TS02I: Spatial Information Applications-II

Designing a Spatial Database to Facilitate Road Maintenance Tasks

تصميم قاعدة بيانات مكانية لتسهيل مهام صيانة الطرق

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Designing a Spatial Database to Facilitate Road Maintenance Tasks

- ✓ Introduction
- ✓ Designing the Relational Database for Road Maintenance
- ✓ Building the Spatial Database
- ✓ Spatial Data Connection to Relational Database
- ✓ Results and Conclusions
- ✓ Recommendations

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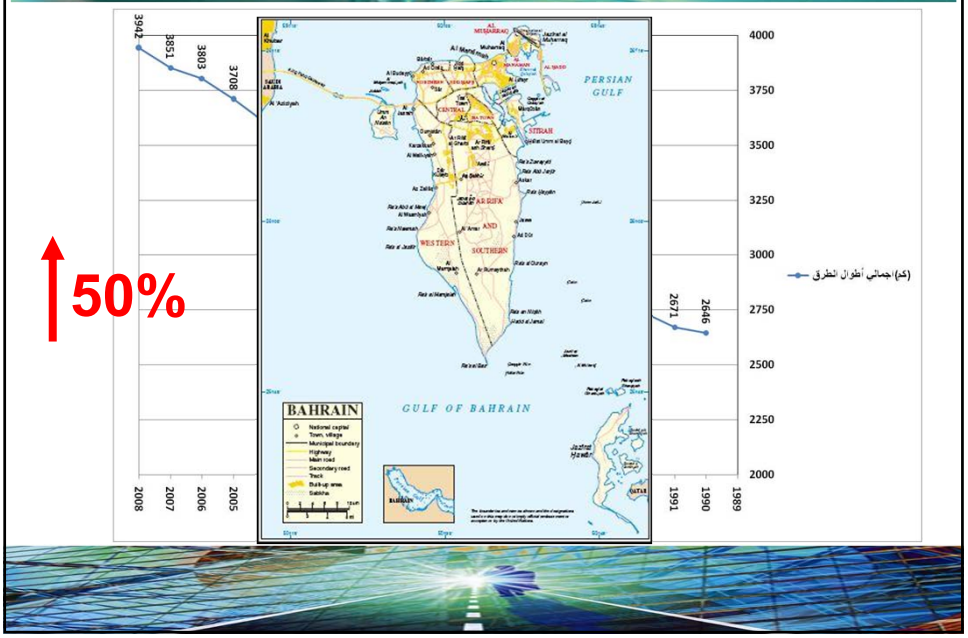
Total Roads Length in Bahrain

Introduction



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The reinstatement tasks

Introduction

- The reinstatement tasks deal with the fixation of all types of damage on the paved roads, which may be caused by:
  - a settle down in the paving material (such as asphalt or interlock),
  - leakage in the underground services,
  - other factors like the rain.

✓The office work to finish the fixing of the task is approximately 3 working days

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Significance of the Study

Introduction

- ✓ **The Bahrain roads network (BRN) cover the majority of the lands in the kingdom, the length of the network is more than (3942 Km length).**
  - The study is only about one of the maintenance tasks for the surfaced roads, which is the reinstatement tasks,
- ✓ **This study was designed to facilitate the following actions:**
  - Reduce time & efforts of the roads maintenance inspectors, by linking the reinstatement jobs with their locations.
  - Reduce the paper work for the Road maintenance tasks.

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Study Area (Kingdom of Bahrain)

Introduction

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Objectives of the Study

Introduction

- Design a spatial database to **connect each job with a specific location** on the field, which will reduce the time for storing and retrieving the reinstatement tasks.
- Build a **pilot spatial database** for the reinstatement jobs using **the GIS techniques**. (Small area – Isa Town).

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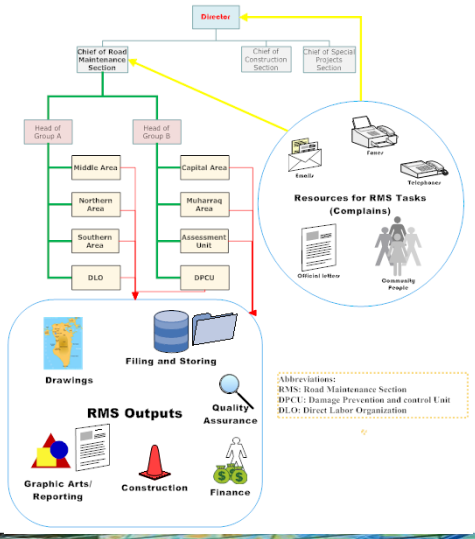
Current Situation of RMS (Reinstatement Tasks)

Database Design



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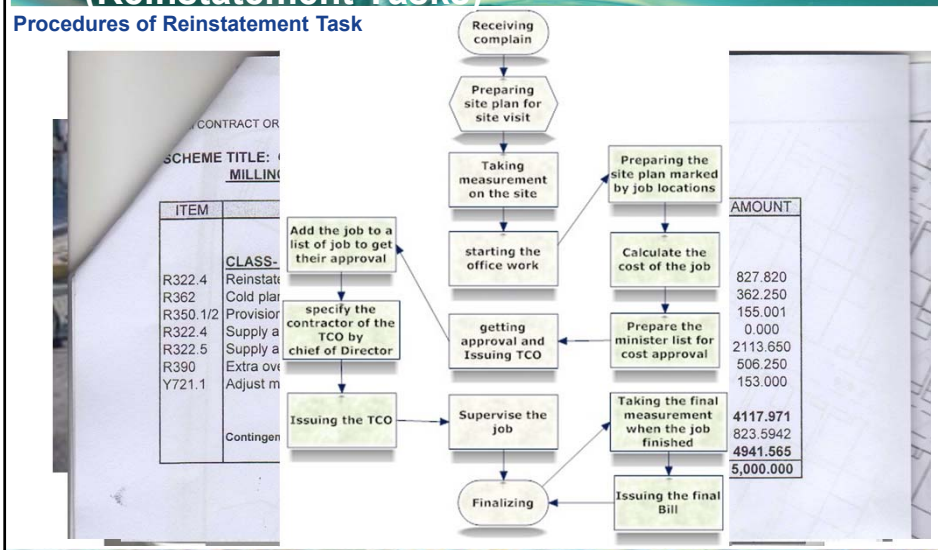
Current Situation of RMS (Reinstatement Tasks)

Database Design

Procedures of Reinstatement Task



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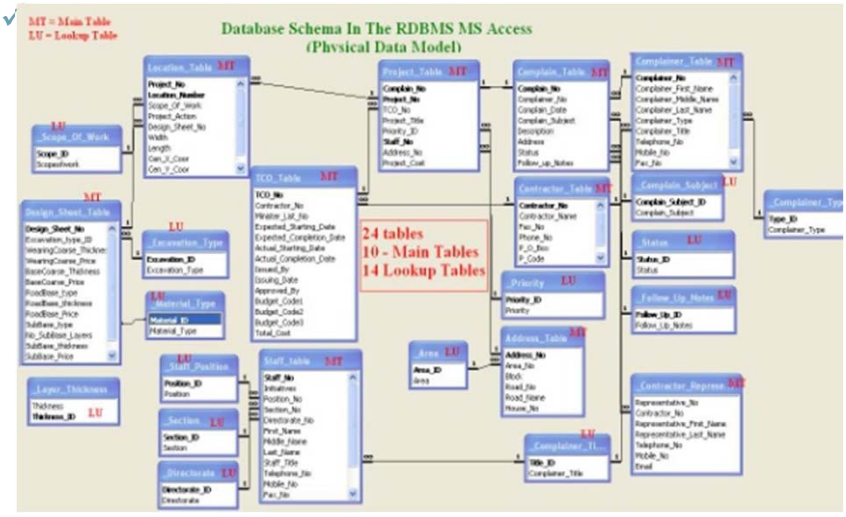
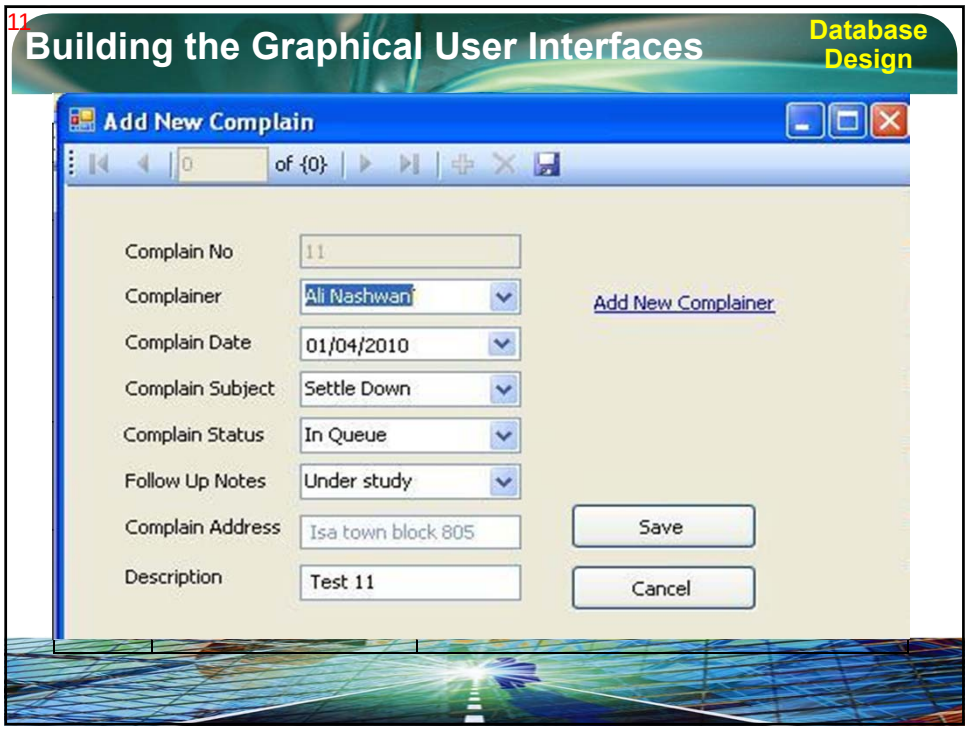
Design the Relational Data model

Database Design

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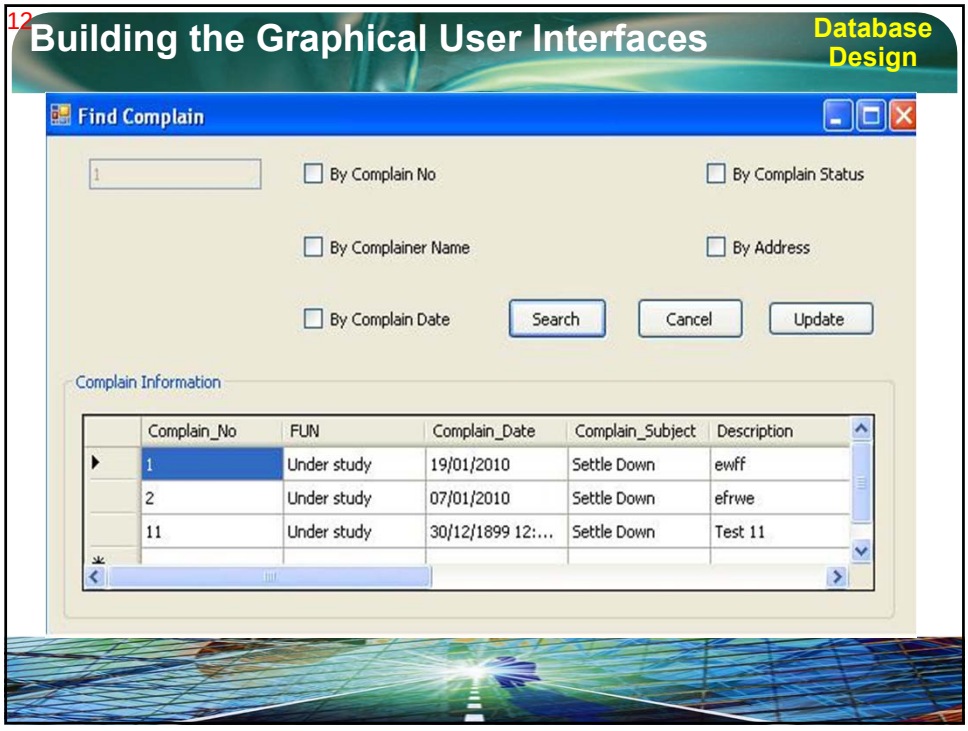
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Building the Graphical User Interfaces
Database Design
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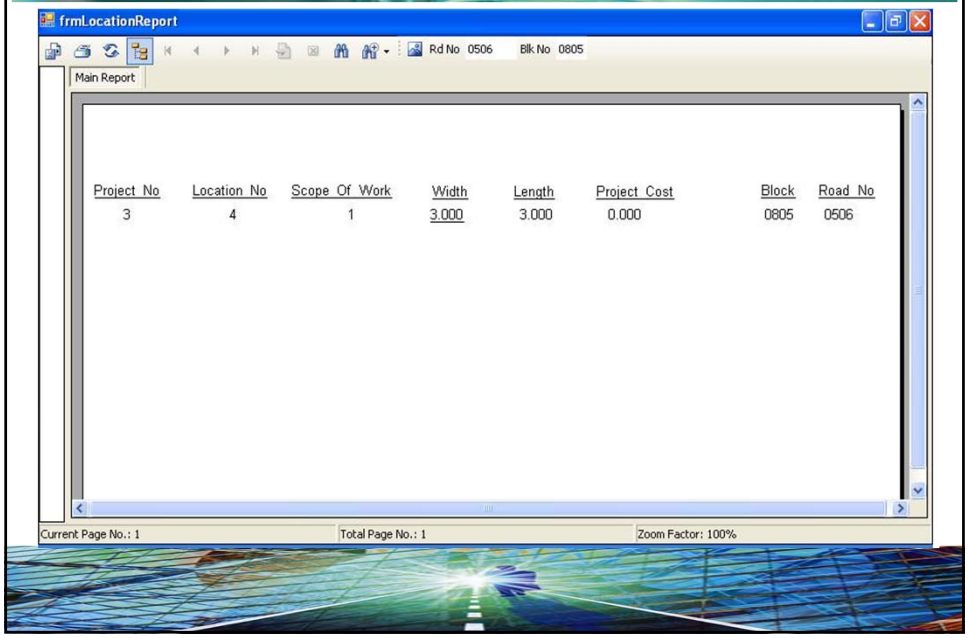
Building the Graphical User Interfaces

Database Design



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What to do with spatial database

Building Spatial Database

- ✓ **To links the non-spatial data with their locations in the reality by showing the answers of different queries on a map.**
- ✓ **The spatial queries that depend on the task location as on the following questions.**
  - Where is the location of a specific complain?
  - Where are the locations related to a specific TCO?
  - Where are the locations of specific address?
  - How many patches are their on a specific address?
  - What are the attributes of a specific location?

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Choosing the GIS Environment

Spatial Data Connection to Relational Database

- ✓ **The criteria for selecting the GIS environment:**
  - Must be compatible with objectives of the project.
  - Must be available and licensed.
  - Must be able for updating and generalization process.
  - Must be able to extend in the enterprise project rather than needed to reconstruct from scratch.
- ✓ **The selected GIS environment is: the ActiveX controls MapWinGIS from the www.MapWindow.org site**

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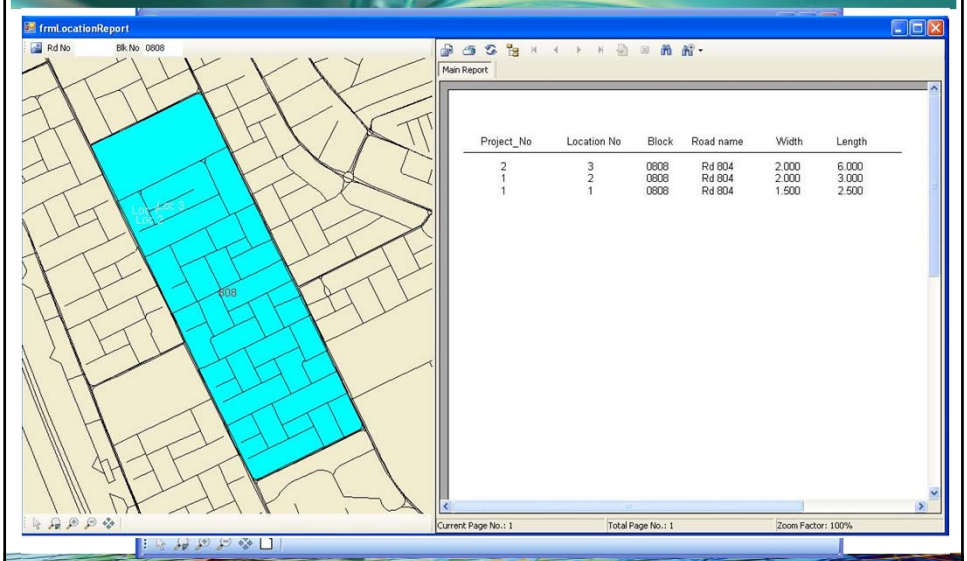
Choosing the GIS Environment

Spatial Data Connection to Relational Database



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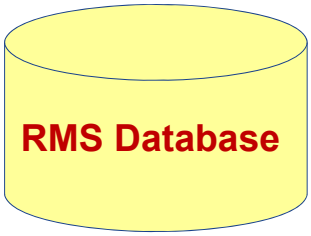
Checking and enhancing the database

Spatial Data Connection to Relational Database

✓ Demonstration of Designed spatial-Relational database For Reinstatement tasks



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Results & Conclusions

Results and Conclusions

✓ The current situation of handling the Reinstatement task in RMS is time consuming, less productivity, and contains a lot of paper work.

✓ The deliverables of this research is a standalone application to facilitate the road reinstatement tasks for the road maintenance section, so it can save time effort, and cost of these tasks.

Comparison of Current Situation with Designed Spatial Database

Step	Time in the current situation	Time using the RDBMS	Notes
Receiving the complain file by complaining offices and open separate file for each.	1 hour	1hour – this job is not inside the RDBMS yet	The time will be 5 minutes if the system generalized using the MOW intranet.
Open a project file for the complain and prepare for site plan –searching for the address and prepare maps.	1 – 4 hours depending on the original complain file and information	5-10 minutes	
Visiting the site, determine the location, taking measurements, and register it on the printed map and the job requirements.	4 hours	3 hours just for the site visiting time	If the location Based services has been used the time will be 15 minutes
Calculate the project cost and reporting for the senior engineer to take the approval	3 hours	15 minutes	
Add job to a TCO or creating new one. And issuing it.	1 hour using the existing contract system	1 hour using the existing contract system	If connected the time will be about 15 minutes.
Execute the task and update the status of the job on the project file and inform the others about completing.	2 hour	5 minutes	
Reporting the job in the monthly and other periodically reports	3 - 5 hours	5 -10 minutes	
Total	13-20 hours = 3 working days	5 hours and 40 minutes = one working day	In the fully automating solution the time will become 1 hour.

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Results & Conclusions

Results and Conclusions

- ✓ **The enhancement of the work productivity is about 3 times than the current situation,**
- ✓ **If the comparison had been applied- By neglecting the common factors e.g. the site visit time and the handling of the correspondences, then the enhancing is more than ten times the current situation.**

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Recommendations

- ✓ Adopting the results of this project by the MOW, and generalizing the project by replacing the existing sample base-map with the completed one for the whole country.
- ✓ The adaptation of this project to be the connector for all other strategies and systems (ESM, EDMS, ISO, Cost Center, and monthly reports).

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THANK YOU