt.

5. Given the aforementioned facts it seems justified to launch a follow-up project for transforming RAMSES into the urgently needed system, whose name could be Business Opportunities Information System (BOIS), to be created on top of RAMSES and the facilities already acquired.

Lessons learned

1. The project duration exceeded the planned timeframe. This is mainly due to the fact the Ministry was under a deep reform. The same reason was behind the need for redefining the project objective and changing its implementation strategy. Although all this has not affected the project budget, it was rather a painful experience for all the involved parties. Therefore, it is strongly recommended not to implement the information technology projects for the organizations which are the subject to substantial restructuring.

2. Strong and stable leadership on the part of the counterpart is a condition sine qua non for smooth and timely work. RAMSES, due to the fact that its 4 major counterpart managers left the Ministry during the project execution lifetime, suffered a lot in terms of continuity and decision making process.

3. The tendency that the staff trained on the project left the Ministry was observed. Needless to say how it has hindered the project. Therefore, a system of incentives to stabilize the staff, especially addressed to the persons who were trained as a

part of the project activities have to be developed by UNIDO and the counterpart. Noteworthy, the salaries of the MoI information staff are very low, for instance a database application programmer's month salary is about E.P. 150 (approx. USD 30).

4. Awareness creation of the project objectives and also of the requirements and a certain discipline imposed by the projects among all the involved parties turned out to be a long learning process. Efficient techniques to speed it up would be very helpful.

5. It is an illusion that one can operate an efficient information system providing credible services and trustworthy information open to the various categories of users on the free-of-charge basis (except for the very first stage of the system operation when promotion is necessary). Therefore, every effort has to be made to work out such working modalities of RAMSES that the system as a whole will become self-sutaining. In practice, it means that RAMSES has to offer the services at a price.

RECOMMENDATIONS

to MoI

1. To continue the work on RAMSES towards refining its data model, arabization and putting it on the LAN environment.

2. To develop a system of incentives to stabilize the RAMSES personnel.

3. To distribute the refined version of the RAMSES software among the R+D institutions willing to cooperate with MoI.

4. To start the process of collecting and inputting the data.

5. To elaborate a strategy transforming RAMSES into a self-sustaining operation (most information and services offered by RAMSES should be at a price).

6. To devise and launch the RAMSES promotional programme.

to MoI and UNIDO

1. RAMSES as it is nowadays does not provide satisfactory facilities for serving new categories of users and to meet the emerging needs, especially on the part of SMEs and business concerned agents (see previous Chapter). Therefore, it is recommended to submit the SIS Project Proposal (see Annex) and to start the follow-up project which will enhance RAMSES towards the Business Opportunities Information System addressing chiefly business and industrial communities.

   Note. It is estimated that the facilities already available within RAMSES constitute some 70-75 per cent of the prospective BOIS system.