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INFORMATION TECHNOLOGY AND ORGANIZATIONAL STRUCTURE OF THE GREEK PUBLIC ADMINISTRATION

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ABSTRACT

It is widely accepted in the management literature that Information Technology can greatly contribute to the administrative modernization and especially to the improvement of organizational productivity. This is of great interest for the Greek Public Administration, which faces long term problems of low productivity. The main objective of this work is to analyse the impact of Information Technology on the organizational structure of Greek Public Administration, that is one of the main determinants of its productivity. Initially the theoretical background is presented on which the present work is based. Using data compiled from the

whole Central Government, firstly the study is focused on the hardware and software technologies which are employed. At a second stage the impact of the use of Information Technology on a set of dimensions of the organizational structure,which are of critical importance for the productivity of the Greek Public Administration,is examined. The conclusions of the study provide the basis for the development of strategic guidelines for maximizing the benefits from using Information Technology in Greek Public Administration.

INTRODUCTION

Public bureaucracy is increasingly a vital part of the daily life of the average citizens. Once relegated to the rather basic tasks of delivering the mail, policing the streets, and defending the nation in a time of war, contemporary Public Administration provides an array of goods and services. Many activities that were virtually unknown fifty years ago are today the subjects of extensive governmental regulation. The core functions and responsibilities of modern government have increased profoundly after the second world war. Public Administrative systems carry out to varying degrees such activities as health, education,environmental protection and general socio-economic development.

The last twenty years Greece has witnessed a steady growth of the size of government. Although we know that it is difficult or impossible to measure the growth of government definitely, we can still get insight into the changes that have taken place in the role of government by examining figures for public expenditure. This is the most widely used measure of the relative size of governmental activity. A particular clue can be found in the relationship between government expenditure and Gross Domestic Product (GDP) which constitutes a standard measure of all the marketed goods and services produced in economy. So, as can be seen in Table 1, there is a steady growth in the proportion of GDP that is devoted to public expenditure.

TABLE 1

Percentage of Gross Domestic Product going to Public Expenditure

Year	%
1975	32,8
1976	33,3
1977	34,5
1978	35,7
1979	36,0
1980	36,8
1981	42,7
1982	43,7
1983	45,3
1984	47,1

(Source : National Accounts of Greece)

However there is a universal and diachronic consensus among many scholars that the capacity of Greek Public Administration (GPA) needs to be modernized to level with public expectations concerning the efficient and effective achievements of projected national goods. Of course the issue of the problem of administrative modernization is not new. It is a social need, that has been considered as one of the main preconditions in the course of economic development of Greece. It is so well known, that K.Varvaressos wrote that "we must not expect any real improvement in the country's economic situation as long as we do not deal with the fundamental problem of the inadequacy of its administrative machine"[(1)].

Thirteen years later, Langrod's Report, published by OECD in 1965 emphasized that "at a moment when Greece is going into the

European Economic Community and will consequently have to enter into competition with its Member countries it must be provided without delay with an adequate administrative machine, and in order to achieve this, give first priority to its reform"[2].

As a result,for the avoidance of a chronic state of underdevelopment[3] ,GPA should enhance its capabilities. The concern is to overcome its administrative pathologies or the crisis[4] it faces, referred many times under titles such as administrative modernization or reform (Law 1943/1991). So, if the strategic goal of such an effort is the development of GPA in order to function effectively and efficiently, at a tactical level this effort should be focused on the enhancement of its administrative capacity to respond to environmental changes, to ensure optimal utilization of available resources and to develop a more result-oriented function and a more cost-conscious and accountable administrative system.

From this point of view, Information Technology (IT) provides a significant factor that may facilitate the increase of administrative capacity. The utilization of IT is an important tool that facilitates an accurate gathering, storage, retrieval, processing and analysis of data and information for both planning and operational purposes. In other words, IT is considered as one basic mechanism that enables the improvement of administrative productivity. Although the detailed impact of IT on organizational change is not clear[5], it is well known that IT contributes to the amelioration of administrative performance[6].

The basic goal of this paper is to analyse the impact of IT on the organization and the function of the GPA, which are significant determinants of its productivity. Based on this analysis the modernization of GPA is viewed from an Information Perspective, providing strategic guidelines on the wider and more effective utilization of IT in the GPA.

1. METHODOLOGY

For the investigation of the impact that IT has, or is capable of having, on an organization, there is a lack of generally accepted

methodologies in the literature. Most of the existing methodologies are oriented towards the determination of the impact of IT on achieving competitive advantages[7]. These methodologies provide a tool for assessing the existing IT systems and for designing new ones, with a view to increase the negotiating power of the organization with respect to its suppliers and customers, and also to decrease the threat from its competitors. Therefore they are suitable for application to private organizations, whose objective is to enhance their strength in the market. They could also be used for public services organizations, which have competition from other public or private organizations. However these methodologies are not suitable for analysing the impact of IT on the Central Public Administration.

For this reason, in order to analyse the impact of IT on the Central GPA, a methodology appropriate to the objectives and the philosophy of the Central Public Administration has been used. As a first step the impact of IT on the three main subsystems of a Public Organization, that is the support, the operational and the strategic subsystems, is examined. A similar approach is presented by K.L.Kraemer[12].

By means of the operational subsystem Public Organizations receive social demands and through a transformation process produce services and goods, such as health, education, transportation and insurance. The strategic subsystem is referred to the policy development dimension of a Public Organization. This includes the capacity of a Public Organization to maintain favorable and responsive relationships with its environment. The support subsystem is defined as the total of functions and activities that are necessary for the operational and strategic functions of Public Organizations, such as payments, personnel records and budget control.

The administrative productivity of the Central Public Administration is not determined only by the productivities of the subsystems of the Public Organizations. It is also determined by the coordination within and between the Public Organizations. Therefore as a second step the impact of IT on coordination was

examined. Also the role of IT on Central Human Resources Management, which constitutes a very important aspect of coordination in GPA, is separately examined, because Human Resources are a crucial factor of the efficiency and effectiveness of GPA, and also their cost is an important component of Public Expenditure.

Quite useful for the analysis of the impact of IT on GPA is also the evaluation of the technological level of GPA with respect to the modern state of the art, which is presented first.

2.INFORMATION TECHNOLOGY REVIEW

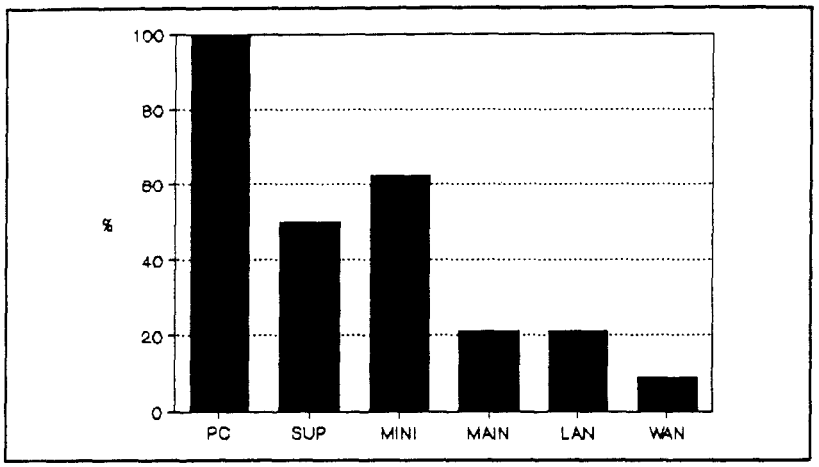
In order to analyse and understand the impact of IT on the organization and function of GPA, initially its technological level is evaluated. The information technologies employed in the GPA, both in hardware and software were examined in comparison with the state of the art in these areas. For this purpose data from the whole Central GPA (Ministries and General Secretaries) were collected and analysed. The results are presented in par.2.1 for the hardware and par.2.2 for the software.

2.1.Hardware

The basic hardware categories and architectures employed have been critically examined. In fig.1 we can see the percentages of the investigated Public Organizations that use Personal Computers (PCs), Supermicros, Minicomputers, Mainframes and Networks. We can observe that all the investigated Public Organizations (100%) use Personal Computers. Also, from additional quantitative data which have been compiled, it is seen that the Financial Ministries (mainly the Ministry of Agriculture, the Ministry of National Economy and the Ministry of Industry, Energy and and Technology) dispose the highest number of personal computers.

On the contrary, from the same figure it can be observed that only 50% of the investigated Public Organizations use Supermicros.

FIGURE 1
HARDWARE CATEGORIES AND ARCHITECTURES PERCENTAGES



If we further specialize, it is only 16% of the investigated Organizations that use UNIX Supermicros, while 34% use Supermicros with other, mainly proprietary of the manufacturer, operating systems. Wider is the use of Microcomputers, with 62,5% of the investigated Public Organizations using hardware of this category. Further specializing only 9% of the investigated Organizations dispose UNIX Minicomputers, while 53,5% dispose Minicomputers with other, mainly proprietary of the manufacturer, operating systems. Finally 21% dispose big Mainframe Computers.

The utilization of Networking Technologies is very low, with only 21% of the investigated Public Organizations using internal Local Area Networks (LANs). Also only 9% communicate with other Public Organizations via Computer Wide Area Networks (WANs). This happens mainly in the Ministry of Agriculture whose Central Agency, located in Athens, is connected to all its Peripheral Agencies located in the Prefectures. Also the Central Agency of the Ministry of Labour is connected to all the capitals of the EEC

member states, exchanging information about the European Social Fund Programs. These percentages are particularly low, much lower than corresponding percentages derived for the Greek Private Sector[8].

From the above it is concluded that most of the medium range hardware potential of the GPA (Supermicros and Microcomputers) belongs to previous technological generations characterized by proprietary operating systems. Only a small part of it follows the modern state of the art which is characterized by UNIX operating systems[9]. This will result in limited capabilities and high cost of upgrading and networking this hardware in the future. Also this nonuniformity of operating systems in the medium range computers is the main reason for high cost and double efforts in developing or purchasing software and educating personnel for them. These problems are very important, taking into account that medium range computers carry the biggest part of the computing burden in GPA and will be the backbone for future extensions.

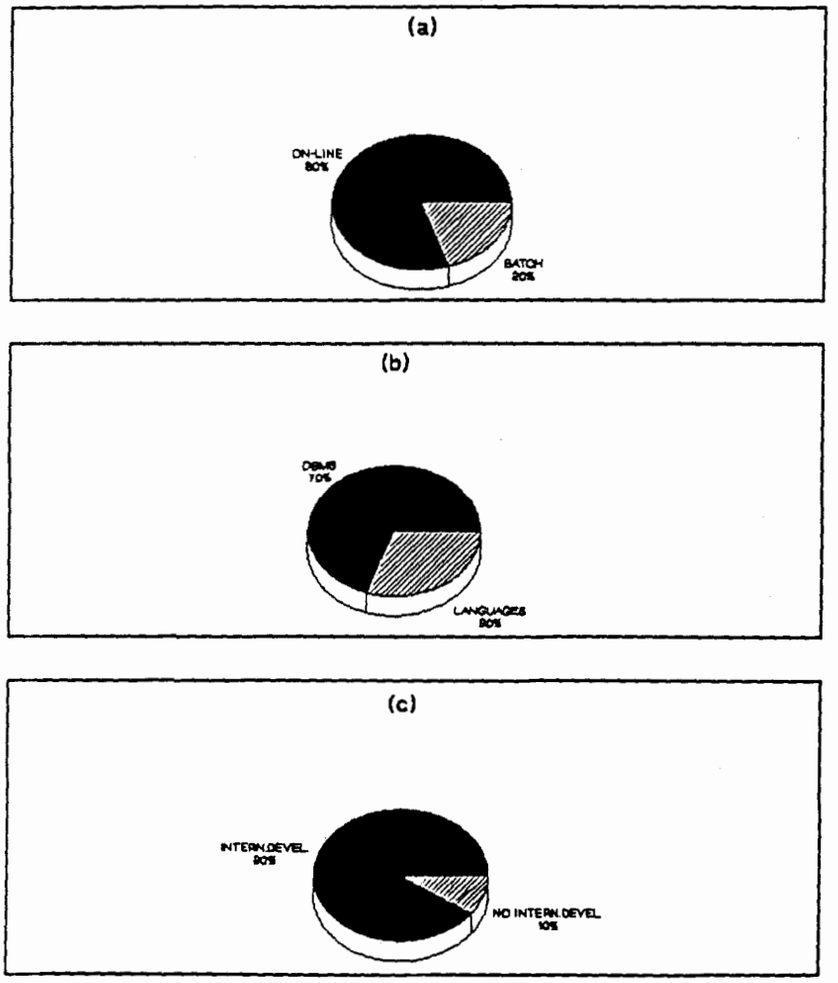
A second important conclusion is that the dominant structure is centralized computing, based on Mainframes and big Minicomputers. On the other side decentralized computing based on smaller Computers interconnected with networks, which represents the modern state of the art, appears only to a very limited extent. This results in difficulties and inflexibilities of adapting the existing potential to changing needs and priorities and also in high cost of upgrading it. Also this does not offer the possibility of information exchange between different units within the Organization.

Generally, the implications and the consequences of the above mentioned features of the hardware technologies employed are not only technical but are also related to organizational, functional and management dimensions that will be discussed later.

2.2.Software

In fig.2a we can see that 80% of the investigated Public Organizations use applications which access and process data on-

FIGURE 2
PERCENTAGES OF THE PUBLIC ORGANIZATIONS USING (a) ON-LINE SOFTWARE (b) DBMS (c) HAVING INTERNAL SOFTWARE DEVELOPMENT



line. In the remaining 20% all the applications are based on batch access and processing of data. But even in most of the Public Organizations with on-line applications there are at the same time batch applications as well, to an extent varying between the above Organizations.

Also the tools and languages used for the development of the applications have been examined. We can see in fig.2b that 70% of the investigated Public Organizations use Database Management Systems (DBMS) for the development of their applications, while the remaining 30% use exclusively high level languages (mainly COBOL). But even in most of the Public Organizations that use DBMS, at the same time high level languages are also used to some extent. Generally it is positive that in 90%of them some level of internal software development takes place, as it is shown in fig.2c. But the quality and quantity of the developed software varies significantly between the above Public Organizations.

The conclusion which is drawn is that on-line software, which represents the modern state of the art[8], has been introduced to some extent, but still a lot of important tasks are executed using batch software which represents the previous technological generation. Therefore the update of a big amount of data kept by the above Public Organizations, which are related to these tasks cannot be timely enough, in order to incorporate new data and information. This has negative effects of their functionality, productivity and decision-making capability.

Also, about the software development capabilities it is concluded that DBMS, which represent the modern state of the art, have been introduced. Though extensive use is still made of high level languages of previous generations. This often results in high costs and long times of maintaining the existing software or developing new software in order to respond to new requirements. Taking into account the change of roles and activities that modern Public Administration faces, the above problem is highly important.

3.IMPACT OF INFORMATION TECHNOLOGIES

Having evaluated the technological level of GPA, next the analysis is focused on the impact of IT on a set of important determinants for its productivity. Within this framework, first the impact on the functions related to the support, operational and strategic subsystems is examined. Next the effects on Coordination and Decentralization are examined. Finally the influence of IT on the Central Human Resources Management is examined. Highly related to the above issues is the hierchical level and the role in the process of decision making of the IT units, which are also studied.

The investigation of the impact of IT on the above organizational structure dimensions is based on data compiled from the whole Central GPA (Ministries and General Secretaries). The main functions which are covered by IT in the investigated Public Organizations are shown in fig.3.

3.1.Support and operational functions

From fig.3 it is observed that most of the IT potential covers support functions, mainly concerning payments, personnel records and budgeting. The reason for this is that historically GPA allocated quite a lot of Human Resources for support functions, which had to be reduced. Also according to other countries experiences[10], support functions were among the first to take advantage of IT, because of their labour intensive nature involving high volumes of routine work.

The introduction of IT in support functions contributed to the increase of their productivity. However this contribution was evaluated to be lower than expectations. It is true that a reduction of the Human Resources allocated to support functions was achieved. However still it is about 30%-40% of the personnel of the investigated Public Organizations that is allocated to these functions. The main reason for this is that some of the support functions are still performed manually and the integration between them and the

FIGURE 3
MAIN FUNCTIONS COVERED BY IT
(Support, Operational, Strategic functions are denoted with SU, OP and ST respectively)

Organization	Functions
Min. to the Presidency of the Government	Payroll(SU), Budget(SU), Public Sector Personnel Data Analysis(OP+ST)
Min. of Foreign Affairs	Payroll(SU), Budget(SU), EEC Issues Record(ST)
Min. of National Economy	Payroll(SU), Public Investment Management(OP+ST), Regional Development Projects Management(OP+ST), EEC Funds Management(OP)
Min. of Finance	Payroll(SU), Taxation Processing(OP)
Min. of Interior	Payroll(SU), Personnel Records(SU), Electors Registation(OP)

Min. of Agriculture	Payroll(SU),Personnel Records(SU), Agricultural Production Records(OP+ST), EEC Subsidies Management(OP) Communication with Peripheral Agencies(OP+STR)
Min. of Health,Welfare and Social Insurance	Personnel Record(SU), Premises Record(OP), NHS Doctors Record(OP)
Min. of Commerce	Products Pricing(OP), Drugs Costing(OP), Public Procurements(OP)
Min. of National Education & Religion	Payroll(SU), Teaching Personnel Record(OP), General University Entry Examinations(OP)
Min. of Culture and Science	Payroll(SU), Procurements(OP), Monuments Record(OP+ST)
Min. of Transports & Communications	Payroll(SU),Personnel Record(SU), Vehicles Licences(OP)

(continued)

FIGURE 3 (Continued)

Min. of Housing and Physical Planning	Urban Planning(OP+ST), Construction Regulations Record(OP)
Min. of Industry,Energy and Technology	Payroll(SU), Personnel Record(SU), Energy Consumption(ST)
Min. of Labour	Payroll(SU), Collect.Negotiations(OP), Communication with EEC members capitals(OP)
Min. of Macedonia and Thraki	Legal Affairs(OP), Subsidies Management(OP)
Gen.Secr.of Public Enterprises	Monthly Financial Budgets
Nat. Statistic Organization	Popul. Census(OP+ST), External Commerce(ST) Unemployment Res.(ST)
Gen.Secr.of Social Insurances	Personnel Record(SU), Insured Record(OP) Insurance Exeptions(OP)

Gen.Secr.of Sport	Payroll(SU),Budget(SU), Project Management(OP)
Gen.Secr.of Migrant Greeks	Payroll(SU),Personnel Records(SU), Migration and Repatriation Record(ST)
Gen.Secr.of Popular Education	Personnel Record(SU), Educational Cources Planning(OP+ST)
Gen.Secr.of Public Works	Administrative and Financial Support(SU), Project Management(OP), Technical Companies Record(OP)
Gen.Secr.of Industry	Office Automation(SU+OP) Data collection from Industrial databanks(ST)
Gen.Secr.of Research and Technology	Payroll(SU), Budget(SU), National & International Research Programs Record(OP)

computerized ones is characterized by poor efficiency. Another reason is that the introduction of IT has not been accompanied by the necessary changes in the organizational structures of the support departments.

From fig.3 it is observed also that considerable part of the IT potential covers operational functions, which is however much less than the potential allocated to support functions. Between these functions are included some of critical importance to basic government functions, such as taxes collection and financial management, public procurements, education and welfare. The introduction of IT in these operational functions has contributed greatly to the improvement of their productivity. Although there was some reduction of the Human Resources allocated to these functions, but still there is much to be done in this direction.

3.2.Strategic Functions

As we can see from fig.3, the part of IT potential covering strategic functions is limited, though varying between the investigated Public Organizations. This constitutes a quite negative feature, taking into account that these functions are highly information intensive. According to the existing experience, the quality of the policy developed in Public Organizations has proved to be critically dependent on:

i) the collection of the appropriate data from Peripheral agencies, other Public Organizations or the external environment,

ii) processing of these data in order to produce meaningful collective parameters or future evolution forecasts.

At present the data collection in GPA is performed mainly by paperwork exchange with the sites of primary data collection. This approach has proved to have various disadvantages. First, it does not enable high enough rates and quantities of information transfer. Second the information transferred via paperwork is characterized by lower quality, validity and timeliness. The data compiled in this

way have to be entered into the computer by manually typing them, which requires a lot of Human Resources, in order to be next processed. Quite limited in GPA is the data collection using computer connection with the sites of primary data collection via interorganizational networks. This is also indicated by the limited use of Computer Wide Area Networks (WANs) discussed in par.2.1.

3.3.Coordination and Decentralization

The capabilities offered by the use of computer networks for exchanging information between different units within a Public Organization, or between Public Organizations,in order to improve their coordination, have been extensively discussed in the literature[11]. As we can see from fig.2, limited is the utilization of LANs in the GPA for internal coordination purposes. One of the main features of the internal coordination between different units within Public Organizations in GPA is the underutilization of IT. The coordination is achieved mainly using traditional means, such as hierarchy and managerial meetings. These means have proved to be very time consuming, much of the managers' time, which could have been spent in a move creative may, being spent for them. Also they have proved to be inefficient, because of the variety of matters requiring coordination in Public Organizations. Another reason for this inefficiency is that the existing organizational culture does not favour sharing of information, regarding it as a means of exerting more influence. Also, as we can see in fig.2, only in a few cases is computer connection via WANs used in GPA for the exchange between Public Organizations of the information, which is required for their effective coordination.

Limited also is the utilization of WANs in GPA for the exchange of information between the Central Agencies of the Ministries and their Peripheral Agencies in the Prefectures. Such an information exchange could greatly contribute to the decentralization of decisions and functions. The most representative case is, as already stated in par.2.1, the Wide Area Network (WAN) of the Ministry of Agriculture,with which significant agricultural and financial information is transferred from the Central to the

Peripheral Agencies. This information has proved critical to the decentralized agricultural functions, which are performed at the Prefectures. However, in the other Ministries the exchange of information between the Central and the Peripheral Agencies is performed mainly via paperwork. This approach has proved unable to satisfy the information needs of most decentralized functions.

3.4.Central Human Resources Management

As already stated in par.2.1 in nearly all the investigated Public Organizations some of the Human Resources management activities are performed using IT. However, still a lot of activities related to Human Resources management, though they are characterized by routine procedures and are suitable for computerization, are still performed manually.

On the contrary limited is the contribution of IT to the Central Human Resources Management, though human resources costs constitute one of the most significant components of the total GPA operational cost. Central Human Resources Management is, according to the allocation of Governmental functions between the Ministries, performed by the Ministry to the Presidency of the Government. The contribution of IT to it is only in data processing, but not at all in data compilation. The data about personnel size, categories and educational levels are sent yearly from the whole GPA to the Ministry of the Presidency to the Government via paperwork. There, the above data are entered to the computer, in order to be processed and some standard reports to be produced.

This approach has proved unable to satisfy, both from a qualitative and quantitative point of view, the information needs of the Ministry units which have the responsibility to develop the Public Sector Policy on Human Resources Management issues. This policy includes as subcomponents the recruitment, performance appraisal, reward and career procedures, which in order to be effective need to be strongly interconnected. This creates a lot of implementation difficulties. Because of the above weaknesses the solution of using a Wide Area Network (WAN) centered at the

Ministry to the Presidency of the Government for personnel data compilation is under consideration.

3.5.Information Technology Units

In nearly all the investigated Public Organizations there is one distinct unit for covering IT needs. Only in a very few of them there are more than one IT units covering different parts of the Organization. The hierarchical level of the IT units varies between the investigated organizations. In 38% of them the IT unit is a Directorate, belonging to a General Directorate of administrative support. In the remaining 62% it is a Department belonging to a Directorate of organization. It is generally accepted that IT units should be of a higher hierarchical level.

The above units in most of the investigated organizations control to a great extent the computerization and the IT resources. Therefore computing management in GPA can be characterized as belonging to the "skill state", according to K.L.Kraemer's categorization of computing management states[12]. However the IT units' role in the decision-making is not yet important enough. The main reason is that the middle and upper management, do not have enough knowledge for the capabilities of IT and are not fully accustomed to the general philosophy that IT represents.

Also in all the investigated organizations the IT units have no responsibilities for telecommunications and office automation, which are controlled by different units. Therefore an integrated management of computing, telecommunications and office automation, which is the modern trend both in public and private organizations[12], with all the functional and economical advantages resulting from it, can not be achieved.

4.AN INFORMATION PERSPECTIVE OF GREEK PUBLIC ADMINISTRATION

It is well known that IT is portrayed as the technology of organizational intelligence[13] ,that promises substantial advantage

for both Private and Public Organizations. It has been observed that new technologies are offering substantial improvements in organizational performance[14]. Among these potential benefits and positive consequences are: rationalization, and standardization of administrative operation, documentation, increased efficiency of administrative operations, greater access to information which are useful for socio-economic planning, increased administrative flexibility, more accurate and timely information for decision-making and more integrated approaches to management.

However, although IT has been introduced within GPA, from the above analysis it can be concluded its limited utilization. Also, the technological level to a great extent is not according to the modern state of the art,but belongs to previous technological generations. GPA does not exploit fully the advantages that are offered by IT. Despite its attractiveness as a mechanism that contributes to the organizational performance, IT is under-utilized by GPA. Rather, IT has to some extent been absorbed by the existing organizational reality of GPA and exerts an influence much less than the expected. Also, IT has not had a significant impact on the organizational design of GPA.

This is due to a set of reasons, such as lack of trained personnel who master the knowledge and skills of potential computer application, the gap between IT and decision-making process, the emphasis that is put by GPA on the traditional patterns of management and the historical tendency of administrative centralization in operations. All these reasons have prohibited the institutionalization of a new way of thinking and functioning that is demanded by IT. IT is conceived more as a "fashion", rather than as a technological innovation that may have potential consequences on the organization and the management of Greek Administrative System.

Of course this does not mean that we consider IT by itself as the only powerful mechanism that may modernize GPA. The utilization, the full realization of the value of IT depends upon economic, social technological and environmental factors.

However the main prerequisite of overcoming the above obstacles behind the full utilization of IT is the conceptualization of administrative modernization of GPA and especially the vital issue of its productivity from a different point of view. The improvement of organizational ability of GPA involves a shift in organizational culture of Public Administration from static operation to evolutionary(15).

This point of view considers GPA as an information-processing system, which is characterized by information intensity. GPA, as an open social system survive to the extent that has the information capacity to detect events, trends and social needs relevant to its survival. In that terms GPA should develop information-processing mechanisms that facilitate its adaptive capacity and finally its responsiveness to the emergent social needs and demands. The behavior of GPA should be based on information that are scanned, interpreted and learned from its environment. From that reasons the introduction of IT should be perceived as an appropriate mechanism that influences the function of the differentiated subsystems, but also facilitates the organizational integration, in a mode that GPA functions effectively, efficiently and responsively to its environment. A more useful utilization of IT by GPA would improve its adaptive effectiveness, in recognizing the need for more strategic adjustment and aiding processes of organizational learning that facilitate the reformulation of problems as a base of new policies.

So given the above consideration of GPA,the main challenge of scholars and public administrators ,both in Greece and internationally ,is to focus on research testing theories about IT in Public Organizations, but also describe guidelines on the optimal way to channel its use.

5.STRATEGIC GUIDELINES

Conclusively the above study leads to the following guidelines as to the Strategy of the GPA in IT:

i) The wider and better organized utilization of IT in GPA can

critically contribute to the achievement of the goals of modernization and productivity increase. Information should be recognized as a valuable resource, therefore its compilation, storage, update, processing and use should be regarded as highly important functions.

ii) Though IT already covers to some extent support and operational subsystem functions, it should find wider and more efficient use in this area, aiming at the reduction of the manual labour required. In this way a decrease of the personnel allocated to these functions can be achieved, which will enable more personnel to be used for strategic functions.

iii) The greatest effort should focus on using IT for the improvement of the strategic functions, where at present the use is minimal. The development of both interogranizational WANs, for improving the information compilation and transfer capabilities, and of computer Systems, for improving the processing capabilities, can greatly contribute to the reinforcement of the strategic functions of Public Organizations, and finally their adaptative efficiency. In that way GPA will enhance its responsiveness to social demands effectively and effeciently. These directions are quite significant both because of the critical importance of the strategic functions and of the weaknesses observed in these areas.

iv) The internal coordination can be strengthened, if in addition to the existing mechanisms, IT is used as well. The development of interorganizational LANs will facilitate and standardize the required for this purpose information transfer. It is quite important before the development of such systems to determine the exact depth of information kept by each unit, that will be transparent to other units. This precondition should be combined with the rationalization of the organizational structure of GPA.

v) The decentralization of functions from the Central to the Peripheral Public Administration, which is a key issue for the Regional Development of Greece can be greatly assisted by IT. Critical in this direction is the development of a WAN connecting the Central Agencies of the Ministries in Athens to their Peripherals

in the Prefectures. This Network will enable the transfer from the Center to the Prefectures of the required information for decentralized functions. Also it will enable the transfer from the Prefectures to the Center of important information for Strategic functions. This WAN can be based at present on the existing analog telephone Network run by the Greek Telecommunications Organization. In the future it can be based on the ISDN which is now under development.

vi) From the technical point of view, decentralized architectures based on lower size hardware connected via Networks, should be adopted, instead of the centralized architectures based on bigger hardware, which are dominant at present. Such an approach is in accordance with the modern state of the art and will result in higher flexibility, upgradability and lower costs. Also the highest possible uniformity of operating system is very important for GPA both from technical and from economical viewpoint. This is facilitated by the modern state of the art, which is characterized by MS-DOS for Microcomputers and UNIX for higher range Computers.

vii) The software should be further directed towards on-line applications, because they are characterized by much higher functionality, enhancing the decision making capabilities, than batch applications, which are still in extensive use to some extent. Also relatively to the development of software an even wider use of fourth generation DBMS should be adopted, gradually replacing the high level programming languages which are still extensively used. Such an approach is in accordance with the modern state of the art and will lead to lower costs and shorter times of software development and maintenance. These advantages can contribute significantly to the improvement of GPA capability to respond to new social demands.

viii) The implementation of the above guidelines is critically dependent on Human Resources. Therefore the IT personnel should be given both the continuous education and the motivation required, in order to follow and apply creatively the quite rapidly evolving IT. Also the role of the IT units in the decision making should increase, enabling the Public Organizations to fully utilize the capabilities

offered by IT. This should be accompanied by an increase of the hierarchical level of the IT units to that of Directorate.

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