

Promoting urban spatial and social development, through strategic planning of GIS

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Abstract

Nowadays one of the most important subjects discussed in the field of Management and planning of social and spatial development of cities is strategic schematization, which in case of proper usage can lead to arrangement and optimum usage of the resources and existing possibilities and desirable symphonic constant growth. Strategic schematization is actually systematic methods that cause incorporation and premiership actions considering four important parameters which are internal strengths and weaknesses and external chances and threats. With the help of this schematization we find out where we are, where we need to go and how we should get there. On the other hand one of today's most important discussions in the world in the field of urban management and extension, according to the growth of urbanization, is the creation of metropolises and their problems and difficulties. The development of ICT contraction and information technology and its specific capability in haltering, controlling, omitting or reducing the difficulties of urban society has caused the idea of electronic cities which is in need of creating electronic organizations which is followed by electronic governments. Because of the unique traits such as exact and quick analyzing of the descriptive information related to them and also urban management needs of today's society, the GIS positional information systems have changed into a safe tool to patronage the decisions of the reference location. Therefore achieving a complete useful location information system needs a calculated and proper short term and long term schematization. In this process using new methods of strategic schematization which includes analyzing SWOT as surveying and identifying the current situation, valuating and analyzing GIS needs and eventually recording the strategic and massive program can be very effective and solving. In this article surveying this subject and discovering paths towards this achievement has been discussed.

Keywords: strategy, GIS, SWOT model, management and strategic schematization, management and urban schematization

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1- Introduction:

Strategic planning, as political and military leaders felt the need for, started during the Second World War. Then with the attempt of officials, pioneers and innovative executives, it went through a rapid development. Military strategists play a major role in the creation of this type of planning. It continued its path in business organizations ever after. From early seventies, there were some extensive economical and political changes, thus the need for planning increased. This thought influenced other aspects of management as well. From then on, people used the word strategic more often.

Considering the nature and mission of city management which very much involves important issues of life and future of a city, it is inevitable to use strategic planning to gain efficiency and dynamics in creating a system of management capable of using site information and other municipal issues. For this reason, to conduct studies on municipal design and development in various dimensions such as GIS systems, fundamentals, and prevalent methods of strategic management is of great use.

2- Basic concepts and definitions:

Strategy:

This word has a Greek root, Strategema, meaning

the commander of army. It is made of stratus meaning army and ago meaning leader or commander. It was used as a method for harmonizing and controlling different forces to achieve military aims.

However, today we used different concepts and interpretations of this word in management planning literature. Of all these definitions, the following seems most comprehensive.

--- Strategy as a plan, meaning the conscious decision about the way that the operations should be conducted.

---strategy as a trick especially in case of competitor's mind.

---strategy as a pattern of practice, that is internationally or haphazardly taken during the time.

---strategy as a situation that can be flexible according to its environment.

---strategy as an approach, which gathers all the ideas as one single force.

From all these discussions, we can conclude that as a matter of fact strategy is a comprehensive, collective plan, which combines all the advantages and positive strategic points in an organization or any company with other environmental factors, changes and challenges. And it's designed in such a way to ensure the achievement of all goals of the company.

Theorist	Definitions of Strategy	classic strategy	Shared and flexible strategy
Mintzberg	Strategy as a plan	*	*
	strategy as a play	*	
	Strategy as a pattern of action		*
	Strategy as a position		*
	Strategy as a perspective		*
Chandler	Strategy as determining large scale goals and long term execution, choosing operating paths and devotion of necessary resources	*	*
Andruz	Strategy as a pattern for major executive goals		*
Shandel and Hafer	Strategy as practices supporting coordination between internal resources and organizational potential with opportunities and threats of external environment.		*
Staiz	Strategy as an appropriate framework providing daily operational management.		*

Hagrive	Involves the future success of the organization, necessary steps, controlling evolutionary procedure, revising and analyzing the actions.	*	
Brysen	An organized effort to make basic decisions, conducting fundamental actions.		*
Ansenf	Strategy is defined according to strategic designs	*	
Metropolis 93	Strategy as a systematic concept to give form and guideline for a system emphasizing action, performance and sharing on the side of main decision makers, and concentration on what's important for the society, distinguishing rare resources		*

Table No.1-

Tactics:

Means short Term decision-making, based on the conditions that change, and include tactic decision-making and detailed decisions and strategic planning.

Diplomacy:

Means the total rules and regulations upon which decisions are made and determines the main path of moving forward. Diplomacy in decision-making is a guideline for thought, whereas strategy along with guidance facilitates usage of resources.

Strategic planning:

This type of planning is usually done on a senior management level, including devising the main duties of the organization, providing facilities to achieve the

goals of the organization and determining operational output based on number of years.

Tactic planning:

Is a process by which a group of connected activities is designed to conduct a strategy.

Operational planning:

Is a type of planning by which a series of specific steps are taken to achieve goals. It is short-term, usually a couple of months.

3- Communication between strategic tactic and operational planning:

In fact three methods are interrelated, meaning each one of these couldn't be effective without the existence of the other two, or has limited impact.

Type of planning	Role and it's position	Management levels
Strategic : focuses on long and medium term	Organizational and regulating:	High level management
Tactic : focuses on medium term	Controlling the whole organization	Medium level management
Operational : focuses on short term	Technological: Supervising the operations	Low level management or supervision

. Table No 2:Comparison of role, position, and the duration of implementing tactic , operational and strategic management

4- Strong and weak points in strategic planning:

Use of strategic planning and management overall

consist of the following advantages and disadvantages which in turn is capable of consideration.

Advantages and strong points	<p>1-Appropriate determination and sorting of priorities in execution and usage of resources</p> <p>2-Decision making based on the results and their outcome.</p> <p>3-Providing a fine base for decision making and planning</p> <p>4-Decreasing major difficulties and improving performance.</p> <p>5-Proper and efficient flexibility in changing situations.</p> <p>6-Developing comprehensive recognition in planning and ...</p>
Limitations and weak points	<p>1-Mostly descriptive and analytical, lacks execution process.</p> <p>It is total-oriental, which does not pay attention to details of executing difficulties.</p> <p>3-Lacks attention on people and their social concerns.</p> <p>and ...</p>

Table No 3:Advantages and disadvantages of strategic planning

5- Strategic planning municipal management:

Municipal planning, like other social sciences, has gone through great changes in recent years. most experts believe that most of these changes began early 19th century .some early views are recorded as the comprehensive municipal planning for the city of Barcelona began in 1859 by a civil engineer named “Aidfons Serva “

Municipal planning as an organizational framework of city development requires policies, plans and designs. This, in turn, has to compromise with the municipal growth and development according to the infra structure. Strategic management of the city is a process that provides and combines all attempts and innovations required between the state organizations and the private sector for dynamic city development .

City planning needs to focus more on the general principals rather than the details. It should have a process or sequence to overcome the timely goals. In strategic management, we can determine three phases, implementing and supervising the steps of the traditional planning, i.e. Extracting data, analyzing them and designing.

Strategic planning, considering the external environment, should often know the possibilities and limitations. This, in fact, is an outcome of systemic thought. This type of planning, in response to discrepancies of comprehensive and detailed designs and avoiding concentrated planning is moving towards a more process oriented-planning, decision making, local programming shared and combined planning, and implementing.

Comprehensive planning	Strategic planning
<ul style="list-style-type: none"> -Conducting discipline in city environment -Defining the application of land in general. Locating all civil developments and general systems precisely. -Planning is a state responsibility -Using experimental studies -Plans to discipline potential future private activities -Organizing a plan of action. 	<ul style="list-style-type: none"> -An integrated plan with some environmental executing objectives -Prioritizing projects and locating them. -All phases should be implemented in total agreement. -Using qualitative analysis and crises factors -Agreed and committed plans with doers for short term and immediate actions -An operational planning

:Table No 4:Evaluation of comparison between comprehensive and strategic planning

6- Basic steps in the process of strategic planning:

- First phase: study, recognition, analysis of the environment
- Second phase: selection of key factors
- Third phase: Defining organization goals and objectives
- Fourth phase: Analysis of internal and external environment of planning
- Fifth phase: Choosing practical and strategic goals proper to every situation
- Sixth phase: Providing an implementation scheme, for strategic actions.

Eventually, comparing comprehensive and strategic scheme and changes of timely strategic planning concentrated more on practical and executive schemes and shared methods in its course of development rather than spending time on cognitive and superficial subjects, its function can be of specific value in promoting and excelling city management.

7- History and definition of GIS:

GIS technology has a business history of more than thirty years; however, its extensive use has only become popular in recent years. The most comprehensive definition is the one, which was accepted as the geographical data in analyzing committee under the supervision of lord Chorley. According to this definition, GIS is a system for receiving, storing, controlling, combining, processing, analyzing and displaying data with its location on earth. This system usually involves a referent computer database on the earth, and an appropriate soft ware with specific application. Dr. Tomlinson first implemented GIS in Canada for use in implementing forest management.

8- The position of GIS in municipal planning and management:

The world today is based on information and manag-

ing it. Advancement in technology in the recent decades has urged for collecting and storing data. This has caused an enormous amount of data for the users and organizers. Thus, there is a need for efficient and powerful systems, that can collect, process, store, relocate, and market various data. So GIS has been considered as an answer to this need, as a powerful tool and efficient technology.

GIS has had an effective role in promoting the quality of different programs. Today, by the use of digital models provided as multidimensional virtual simulation, experts have proved the accuracy of decision-making and justification of users. By the help of GIS, today we can promote all city affairs; plan various very sensitive municipal activities, such as distribution of population, traffic and transportation, parks and green spaces, pollution, essential services and so on very conveniently with the least possible mistakes.

GIS is capable of facilitating and accelerating municipal researches including the rate of change in cities, suggested development, simulating future modeling in city management. So to put it in a simple way; using the powerful tool of GIS in today's complicated life can help the quality of decision making in city management, help citizens to use their desired services of the city. It also reduces the rate of accidents and other misfortunes, which have become a big concern in metropolitan areas.

9- PROCEDURES FOR GIS STRATEGIC PLANNING:

Strategic planning of GIS development is baked on description and analysis of the present situation, evaluation of the ideal condition, determining strategic priorities in the most effective and continual progress of the location. This includes the following phases:

1. Determining the present situation, defining the future perspective, principles and objectives in large scale and long-term development of GIS.
2. Analysis and evaluation of strong and weak points, opportunities and threats (SWOT), providing

large scale strategic GIS.

3. Presenting operational and executing projects based on strategic GIS objectives.

Considering the social and managerial situation in the municipal management system of the country, now, although it has not yet been developed, municipalities provide more than 80% of the city services. Most of these are interrelated with the data of the main (referent) location. In other sectors, GIS has helped reduce costs significantly and facilities work as well. Therefore, municipalities are the chief producers and consumers of GIS. This is especially important in metropolises where they need to keep their data updated, or keep track of their recourses and facilities. Thus, designing and implementing strategic management and development of GIS is highly essential. Although this system is provided for the municipality, the data system actually becomes available for other state and private organizations giving municipal services, conducting researches, or planning as well after its production.

10- THE PROCESS OF COMPILING GIS STRATEGIC PLANNING:

First Step-getting to know the facts:

The first step in compiling this plan is recognition and evaluation of the present situation, goals, and hierarchy and work circulation in user organizations together with the rate of GIS effectiveness on the performance of their different sectors.

Second Step-Adaptive studies:

This includes other similar experiences and achievements nationally and internationally, so as not to spend dual time and money with little or inappropriate output.

Third Step- Surveying the application of superior documents:

Optimum use of superior national, provincial and related organizational regulations, documents is extremely useful and effective. Therefore, we produce powerful documents with the same framework.

Fourth Step- Consulting Other experts and specialists:

Consulting other experts and executive managers

can definitely be very helpful. It is extremely significant, for then our plan will be successful, applicable and effective.

Fifth Step- Compiling the perspective, Principles and objectives of developing GIS:

A. Municipal GIS perspective

Location information is an asset and strategic resource in municipal management. It plays a significant role in achieving future perspective of the goals and city development. The perspective of location information technology of the city consists of an integrated electronic system, which, provides, produces and distributes the reference location information, guides and supervises all the activities. Such a system should hold these characteristics:

- Provision of an integrated continual electronic working environment (E-Office)
- Production of necessary location information according to the needs of the citizens
- Development of a concentrated location data base, based on the current data
- Development of a continual planning space, to control, update and provide location information in different matters
- Development of a flexible space so as to offer the citizens the integrated, interactive services
- Development of sharing and corporation among all existing departments involved in service-offering organizations and with other municipal organizations

B. Principles of GIS

These principles express basic guidelines in application and development of GIS in schematization and city management and consist of:

- Sharing location information resources in the organization and society
- Providing continual services which are reliable and sustainable
- Protecting the location information services as the municipal management assets
- Development of added value by location information technology

- Development of an ongoing working environment
- Following the standards of producing location information
- Effective service management and information resource
- Application of location information technology in order to achieve developmental goals, schematization and municipal planning
- Reducing the need for the citizens to refer in person to receive city services
- Creating common sites and links for city and provincial organizations and companies

C. The Objectives of information technology of location

These objectives are determined according to the general perspective of development and ICT, IT objectives and other needs for extending cities:

- Objective no 1) Creating a flexible location IT department
- Objective no 2) Compiling and fixing an architectural location IT required for municipal management organization
- Objective no 3) Appropriate management of location information resources
- Objective no 4) Offering electronic services and other information required for citizens

Sixth Step- Presenting analytical SWOT model and extracting location information technology strategies:

Analytical model of SWOT which is taken from the first letters of strengths, weaknesses, opportunities

and threats is in fact a method of systematic recognition of factors and strategies that is based on most similarities between these and rational principles. So that their most effective ones cause an increase or strengthen powerful points and opportunities of an organization and simultaneously decrease weak points and threats. Based on appropriate strategy recognitions and knowledge of the current situation, internal and external factors, optimum strategies and dual interactions, these four factors can be extracted and classified.

Analysis of the systematic SWOT obtains all the viewpoints regarding an organization. Thus, all these viewpoints can change to an effective and useful framework in order to choose an appropriate strategy.

11- General form of implementation of SWOT model in the field of creation and improvement of urban GIS:

In application of urban GIS, careful noting and consideration of determining a base and general format is necessary for a further integrated sort of the prepared examination and planning. By the same token, a model is obtained for the analysis of indoor and outdoor spaces according to the division of working areas and identification of the favorable situation achieved by providing the items raised in each of these areas; provided that we collect and analyze the strengths, weaknesses, opportunities, threats, and finally analyze, examine, and extract the suggested strategies in the four fields of data, application systems and services, information technology, and business.

Field	Definition and limits
Data	Entities, the relationship between them and data model of the organization is located in this area.
Services	In this layer, systems that are ready to extract and analyze the geographic information are placed.
Technology	This field consists of tools and technologies of information and communication systems.
Business	Missions and objectives on which an organization is based.

Table No 5

Area	SWOT	The most important examples of cases raised, in the recognition range
DATA	Strengths (S)	Presence of different experiences and documentation in the field of geographic databases.

		Presence of different experiences and documentations in the field of editing the topographic plans of information.
	Weaknesses (W)	Lack of an efficient procedure in a timely monitoring and evaluation process of preparation and updating spatial and descriptive information of the organization Absence of proper terms, legislations, bills, and instructions
	Opportunities (O)	Possibility to allocate sufficient funds to establish an efficient infrastructure of basic geographic database in the city
		Developed standards in areas related to an efficient urban infrastructure of geographic database in different countries
	Threats (T)	High costs in producing and updating the geographic information
		The providing and entering process of the data being slower than the expected one
Application systems and services	Strengths (S)	Adequate financial resources and budget allocated to this field
		Access to a wide range of geographic information in order to implement and use different software
	Weaknesses (W)	Absence of public application of proper standards and instructions in the field of activities related to GIS
		Weakness of raised documents and systems
	Opportunities (O)	Opportunity to use the operating system of open source in order to implement GIS plans
Opportunity to use databases of open source in order to implement GIS plans		
Threats (T)	Lack of a proper support for many GIS software and hardware equipments in the country	
		The impact of economical, cultural, and political affairs on urban GIS and organizations
Technology Information and Communication	Strengths (S)	Defining and equipping Data Center for security of the data
		Extensive experiences in the various required fields of IT and ICT
	Weaknesses (W)	The condition of the software in connection with GIS normally being extremely weak
		Absence of proper information base and also an efficient structure for the methods of exchanging software via internet, intranet and PC passed, for most of the software
	Opportunities (O)	Appropriate technical and financial resources available to implement projects in different fields of IT and ICT
Successful experiences in different cities and countries, in creating cities and electronic organizations		
Threats (T)	Exorbitant costs of providing, supporting and updating of hardware equipments Lack of a proper support for many of the hardware equipments within the country	
Business	Strengths (S)	Experts with experience in preparing and updating topographic maps and urban basic geographic information
		Professional experts in urban service organizations in fields of IT and ICT
	Weaknesses (W)	Shortage of expert teams in various fields of IT and ICT and geographic information technology
Participating in island actions and decentralization and lack of integration and coordination in GIS affairs		

	Opportunities (O)	Using potential and ability of human resources in functional and faculty centers in various fields of IT and ICT and geographic information technology
		Support of the Third Development Plan, government and international agencies for non-focused and discrete management approach and development of integrated management in the implementation of urban affairs
	Threats (T)	Government restrictions in recruiting skilled manpower, especially in areas of IT and GIS
		Lack of comprehensive planning of finances and budgets for urban GIS, and also the share of each organization in the matter

Table 6_ The most important examples of cases raised, in the recognition range

12- Various types of strategies in analysis of SWOT:

According to the analysis of SWOT, four types of strategies are obtained based on analysis, confluences, and similarities of strengths, weaknesses, opportunities and threats; which can be cited as bellow:

A- Aggressive strategy (S-O): relying on strength in order to implement the opportunities, this practically results in implementation of the favorable situation.

B- Continuous improvement strategy (S-T): utilizing the strengths in order to fight the threats, this practically results in provision of long-term opportunities.

C- Gradual change strategy (W-O): gradual removal of the weaknesses in order to optimally implement the basic opportunities is the base of this method.

D- Defensive strategy (W-T): removal of the weaknesses in order to fight the threats, these results

in reduction or alterations of providing services, and changes the obtained conditions and situation.

13- Analysis, examination, and extraction of the suggested strategies in the four fields of GIS improvement:

Using the SWOT model, we can analyze and compare the collected information in the four fields of data, application systems and services, information technology, and business in the form of four mentioned strategies: aggressive, defensive, continuous improvement, and gradual change. According to the following table the suggested strategies for the complement and improvement of urban GIS can be determined in each one of the four areas; and finally extract the related projects. Also follows a table of the suggested strategies of the SWOT model in the four fields of development and planning of urban GIS in bellow.

Quantitative and qualitative goals	Strengths	Weaknesses
1. ...	S1 ...	W1 ...
2. ...	S2 ...	W2 ...
3. ...	S3 ...	W3 ...

Opportunities O1 ... O2 ... O3 ...	Aggressive strategies Those which have been established based on the application of strengths to implement the opportunities.	Gradual change strategies Those that have been established based on the removal of the weaknesses to implement the opportunities
Threats T1 ... T2 ... T3 ...	Continuous improvement strategies Those that have been established based on application of strengths to fight the threats.	Defensive strategies Those that have been established based on removal of the weaknesses to fight the threats.
Urban GIS areas: (data, application systems and services, information technology, business)		

Table 7 _Model of the extraction of SWOT analysis strategies based on the information from the recognition stage

	S-T	Utilization of the modern GIS technologies and localizing them in order to provide an excellent service of GIS organization.
Strategies of the business field	Analysis of S-O	Promotion of scientific and technical experts and recruiting specialists in the field of mapping and GIS considering the existing potential.
		Centralized management of information technology in order to create the Urban Management Unit considering the policies and programs of implementing and enforcing the rule and policy set by the trustee in this area.
	Analysis of W-O	Providing training and upgrading manpower skills.
		Moving towards the urban management unit and to avoid island actions.
	Analysis of S-T	Familiarizing and training organizations and agencies concerned regarding the Geographic Information Technology
		Comprehensive and codified planning in the budget of GIS in the city and representing the share of organs in this particular matter.

Strategies of the information technology field	Analysis of S-O	Creating the appropriate network infrastructure required to implement comprehensive and integrated systems of GIS.
		Using strong consultants in performing appropriate enquiry and planning in order to create technologies.
	Analysis of W-O	Improving management of the communication network and local network using the proper hardware support.
		Improving the level of server technologies, quality and storage using existing resources of ICT in the country.
	Analysis of S-T	Using appropriate hardware models to improve and upgrade the level of performance of hardware equipment
		Maintaining and enhancing productivity and utilization of GIS software considering its cost.
	Analysis of W-T	Improving the access to communication networks for organizations regarding the communication service.
		Gradual and continuous increase and improvement of hardware related to Geographic Information

Table 8_The extracted examples of the suggested strategies of the SWOT model in the four fields of development and planning of urban GIS

14- Creation of the database for the strategies:

After the process of strategic analysis of SWOT in order to sum and use the appropriate strategies, their database is created which includes the most effective interior and exterior factors influencing the organization or objective, or the carried out analyses.

15- Exploitation of the results of strategic planning and extraction projects:

Strategic planning is considered as a deep, principled and purposeful movement towards providing correct conditions to make proper decisions in current affairs; therefore, in order to achieve this end, it is necessary to exit the general form and policies and take practical aspects of enforcement. Thus, all long-term plans must be divided into smaller units such as practical plans and projects based on the adopted strategies in order to be possible to find realization and become operational. Now the important thing here, is the representation of the real needs and their executive priorities considering the dominant situation; in other words feasibility study of the suggested

projects based on which the proper projects are chosen and prioritized considering the technical capabilities and present financial sources.

16- Different steps of taking up studies on feasibility study:

Feasibility studies on each topic generally include the following quadruplet steps:

- first step: examining and understanding the present condition
- second step: analysis and needs assessment of the future
- third step: designing and determining the possible choices
- forth step: comparative analysis and prioritizing the alternatives

17- The necessity of feasibility study and prioritizing in GIS projects:

In the GIS, considering the enormous cost of implementing, high risk in achieving the goals, complications and problems, multiplicity and diversity of the proposed solutions, lack of a sufficient knowledge of

GIS and its features, lack of a proper analysis and understanding of the real needs, and finally the high percentage of failed projects, the feasibility study is of tremendous importance.

18- The process of feasibility study and prioritizing operational solutions in development of urban GIS:

To implement this process firstly, an all-inclusive list of various introducible features and applications in the field of analysis and feasibility study of the projects in the quadruplet areas of business, services, data, and technology is assembled in a separate manner with the following general features.

- Percentage of the requirement for each project being desirable
- Having the highest priority in the eye of managers and decision makers
- Having the highest density in the SWOT analysis
- Being able to be implemented fast
- Needing little time and cost to be implemented
- Having the history of being implemented in the large cities around the world
- Being effective and efficient enough according to the goals of urban GIS
- Its prerequisites having been completed or implemented
- Having the required background to be implemented or achieved
- Achieving many objectives at the same time if started
- Implementing it must solve serious problems of urban GIS or service organizations

- Implementing it must take other problems into sight
- It must be examined in terms of to the human resources management of the service organizations
- It must be examined in terms of planning the data requirements of the urban service organizations
- It must be examined in terms of necessary facilities by the service organizations.
- In addition, other priorities that must be taken in notice according to the city management.

Firstly, the checklist related to the solution desired by the expert team based on the current status of the system is completed, and the features of the requirements are determined based on the consultants' and experts' points of view, previous experiences, existing standards and managers' point of view. Finally, one of the four levels of A, B, C, or D. clears the priority of each project. After completing the general features for each project, the necessity level of that project will be considered.

And in the end, having analyzed and assessed the existing needs in urban GIS and the features of each project, the main proper choices will be chosen. This will be done through rating each feature. We can enter the stage of applying and implementing the projects by completing the checklist and determining the ones that are more compatible with the objectives and present conditions.

Considering the nature and effective features of them, each urban GIS plan and project can be categorized in either one of the two general forms of a defensive and coherent development, or a gradual and continuous one. Examples of the effective projects are cited below in the form of SWOT analyses, while mentioning the time limits and priorities.

The required projects in the business field in order to realize the defensive strategies				
Project code	Project title	Prerequisite	Priority	Time (Month)
-B-WO	Sending technical staff available in order to participate in the short-term training courses in various fields of geographic information technology inside and outside the country	None	B	Yearly
B-WT-2	Recruitment of specialist in different fields of geographic information technology and IT in the structure of urban GIS	None	A	-
B-WT-3	Providing training courses for various concerned organizations and .agencies relating to geographic information technology	None	A	Yearly

Table 9_The list of examples of the suggested projects in the business field

The required projects in the business field in order to realize the defensive strate The required projects in the services field and applicable systems in order to achieve aggressive, gradual change, and defensive strategies				
Project code	Project title	Prerequisite	Priority	Time (Month)
S-SO-1	Service-oriented system design of urban GIS infrastructure based on the geographic information	None	A	4
S-SO-2	Understanding, needs assessment and informational software design based on the geographic information by the urban informative stands	None	B	6
S-SO-3	Understanding, needs assessment and software design of GIS of urban crisis management	None	B	4
S-SO-4	Understanding, needs assessment and design of the urban automatic vehicle location (AVL)	None	A	4
S-ST-5	Design and implementation of the modeling system of city development	None	A	10
S-ST-6	Design and implementation of the realistic virtual urban three-dimensional system	S-WO-7	B	6
S-WO-7	Creation of the urban geographic database (GeoDB)	None	A	10
S-WO-8	Implementing the Geo Portal of urban management	None	A	8
S-WO-9	Implementing the software of GIS of urban crisis management	S-SO-3	B	6
S-WO-10	Implementing the information software based on geographic information by the informative stands in the city	S-SO-3	A	6
S-WO-11	Implementation of the urban automatic vehicle location (AVL)	S-SO-4	B	6
S-WT-12	Implementation of Geo Portal of city management based on the development software languages supporting Open Source	None	B	6

Table 10_The list of the example suggested projects of services field

The required projects in data field in order to achieve the aggressive, continuous improvement, gradual change, and defensive strategies				
Project code	Project title	Prerequisite	Priority	Time (Month)
D-SO-1	Codification of urban SDI	None	A	8

D-SO-2	Editing the methodology of updating the plans of the basic topography and geographic information of the city	None	A	6
D-SO-3	Editing the methodology of modeling the urban access lines in the area of traffic and analysis of the urban routing network	None	A	5
D-ST-4	Creation and updating the Global Positioning System (GPS) database	None	A	Yearly
D-ST-5	Updating the topography maps and basic urban geographic information	D-SO-2	A	6
D-WO-6	Provision, enrichment and preparation of information on historical, cultural and religious monuments of the city	S-WO-7	B	6
S-WT-7	Collecting information and creating the geographic information database for the installations (water, electricity, gas, telephone)	S-WO-7	B	16

Table 11_ The list of example suggested projects of the data field

The required projects in technology field in order to achieve the aggressive, continuous improvement, and defensive strategies				
Project code	Project title	Prerequisite	Priority	Time (Month)
T-SO-1	Understanding, design and needs assessment of the geographic databases based on Open Source	S-WO-7	B	6
T-SO-2	Understanding, design and needs assessment of Data Warehouse of city management based of geographic information	S-WO-7	B	6
T-ST-3	Optimization and strengthening GIS hardware and software equipment, existing in the urban service organizations	None	A	Yearly
T-WT-4	Implementation and utilization of the geographic databases based on Open Source in the IT/ICT infrastructure of city	T-SO-1	B	7

Table 12_ The list of the example suggested projects of the technology field

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