Chapter 4

Proposal of Information Systems like a Tool for Management Control of Municipal Public Services in Mexico

4.1 Proposal of Information System

The following is the diagram of the proposed information system, analysis of feasibility, technological tools, information security, technical development, information system diagrams and finally the proposed implementation schedule.

Figure 4 *Implementing and integration of the information system.*

Source: Own (2013).

The objectives of each component before starting the development of the information system are:

- The first component, they must analyze the resources that are available, to support basic infrastructure required for the implementation of the information system.
- The second block, it aims to project the life cycle of the system, as well as administrative and operational processes that will be systematize.
- The third component performs the selection of system development tools, programming language, databases, and other technologies for its development.

- Fourth component, it is related to the security of information. This will be to select the service and security mechanism, based on which a detailed analysis is required to protect information.
- Fifth component, it is generate a schedule of activities that include administrative and operational phases, and system development, dates of partial and final releases, with the aim to design and develop appropriate mechanisms to prepare staff.
- Sixth component, It is selects the software development methodology that best suits the needs of the system, ie the initial and projected requirements.
- Last but not least include use case diagrams of the system to locate the actors and procedures that will be involved in the functioning and operation of the information system.

4.2 Feasibility Analysis

According to Kendall & Kendall (2005), the feasibility of the system projects is evaluated in three main ways: operational, technical and economically, with the following characteristics:

1. Technical feasibility
   - Added to the current system
   - Available technology to meet user needs
2. Economic Viability
   - The time of systems analysts
   - Systems cost study

- Cost of employee time in the study
- Estimated of cost of hardware
- Prices of commercial software or software development

3. Operational Viability
   - If the system worked when finished
   - If the system will be used

Technical Feasibility. Much of the identification of resources has to do with the assessment of the technical feasibility. The analyst must find out if can update or enhancing existing technical resources so as to meet the requirements under consideration.

Economic Viability. The basic resources to consider are time analysis and team systems analysis, the cost of conducting a study. Complete systems (including the time that employees will work), the estimated cost of hardware and the estimated cost of commercial software or software development.

Operational Feasibility. The operational viability depends on the human resources available for the project and involves determining whether the system will work and will be used once it is installed.

If users are happy with the current system, have no problems with its handling and typically are not involved in the application of a new system, there will be a strong resistance to the implementation of the new system.

The chances of coming into operation are low. Conversely, if the users themselves have expressed the need for a system that works most of the time in a more efficient and accessible manner, it is more likely that eventually the system requested is used.

4.2.1 Technical Feasibility

Added to the current system at this point it is are considering the creation of an integrated information system, which will support functionalities gradually, the current administrative and operational activities, such as customization for management of public services and the different areas within it. These features are intended for citizens to increase efficiency in the management control of municipal utilities, in addition to providing the job to the administrative and operational municipal authorities.

Technology available to meet the needs, it has the technology (hardware - software) available to meet the needs of users, the advantage you have is, first implementation of this model will gradually, and on the other hand already has the technological requirements minimum for implementation.

In relation to the technological requirements, already has the infrastructure for the implementation of this model, the state government of Mexico, through the Directorate General of the State System of Computing, provides support to the municipalities of the State of Mexico to the attention of portals / web / developments that they request pages.

In this part two infrastructures are required with a strong part, is infrastructure where data, information consultation, and applications (server) and on the other hand will be stored, the portion that consultation (Client), as well as storage infrastructure that contains the information.

According to Tanenbaum (1996), a server is process group cooperation, offering services to users, called clients. The machines of clients and servers run usually in the same area, also a machine server can resolve one or more processes of clients or servers, or combinations of both. The following Table 2, presents, the features packed into this direction, for server machines.

Table 2 *Technological infrastructure of the Directorate General of the State System of Computing, State of Mexico.*

1. Hours of service CEI.
• 9 to 18 hours of Monday to Friday
2. Physical location CEI.
• Located on the street of Cologne Izcalli IPIEM 100, Toluca, State of Mexico CP 50150
3. Equipment available for the care of portals / web / developments requested by municipalities in the State of Mexico.
a. Equipments numbers
• Six
b. Make
DELL
c. Hardware capacities
• 4, 149, 104 kB y 8, 310, 512 kB
d. Network capabilities (local transmission speed (Ethernet) and external (internet)
• FDDI (Internal). FDDI (Fiber Distributed Data Interface) is a set of ANSI and ISO standards for data transmission in computer networks or wide local area network (LAN) via fiber optic cable. Architecture is based on the token ring and allows full duplex communication type. As can supply thousands of users, an FDDI LAN is often used as backbone for wide area network (WAN). Cables copper wire known as CDDI. Ethernet technology to 100 Mbps (100BASE-FX and 100BASE-TX)
• E1 (External). Plot E1 or E1 is a digital transmission format. E1 consists in 31 divisions (time slots) PCM (pulse code modulation) 64k each. E1 equals 2048kb or 2 MB transmission.
e. SITE dimensions (physical measurement of the equipments)
• 20 X 20 meters
e1. Percentage of occupied SITE
• 40%
e2. Percentage of unoccupied SITE
• 60%
4. Estimated lifetime of the equipment.
• Lifetime estimated between 5 and 10 years
5. Human resources administrative and operating of the Service
• Three public services
6. Platforms equipment work
a. Operative system
• Unix
b. Systems manage of data base
• Platforms ORACLE

c. Programation languages

- Java y ASP

d. Internet (Fire fox, Internet Explorer, etc.)

- Internet Explorer y FireFox

e. Local Software (office, open office, etc)

- Microsoft Office

f. Others that considered relevant

- Dreamweaver

Source: MTIA Ubaldo F. Velasco Morales, Assistant director of Policy Informatics, Direction of the State System of computing, 09/07/2012.

The following Table 3 is the minimum requirements that include the addresses of public services in the municipality of Ecatepec de Morelos.

Table 3 *Minimum requirements of Hardware and Software.*

Minimum requirements	
Hardware	Software
Procesador Pentium III o highest, Minimum: 1,0 GHz	Windows XP SP3 / Windows Vista SP2 / Windows SP1
RAM Memory (minimum) 256 KB	SQL 2008 Standar / SQL 2012 Standar
Hard Drive (Minimun) 1 GB	.NET Framework 4.0
Unid CD / DVD	Silverlight 4.0
Network tarjet	Internet Explorer 8.0 o highest. Firefoxver 14.0 o highest
Video tarjet (minimun) 16MB	
Monitor	
Keyboard	
Mouse	

Source: Own (2012).

A way to illustrate the technical feasibility ispresented below in the following Figure 5, the interaction between servers and clients.

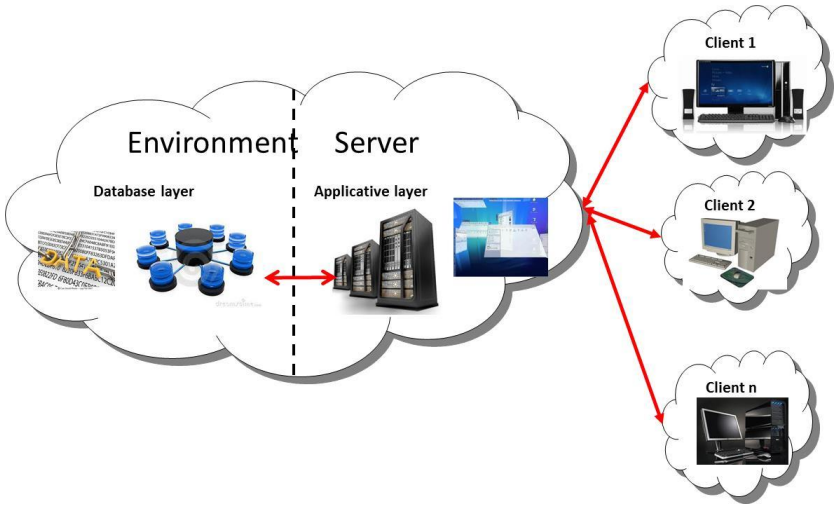

Figure 5 *Ilustration client– server.*

Source: Own (2012), in reference to the definition of Tanenbaum (1996).

Derived from the specifications of the server's computers, and based on storage requirements, it is recommended to extend annually the space storage (Hard Drive), approximately 18.20 GB, derived from the following calculation and model of relational database, indicated in the table 4.

Taking as example the management of public services in the municipality of Ecatepec, note that this proposal is an approximate average, with a margin of error of plus / minus 5%.

Table 4 *Estimate rough of annual increase hard disk.*

Minimum data required by citizen					
Concept	**Data type**	**length**	**Size in bytes**	**Size in KB**	**Size in MB**
name	Varchar	50	100	0.0977	0.0001
phone	Int		4	0.0039	0.0000
street	Varchar	150	300	0.2930	0.0003
neighbourhood	Varchar	80	160	0.1563	0.0002
Location Reference	Varchar	200	400	0.3906	0.0004
Date of application	Datetime		8	0.0078	0.0000
Time of application	Datetime		8	0.0078	0.0000
Type of Service	Varchar	50	100	0.0977	0.0001
holder 01	Varchar	50	100	0.0977	0.0001

Minimum data required by citizen					
age	int		4	0.0039	0.0000
Gender	Char	2	4	0.0039	0.0000
Folio Number	Bigint		8	0.0078	0.0000
Tentative date of service	datetime		8	0.0078	0.0000
Copy of identification (IFE) - format jpg / pdf	Blob		20,480	20.0000	0.0195
Copy of proof of address - format jpg / pdf	Blob		20,480	20.0000	0.0195
Data required by the management of public services					
Name who attended (Citizen Services)	Varchar	50	100	0.0977	0.0001
Channeling Date	Datetime		8	0.0078	0.0000
Department or where it is channeled towards	Varchar	100	200	0.1953	0.0002
Responsible name to where it is channeled	Varchar	50	100	0.0977	0.0001
observations	Varchar	500	1,000	0.9766	0.0010
Data of the response of the Management municipally public services					
Name who attended (Directorate / Department)	Varchar	50	100	0.0977	0.0001
Date of receipt	Datetime		8	0.0078	0.0000
Solution Date / attention	Datetime		8	0.0078	0.0000
Hoursattendance	Datetime		8	0.0078	0.0000
Name of the service received	Varchar	50	100	0.0977	0.0001
Material used					-
Invoices - formatjpg / pdf	Blob		256,000	250.0000	0.2441
Distribution - formatjpg / pdf	Blob		40,960	40.0000	0.0391
Parts - formatjpg / pdf	Blob		40,960	40.0000	0.0391
Cost - formatjpg / pdf	Blob		40,960	40.0000	0.0391
observations	Varchar	500	1,000	0.9766	0.0010
status	booleano		1	0.0010	0.0000
Response data of the management municipally public services					
Folio Number	Varchar	50	100	0.0977	0.0001
Name who attended (Directorate / Department)	Varchar	50	100	0.0977	0.0001
Solution Date / attention	Datetime		8	0.0078	0.0000
observations	Varchar	500	1,000	0.9766	0.0010
General total			424,885	414.9268	0.4052
Averageannualapplications					46,000
Total Annual tentative of hard disk space				In KB	19,086,630.86
				In MB	18,639.29
				In GB	18.20

Source: Own (2012).

If the recommended size of the hard disk is added that they will be making a backup and compression of the information, taking a compression factor of 20%,

since they are data mostly text type, and the rest of compressed images. The increase of the hard disk is suggested that annually will be approximately 14 to 15 GB per year, to reduce space. Another recommendation is to have a capacity of 4 GB to 8 GB Memory RAM for server computers.

4.2.2 Economic Viability

1. Time of the systems analysts. It is with an estimated 2 months between each release phase, the analysis, planning, development, testing and implementation is included. In order to perform the activities in the planned time. This according to the implementation schedule. Taking at least two people in the system development.

2. Economic cost of studying of the systems. Given that this proposal seeks to leverage current resources, that a preliminary analysis of the requirements for the municipality the cost will be zero. Taking into account the resources available to the Directorate General of the State System of Computing.

3. Cost of employee time devoted to study. The costs for employees that will not affect their work, testing and implementation will be made by appointment with management to assign corresponding dates to affect the least possible time.

4. Estimated economic cost of hardware. The hardware cost will be absorbed by the support offered by the Directorate General of the State System of Computing, given it has the infrastructure to service municipal requirements and include the minimum requirements necessary for the implementation of the information system.

4.2.3 Operative Viability

At this stage you must ensure its use, taking into account all possible adverse scenarios, with the aim of preventing and propose solutions.

1. If the system will work when it will install. To ensure that the system will works when installed, it is recommended to test on other computers, in a development environment and then in a production environment for its operation, and ultimately be used by the corresponding areas.

2. The system will be used. Since it is a new system, and comes from an academic research project in which you want to know the results of the goals of functionality and use of the information system, the system is being designed to be used the first two months in their first phase, according to the implementation schedule. Thereby ensuring its use by the municipal authorities and citizens later, likewise stages of review be conducted to verify proper operation.

On the other side are presented in Tables 5 and 6, the objectives to be met with the information system. In the first table 5 is projected as affecting system components in the current processes of care and attention monitoring of municipal utilities. As shown in several advantages for improving management control of these services and this largely by the analysis, in The table 5, the issues affecting corporate objectives, as shown in this are presented, all aimed at improving efficiency in the management control of municipal utilities.

Table 5 *Impact of viability to show how system components affect the process objectives.*

Components evaluated (Indicators)	Accelerating a process		Combination of processes		Reducing errors in data capture		Reduction of Redundant output		Improved Integration (modular - objects)		Improved appearance		Extending functionality	
	CS	PIS	CS	PIS	CS	PIS	CS	PIS	CS	PIS	CS	PIS	CS	PIS
Using the system		✓		✓		✓		✓		✓		✓		✓
Information security of the system						✓						✓		✓
Clarity of information		✓				✓		✓				✓		✓
Ease of information		✓				✓		✓						✓
Sufficiency of information		✓				✓		✓						✓
Availability of information				✓		✓		✓						✓
timeliness of information		✓						✓						✓
Scope of Technology		✓								✓				✓
Technology Training (educational component)		✓		✓		✓		✓				✓		✓
Implementation of indicators (strategic component)		✓		✓				✓						
Organizational restructuring (organizational component)		✓		✓										✓

CS- Current system

PIS -Proposed of information system

Source: own (2012), based on the design recommended by Kendall & Kendall (2005), Analysis and system design [edition six], page. 54.

Table 6 *Impact of the viability of components system to corporate objectives.*

Components evaluated (Indicators)	Competitive strategy		Joint operations with citizens		Support internal operations		Service to client		Employee Morale		Reliability of employees	
	CS	PIS	CS	PIS	CS	PIS	CS	PIS	CS	PIS	CS	PIS
Using the system		✓		✓		✓		✓		✓		✓
Information security of the system		✓				✓		✓		✓		✓
Clarity of information		✓		✓		✓		✓		✓		✓
Ease of information		✓		✓		✓		✓		✓		✓
Sufficiency of information		✓		✓		✓		✓		✓		✓
Availability of information				✓		✓		✓		✓		✓
timeliness of information				✓		✓		✓		✓		✓
Scope of Technology		✓		✓		✓		✓		✓		✓
Technology Training - Academic (educational component)		✓		✓		✓		✓		✓		✓
Implementation of indicators (strategic component)		✓		✓		✓		✓		✓		✓
Organizational restructuring (organizational component)		✓		✓		✓		✓		✓		✓

CS- Current system

PIS -Propouse of information system

Source: own (2012), based on the design recommended by Kendall & Kendall (2005), Analysis and system design [edition six], page. 54.

4.3 Technological Tools

For the development of the information system, regardless of the technology tools that are proposed used, It is very important the analysis, design and planning because are the core of any system, and that from this, you can select any tool technological.

Design layer. At this stage of development of the system, diagrams for understanding the requirements and flows for the operation of the municipal utilities processes are generated.

They presented below, some proposals for the technological development tools to the information system. Among these are the tools that have the Directorate General of the State System of Information:

1. Modeling UML

   - Enterprise Architect 2.4.1 Commercial Version for developing various charts, including process diagrams and use case diagrams.
   - Star UML. Free version for the preparation of various diagrams, including process diagrams and use case diagrams.
   - Microsoft Visio 2010. Commercial version of Microsoft suite for the preparation of various diagrams, including process diagrams and use case diagrams.

2. Database Modeling

   - Erwing Data Modeler 7.3. Commercial tool that allows modeling database, also can generate the source code in various platforms Management Systems Databases.

- Microsoft Visio 2010. Commercial tool that allows modeling database at design level.

3. Application layer

- Java. Programming language, which its main advantage is cross-platform, meaning it can run on different operating systems, and completely free.

- Visual studio 2012. Language commercial programming of Family Microsoft programs, which allows a design and development easy.

4. Database layer

- Oracle 11g. Database Manager, which enabled the development and the administration robust of the database system.

- SQL server 2012. Manager database, allowing processing, database management system medium and robust data.

4.4 Information Security

This section is important because it is necessary the regulatory of the services and information security mechanisms.

In the normative part, according to the Federal Law on protection of personal data held by individuals (2012), Chapter I, Article III, Section VI. It indicates that the information sensitive personal data are: Personal data which affect the most intimate sphere of the proprietor, or whose misuse can lead to discrimination or pose a serious risk.

The information is considered sensitive as race or ethnicity, health status, present and future genetic information, religious, philosophical and moral beliefs, union membership, political views, and sexual preference.

In the case of this proposal, the following information will be protected:

- System User
- Password
- Name of the citizen
- Street
- Neighbourhood
- Telephone
- Gender

On the operational side, according to Daltabuit, Hernandez, Mallen, & Vázquez (2007) that they speaking about the informatic, like information management, which ranges from your computer, systematization, creation, storage and transmission. These processes and requirements appear along with our species and to some extent characterized. They are long before the advent of computer processes, however, since the middle of this century has undergone a radical transformation due to the invention and widespread use of computers.

The information can be in four states:

- Acquisition
- Creation
- Storage
- Transmition

And in each of these states has four security properties:

- Confidentiality
- Integrity
- Authenticity
- Availability

For the feedback loop is constructive, the information should be safe-Services and security mechanisms (ISO 7498 - 2) are the next:

Table 7 *Services and security mechanisms.*

Services	mechanisms
Confidentiality	Encryption (Symmetric and asymmetric)
Integrity	Hash, Symmetric Encryption
Authenticity	Digital signature, hash, encryption (Symmetric and Asymmetric)
non-repudiation	Digital signature
Access control	Models of access control

Source: Daltabuit, Hernandez, Mallen, & V ázquez (2007), the information security.

For purposes of this paper, the security of information taking into consideration the following services and security methods will be addressed.

Information to protect:

- System User
- Password
- Name of the citizen
- Street
- Neighbourhood
- Telephone
- Gender

Cryptographic Protocol Proposal:

1. Objective. Confidentiality / Integrity
2. Assumption.
   - Each user will keep your private key
   - It is your responsibility not to compromise the private key
   - The public and private keys will be generated by a regulatory body; in this case it is proposed to generate the Directorate General of the State System of Computing. Le delivery of private keys is proposed, physically
3. Proposed algorithms
   - Asymmetric: RSA
   - Functions Hash; SHA – 1 / SHA – 2
4. Mechanism of information Security to implement in the information system
   - Confidentiality: Asymmetric Encryption
   - Integrity: Hash Functions
   - Access control: Multilevel Bell-La Padula / Based on roles

Is show the Equations of the security services to implement, for purposes of the equation, will be exercise to the year with data to protect, assuming it is the same procedure for the other data.

A: Generates messages:

1. Ma1. System user.
2. Mp. Password.
3. Mn. Name citizen.
4. Mca. Street.
5. Mco. Neighbourhood.
6. Mt. Telephone.
7. Mg. Gender.

- A: Generates messages Ma1.
- A: EK_b^{pub} (Ma1) = CMa1
- A: H (Ma1) = VMa1
- A: A → B: CMa1, VMa1
- B: DK_b^{priv} (CMa1) = Ma1
- B: H (Ma1) = VMa2
- B: Si VMa2 = VMa1, ensuresintegrity

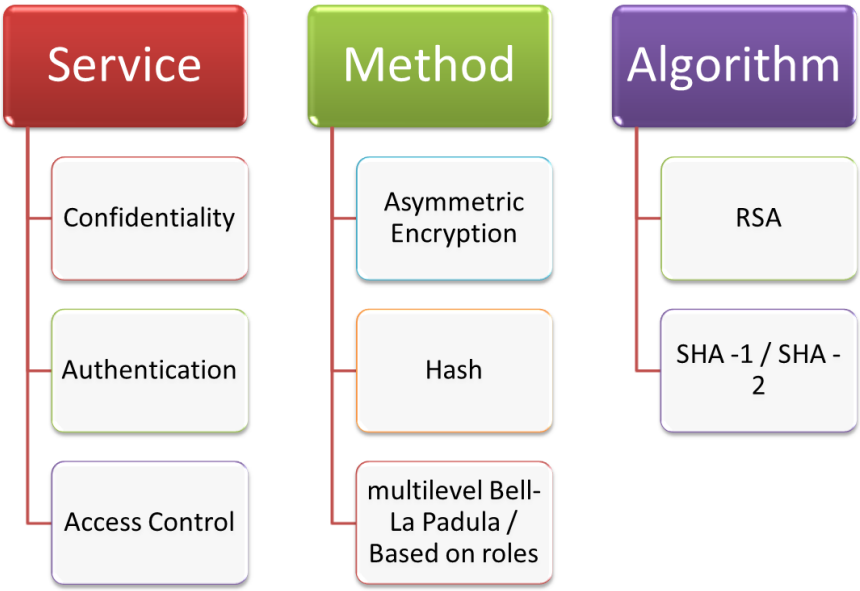

Figure 6 *Diagram of the security services.*

Source: Own (2012).

Explanation of the equation of the Figure 6:

1. Entity A generates the message “UsrAdmin”
2. Entity A, by Asymmetric algorithm RSA, the message is encrypted “UsrAdmin”, with the public key of entity B, obtaining results in a message encryption, for example “3% & TfGn” = CMa1
3. Entity A,fgenerates the Hash of the message “UsrAdmin”, with SHA1 function, resulting in a hash, for example “%4#4$%tgF32” = VMa1
4. Entity A, send the messages CMa1 y VMa1

5. Entity B, by Asymmetric algorithm RSA, decrypts the message "3% & TfGn", with the private key of the entity B, resulting in a decoded message, for example "3% & UsrAdmin" = Ma1

6. Entity B, generates the Hash of the message "UsrAdmin", con la function SHA1, with SHA1 function, resulting in a hash, for example "%4#4$%tgF32" = VMa2

7. Finally the entity B, compares the results of VMa1 y VMa2, if they are equal it means that the integrity is guaranteed.

Regarding service access control method of Bell and pendula, this model is called the Bell - Pendula as it was developed by DE Bell and LJ La pendula in 1976. Also, formalizes multilevel security policy, is classifies the information into four levels. Not classified, confidential, secret and top secret. The information is described in terms of compartments. This is a policy in which people can have access to information that is authorized, with the aim of controlling the flow of information, this model also helps in building security systems that can be verified.

4.5 Development Techniques

Given the nature the research technological methodology used for the development is oriented objects and lifecycle object-oriented. Why is selected this methodology? Because the object-oriented methodology is selected, Dante says Contone (2006), the object-oriented methodology, weapon components based modules, ie each component is independent of the other, this allows the code to be reusable. Derived from the above, be created various blocks to develop the system, which will be linked between them (feedback), so that they have a common purpose. We present a comparison between different methods.

Table 8 *Comparison between general methodologies.*

General methodologies	Advantage	disadvantage
Structured methodology	Decomposes in small individual modules It is easier to solve small problems Division of process according to complexity modules create based in components Each component is independent of other The code is reusable by another process Easy to maintain	You cannot reuse code Is complex with increasing in the number of modules
Object Oriented Methodology	Division of Process according to its complexity	Is complex with increasing in the number of objects

Source: Dante Contone (2006), Cuadro comparativo de metodolog ás de programaci ón, Implementaci ón y debugging, Zigzag, Chile, page. 20.

The methodology selected for the development of this project is the lifecycle object-oriented. According to Dante (2006), this methodology Lifecycle Oriented to objects, each function is considered an object, which are represented by a set of properties, which are called attributes, on the other hand, the behavior will these objects, are called methods. This is proposed by the different processes are used as objects with their own characteristics. It is shown to next, a comparison between the different methods in order to justify the use of the selected methodology.

Table 9 *Detailed comparison between methodologies.*

Lifecycle Methodologies	Advantages	Disadvantages
Linear lifecycle	It decomposes Overall activity in separate steps Easy divide tasks and provide time Ease of management and administration Iterations allowed	No acepta retroalimentaci ón entre etapas del proceso It is very expensive to return a previous step to detect a fault Modelor ígido, poco flexible
lifecycle in pure waterfall	It has a simple planning does not require resource highly skilled	There are many restrictions for application If mistakes have been made and are not detected in the following step or process, is expensive and difficult to return to the problem The results cannot be displayed until the final stage

Lifecycle Methodologies	Advantages	Disadvantages
	iterations allowed	Inflexible and rigid model
	It has a simple planning	There are many restrictions for application
Lifecycle in V	does not require resource highly skilled	If mistakes have been made and are not detected in the following step or process, is expensive and difficult to return to the problem
	Two stages of feedback are added between analysis and maintenance and between design and debugging	The results cannot be displayed until the final stage
	Quality wins in the final product	It is difficult to manage the start and end of each stage
	iterations allowed	The results cannot be displayed until the final stage
Lifecycle type “Sashi”	It has a simple planning	
	does not require resource highly skilled	If there are communication problems generate inconsistencies in the project
	No detailed documentation is required	
	Reduce the risk that arises between user needs and the final product	It is difficult to manage the start and end of each stage
	Supports iterations, which are presented in each user for improvement	The results can not be displayed until the final stage
Iterative cyclelife		
	It has a simple planning	If there are communication problems generate inconsistencies in the project in each iteration
	It is the only suitable for developments that not known the priori its specifications	It is highly expensive
Lifecycle for prototypes	Facilitates transition between initial and final requirements	Difficult for the temporary administration
	Accepted change of requirements at any time	expensive in time
Evolutionary lifecycle	requirements allows of iteration cycles, development and evaluation	Costly in resources and money
	It is used when most of the initial requirements is unknown	Its maintenance is expensive and difficult to administer
	It is constructed of modules that cover different functions	It is susceptible to errors and confusions arising from the potential user changes in any part of the project
Incremental lifecycle	Gradually increases the ability of software	Cost in resources and money
	Is easy to change user requirements	Its maintenance is expensive and difficult to administer
	Is not necessary to have all the	

Lifecycle Methodologies	Advantages	Disadvantages
Lifecycle Object Oriented	requirements at the project start Each functionality requested by the user is regarded as an object It is a flexible model Supports better the uncertainty of user requirements Helps reduce the complexity of the problem, allowing continuous improvement project It can be used in any programation language It is a versatile model	It is cost in time in each development, depending on the magnitude of the project. It requires staff with knowledge

Source: Dante Contone (2006), Comparison table of programming methodologies, implementation and debugging, Zigzag, Chile. Page 21 – 34.

4.6 Diagrams of the Information System

In this part three types of diagrams, on the one hand the use case diagram, diagram relational database and finally the diagram of star database for mining data.

4.6.1 Diagram of Use Cases

Is part of the (Unified Modeling Language) UML diagrams, which according Scotte & Fowler (1999), is a modeling language which allows notation (mainly graphical) of the methods they use to express designs, i.e., is the unified UML diagram or notation (UML) used to specify, visualize and document models of software systems, object-oriented language.

UML is not a development method, which means it does not serve to determine what to do first or how to design the system, but it helps you to visualize your design and make it more accessible to others. The UML elements

are used to create diagrams, representing somewhere or point of view of the system. There are different types of UML diagrams as:

- *Diagram of use case*. Consist in show actors (other system users), use cases (situations that occur when using the system) and their relationships. A use case is a description of the sequence of interactions that occur between an actor and the system, when the actor uses the system to perform a specific task.
- *Class diagram*. Shows the classes and relationships between them.
- *Sequence diagram*. Displays objects and multiple relationships between them.
- *Collaboration diagram*. Displays objects and their relationships, highlighting the objects participating in the exchange of messages.
- *State diagram*. Shows states, state changes and events in an object or part of the system.
- *Activity diagram*. Sample activities and changes from one activity to another with the events that occur in certain parts of the system.
- *Component diagram*. Shows the components of higher level programming.
- *Deployment diagram*. Sample instances of the components and their relationships.
- *Entity relationship diagram*. Show the data, relationships and constraints between them.

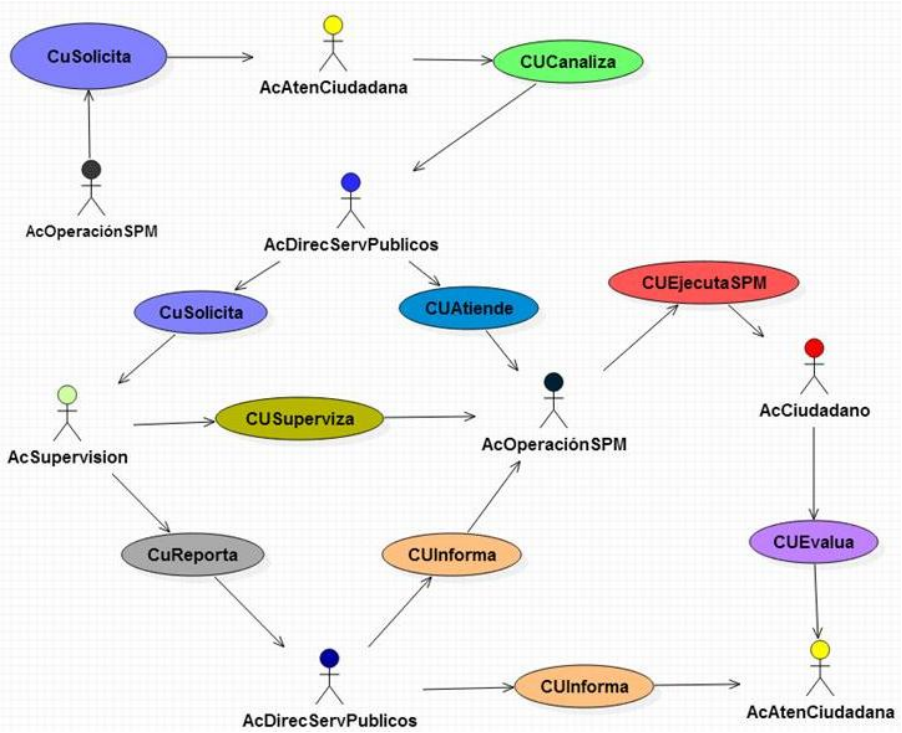

Figure 7 *General diagram of case of use of municipal public services.*

Source: Own (2012).

For purposes of this proposal will be presented in general terms the use case diagram that illustrates comprehensively the procedure for applying, monitoring and treatment of municipal utilities.

This is a general diagram proposed of use cases, for the Application, Monitoring and attention of the municipal public service, according to needs and future projections, the diagram general could propose specific use cases derived from each use case presented, as required.

Explain of the diagram of use cases.

1. Citizen requests a municipal public services (MPS)
2. The management of municipally public service receives and redirects the request to the municipal utilities.
3. Once the request is take by the management of municipal utilities, It will do the following:
   - Requests to supervisor that monitoring the service (MPS).
   - He asks the operational area that attends the municipality public service (MPS).
4. The area of operation of MPS executes the public services that citizens request.
5. The area of operation of MPS informs of the public services management the details of the service request.
6. The area of monitoring gives the reports about service details to the management of public services.
7. The management of utility services, detailed the information requested by the citizen.
8. The citizen evaluates the provision of service you received and informs to the citizen service area in order to save the report.

Actors

1. Ac Ciudadano. Citizen
2. Ac Aten Ciudadana. Area for citizen

3. Ac Direc Serv Públicos. Management of municipally public services
4. Ac Supervision. Monitoring area
5. Ac Operación SPM. Operation area of the municipally public services

Use cases

1. Cu Solicita. Request
2. CU Canaliza. Redirect
3. CU Atiende. Attend
4. CU Superviza. Monitoring
5. Cu Reporta. Report
6. CU Informa. Inform
7. CU Ejecuta SPM. Execute the municipal public services requested
8. CU Evalua. Evaluates the service received

4.6.2 RelationalDatabaseDiagram

According to Date (2001), a database system is a computerized system for keeping records. May consider the database itself as a kind of electronic file cabinet; ie, it is a container for a collection of computerized data files. Furthermore, the systems relational databases, according Silberschatz & Korth (2002), are relational systems based on a formal basis or theory, called the relational data model:

1. Structural aspect: The user perceives the information of the database as tables.

2. Aspect of integrity: These tables satisfy certain integrity constraints.

3. Aspect of handling: The operators available to the user to manipulate these tables.

In particular, three of these operators are important: restrict, project and join (the latter operator is also known as combine or gather). Based on these operations, are presented below, first the general statement from the natural process of the application, monitoring and care of a public service, on the other hand the diagram relational database. Starting from the statement that is generated in the use case diagram we have the following model.

Enunciated: The citizen requests a municipally public service (MPS), to the management of citizen service, which receives and channels the request to the municipal utilities, after, the management of municipally public service, does the following: Request to the supervision a monitoring of service that will be held by the operational area of MPS. Subsequently asks the operational area the application of MPS attend the service. Then, the area of operation of MPS executes the public services of citizens. This in turn informs the details of the service request. Once done, the area of monitoring reports requested service details to the management of public services, which reports on the services requested by citizens and executed by said management. Finally the citizen evaluates the provision of service you received and informs the citizen service area and report to save the report. Derived of this enunciated, the proposed of model database entity - relation is presented below.

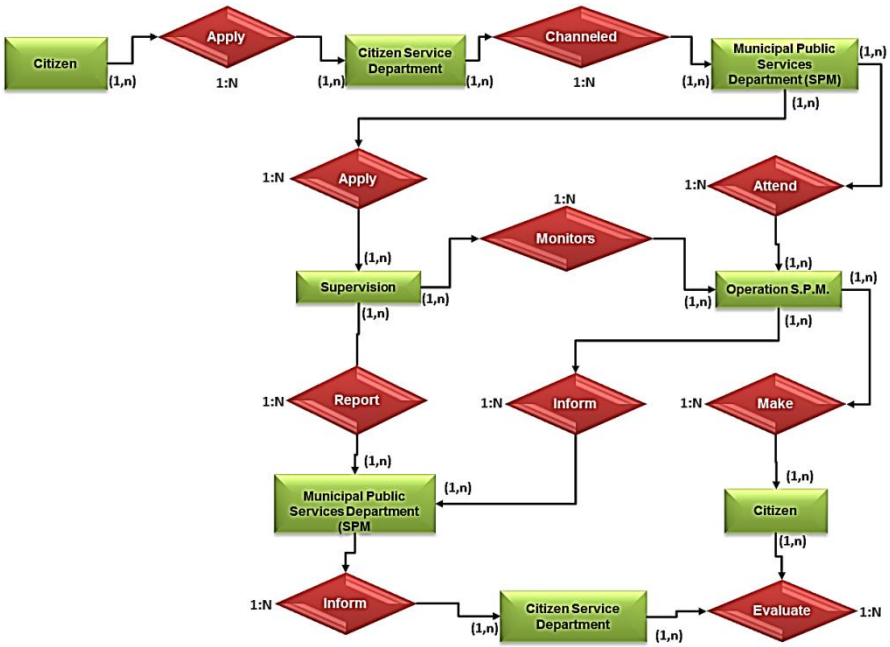

Figure 8 *Modelentity– relation.*

Source: Own (2012).

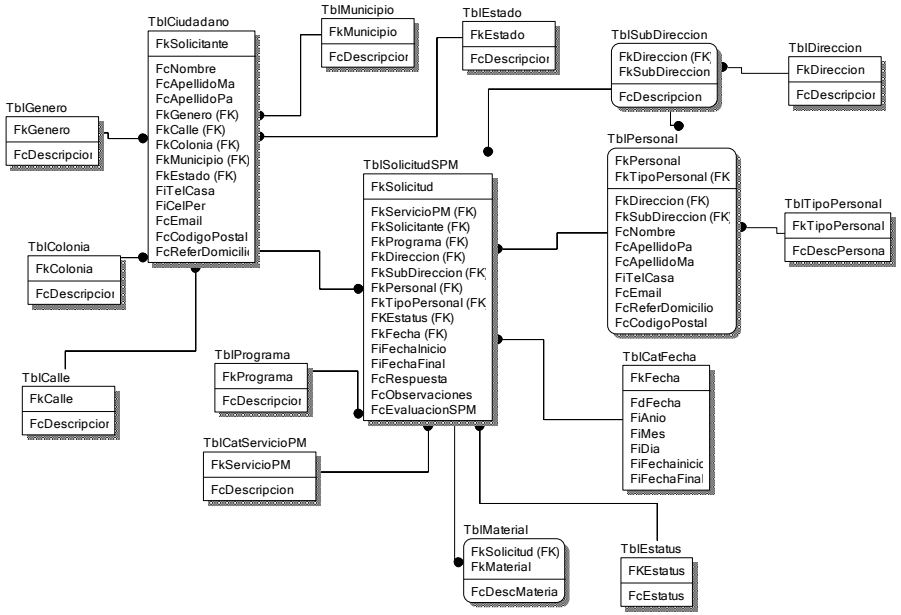

Figure 9 *Relational model.*

Source: Own (2012).

Note that this is a general diagram database, according to needs and future projections.

Annexed is the following proposal, of sub model to include access control roles which is part of the security services.

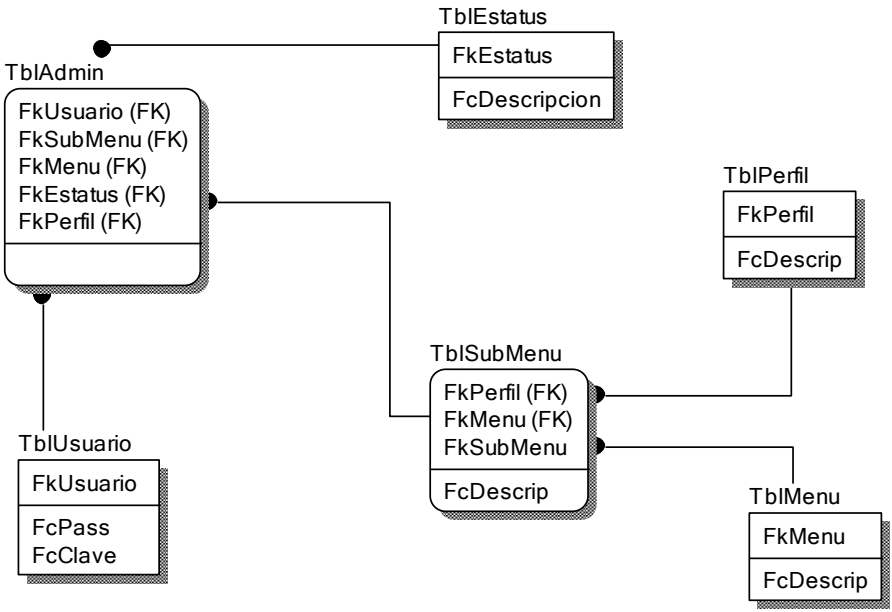

Figure 10 *Subdiagramto the Access control.*

Source: Own (2012).

4.6.3 Diagram of Database of Star for the Data Mining

According to Kimball et al (2008), data mining is only one step of statistics (with the support of artificial intelligence, which has collaborated with the generation of new techniques); however, is the appearance of new storage systems (Data Warehouse) that allows data mining reality. In addition to talking about data mining, must necessarily speak of Data warehouse.

For which there are different methodologies, such as Inmon methodology (2002) and Kimball et al (2008). Both methods are recommended, in the case of the proposed following by Kimball methodology, which is based on the Business Dimensional Lifecycle.

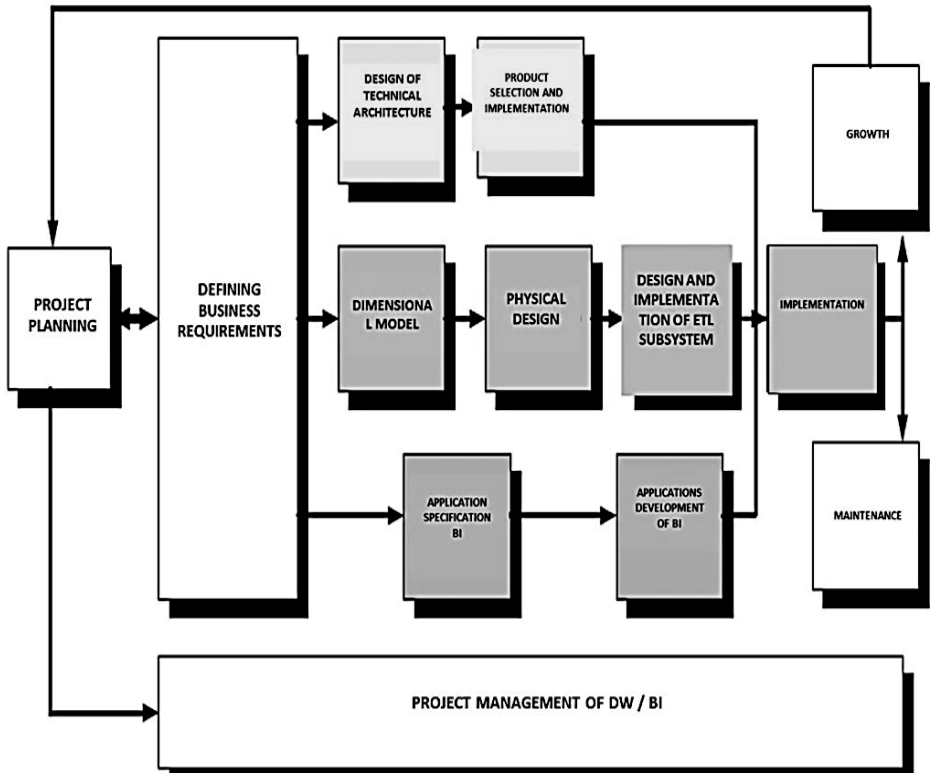

Figure 11 *Business Dimensional Lifecycle.*

Source: Kimball et al (2008), Business Dimensional Lifecycle.

- Project Planning
- Defining business requirements
- Dimensional model
- Physical design
- Physical design
- Design of technical architecture

- Product Selection and Implementation
- Application Specification for End Users
- Developing Applications for End Users
- Implementation
- Maintenance and growth
- Project management

Of the Kimball steps for this project, have the following:

1. The implementation is proposed according to the schedule.
2. As a definition of requirement you have, on the one hand, the research is detailed in the diagrams of the information system, including the statement of requirement, in generally.
3. It is the mapping of the entity relationship model, have a performed similarly to the diagrams of databases included in the project.
4. Is included the Model relational database, based on the field research and the relational modeling.
5. This section in is recommended to insert the data, depending on the correct table. Respecting the integrity of data.
6. Already has defined the technical architecture, previously defined in the feasibility analysis.
7. Using OLAP tools, included in the software recommended about SQL server 2012 is recommended.

8 & 9. The reporting application development is recommended depending on the needs in this project, derived from the use case diagrams, database and star diagram for generating data cubes.

10. The implementation of this procedure is recommended at the end of the implementation of the system according to the implementation schedule.

11. The maintenance and growth. This is recommended to include in the maintenance of the information system.

12. Regarding project management is important determine the extent of this type of methodologies with respect to the need, as it is not only implement tools by fashion but because they really is need, and also define that part of these tools will be useful in the main objective.

Hence in the proposal, is begin by the part of data mining, data warehouse, data cubes is proposed start knowing the details of requests made, shown the star diagram for cube creation from relational diagram.

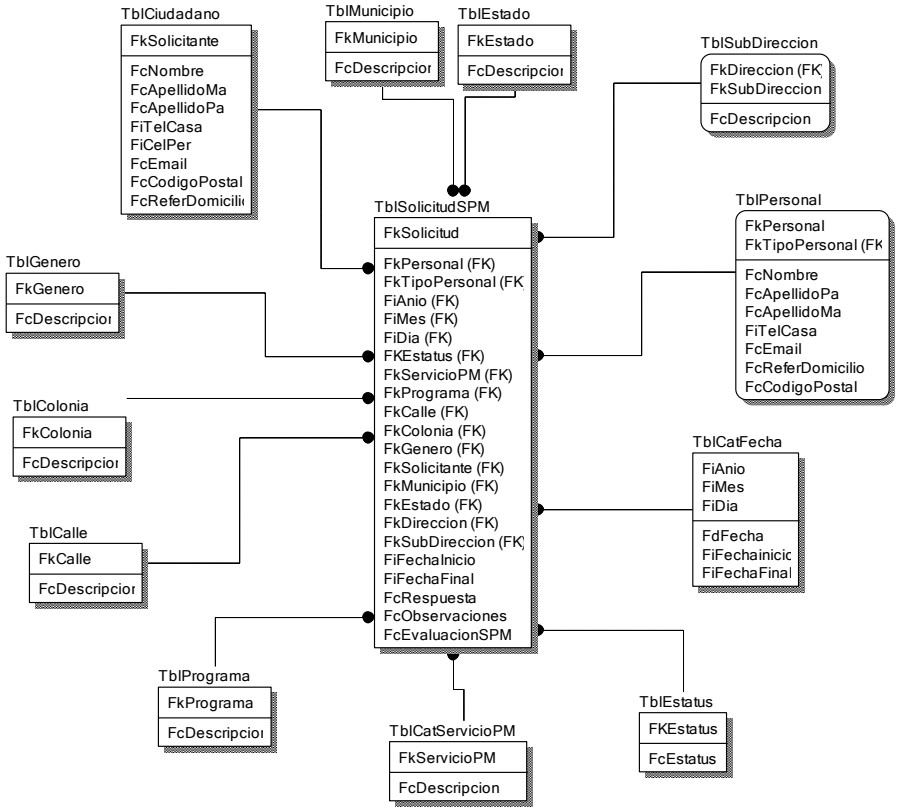

Figure 12 *Star diagram.*

Source: Own (2012).

Note that this model and its tables are fed information of the relational model.

Fact table.

TblSolicitudSPM

Dimension table.

TblCalle, TblCatFecha, TblCatServicioPM, TblCiudadano, TblColonia, TblEstado, TblEstatus, TblGenero, TblMunicipio, TblPersonal, TblPrograma, TblSubDireccion.

It is a diagram star general, according to needs and future projections, is recommended that add more models and designs as required.

4.7 Implementation Schedule

The overall implementation schedule proposed is based on the stages of the methodology of Life Cycle, oriented to goals, according to Dante (2006). This requires conceptualizing each, like are: Stages of Life Cycle methodology Facing Targets

1. Planning.
    - *Expression of needs*. Generate a document in which the requirements and needs
    - *Planning*. Generated a detailed approach to guide project management, temporal and economically.
2. Research.
    - *Analysis*. determined the elements involved in developing the system like structure, relations and functions
    - *Design*. Define to detail the entities and relationships of database.
3. Specification. Requirements are formalized.

4. Implementation. Algorithms and data structures are encoded in the corresponding programming language and database manager.

   - *Debuggin*. Revised and starts the system on non-production environment to ensure that the system not contains design or coding errors.

   - *Validation*. It is verified that the developed system meets the requirements requested.

   - *Start of production.* Presented is delivers the project to the client, previously knowing its functionality.

5. Review. This stage is also called maintenance in which you are given tracking to system with the aim of correcting any error or extend its functionality.

Table 10 *Schedule of activities of the stages of objectives oriented Lifecycle in relation to research.*

Activity	Start date	Finish date	Expected goal	Unit of measure	opening remarks
Planning					
Expression needs					
Verbal meetings with the director (s) of the Municipal Utility directions, to explain the project	January 2011	January 2011	Authorization for surveys	Surveys	There is interest in supporting field research (surveys) by the directors.
Delivery of letters for the formal approval by the directors of MPS for the implementation of field research	June 2011	June 2011	Receive the document and authorize surveys	Deliver letters	authorized to verbally the conducting surveys
Request letter to confirm the authorization of the application of field research	June 2011	June 2011	obtain the document with the authorization of surveys	documents received	The authorization was received by the office of the managing of municipality.

Continuable 10.

Planning				
Generating of results of field research	September 2011	September 2011	Generate graphs of the results of the field research	Results section
Analysis of results	December 2011	December 2011	Analyze the results of the congruence matrix of the research	Analyze dimensions of research
Identifying needs on based on the results of field research	February 2012	February 2012	Identify and justify based on the analysis, the need for which the development of the information system was based	Identification of the general need of the research.
Analysis of viability	April – May 2012	April – May 2012	Determine the minimum requirements for the implementation of the project	Assurance prerequisites

Continuable 10.

Research					
Analysis					
Description of the development based on the needs identified	June 2012	June2012	Clearly identify the need for the project	Identificación	Generation of proposals for the technology component
Detailed generation of the tools to use in developing	June2012	June2012	To Have clearly identified the development tools used	Development tools to use	Sucess
Select type of data encryption and specify its use in the project	June2012	June2012	Determine an encryption method to use in the project, in addition to locating usage.	Security service to use	Sucess
Compilación de los formatos de los Servicios Públicos Municipales	July 2011	July 2011	To collect the formats to use by citizen requesting a municipal public service	Formats	Sucess
Documentation of the existing system.	July 2011 - October 2012	July 2011 - October 2012	Detailed review of the information system that is used today for the care and monitoring of municipal utilities.	Review	There is no information system.
Detection of strengths and weaknesses of the existing system.	July 2011 - October 2012	July 2011 - October 2012	Generation of strengths and weaknesses of the current system. There is no information system	comparative	There is no information system.

Design					
Modeling of use case of the project	July 2012	July 2012	Create a general model of use case in the project	minimum a general model of use case in the project	Success
Recommendation of encryption and decryption of data	July 2012	July 2012	Selecting a method of data encryption	Data Encryption Algorithm	Success
Profiling based on their function (access control)	15 Days	15 days	generation of batabase model for access control	Access control	Recommend

Continuable 10.

Design of relational database	June 2012	June2012	Design of relational database of the project	design of relational database of the project
Specification				
Feedback from the requirement, need, analysis and design	September 2012	September 2012	Getting consistency points between the need, the analysis and design made to ensure the objective	analysis with the points resulting from the feedback
Proposal of relational database	September 2012	September 2012	Generation relational database using the standard SQL server manager 2012 for educational and research purposes	Relational database
Development of the information system	4 Month	4 Moth	Development of the information system, based on the tools used by the Directorate General of the State System of Computer	Information system

Continuable 10.

Specification (Developments in parallel - total 4 Months)		
Development of the database layer (Development, testing and production), SQL server 2012.	2 Months	Production start and data modeling, inserting records, creating stored procedures for conducting transactions required in the project, including development, testing and commissioning of the entire database layer.
Development of the Applicative layer (Development, testing and production), Java / ASP	2 Months	Start of production of applicative layer, creating modules, menus, interaction with the database layer, and other objects - external, including development, testing and putting into production of the applicative layer.
Creating User Profiles (Roles)	15 Days	Development and testing of user profiles, including to all system users
Creating indicators (strategic component) within the information system	25 Days	Development and testing of indicators for the strategic component
Development of the design of	15 Days	Production start design applicative layer, color, size,

Applicative layer (front) (Development, testing and production)		background and other visual designs for the end user of the system.
Creating and testing services and methods of information security	1 ½ Month	Ensure proper functioning of the cryptographic protocol, services and methods.
Development, testing and interaction between all layers immersed including connectivity tests, and response times.	15 Days	Ensure the functioning of the system in the production environment.
Specification (Developments in testing and production - Total 1 Month)		
Development, testing and interaction between all layers immersed including connectivity tests, and response times.	15 Days	Ensure the functioning of the system in the production environment.
Final Testing, production and interaction between all layers immersed including connectivity tests and response times.	15 Days	Ensure the functioning of the system in the production environment.

It is important to note that development environments, testing and production should have similar environments, both physical and logical, to ensure as much as possible at each stage in the end room (productive).

Continuable 10.

Implementation (Dates in parallel)					
Debuggin					
Review of system functionality for blocks / objects (development environment) to detect and correct errors	3 Months	3 Months	Ensure the system functionality based on the need found in field research	Review of all system blocks	Recommend
Completion of the development and review of their functionality blocks / objects (development environment)	3 Months	3 Months	Completion of development in non-production environment.	Completion of project development environment	Recommend
Validation					
Verification of blocks / objects to ensure that the system meets the needs encountered in research	15 - 25 Days	15 – 25 Days	Ensure of the system functionality.	Review of the system functionality	Recommend

At this stage, it is proposed to have the system completed in at most 4 months; the following proposal is put into production, for the use of the information system by administrative areas

Continuable 10.

Start of production	Time to implement 100%	Description
Use of the information system (Phase 1/4)	2 Months	First phase The first area that will make use of the system is the management of Citizen Services
Use of the information system (Phase 2/4)	2 Months	Second phase, it is released the information system to other management of municipal public services
Use of the information system (Phase 3/4)	2 Months	Third phase is released to the citizens of the municipality
Assessment and release, maintenance post		
Use and feedback of the information system (Phase 4/4)	2 Months	Fourth phase. is performed the system analysis and feedback

In total of the time to the development is proposed to be 4 months to develop the system and 6 months for the inclusion of this in the administrative areas and the citizen (2 of these months are part of the testing and production release system), for implementation, ie about 8 months for the full integration of the information system.

Continuable 10.

Review	Description
Review of results obtained by the system, and observations of operator (Feedback)	On an ongoing basis, every month is recommended
Performing backups	It is recommended that backups and compression of all information would every year; this information will be purified from the information system. When you require historical information, can be made to the system requesting reinstatement of backups.
Generating reports, using data mining techniques	After ensuring the functionality of the information system, it is recommended to use data mining techniques to take advantage of that information in databases to generate strategic information in the decision making.
Maintenance	Maintaining the system is an essential part, since not only is required when a problem occurs, the maintenance will also serve to make any improvements the system, to evolve in this functionality. Such maintenance is suggested that each month.

Source: Own (2012).

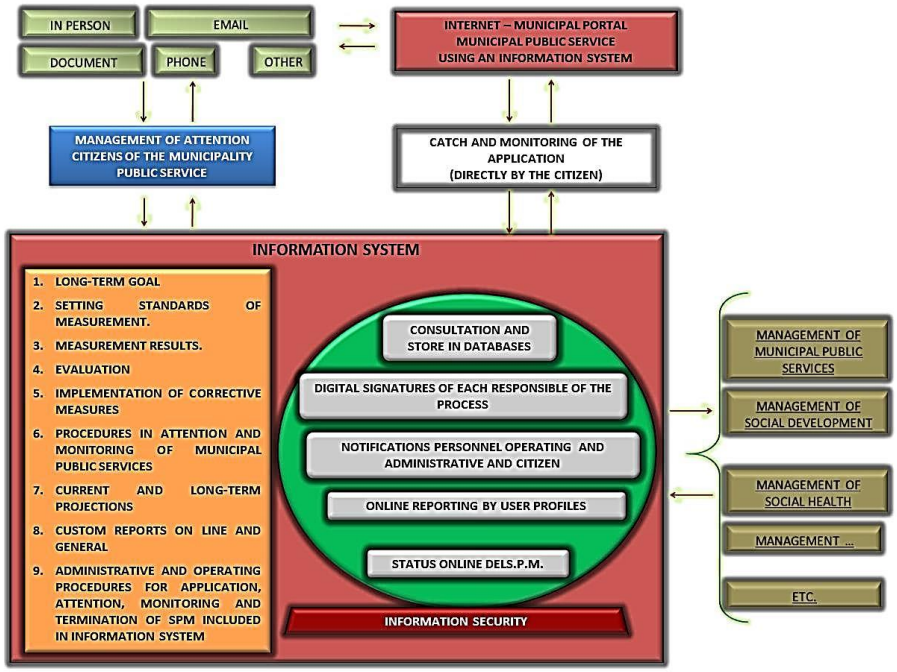

Figure 13 *Proposed diagram of an Information System for Management Control of Municipal Public Services in Mexico.*

Source: Own (2012), Based in management control processes by INAP (1986), scorecard (Kaplan, Norton (2002), manuals of procedures municipal governments, observations in field research. Experiences of Information Systems for management control of the municipal utilities in municipalities investigated.