

# **Role of Geographic Information System for Asset Management Information Risk Assessment for Pipe Lines Utility In Oil and Gas Industry**

**By**

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# Objective:

- GIS concept and definition.
- Spatial risk management.
- GIS & Asset Management System.

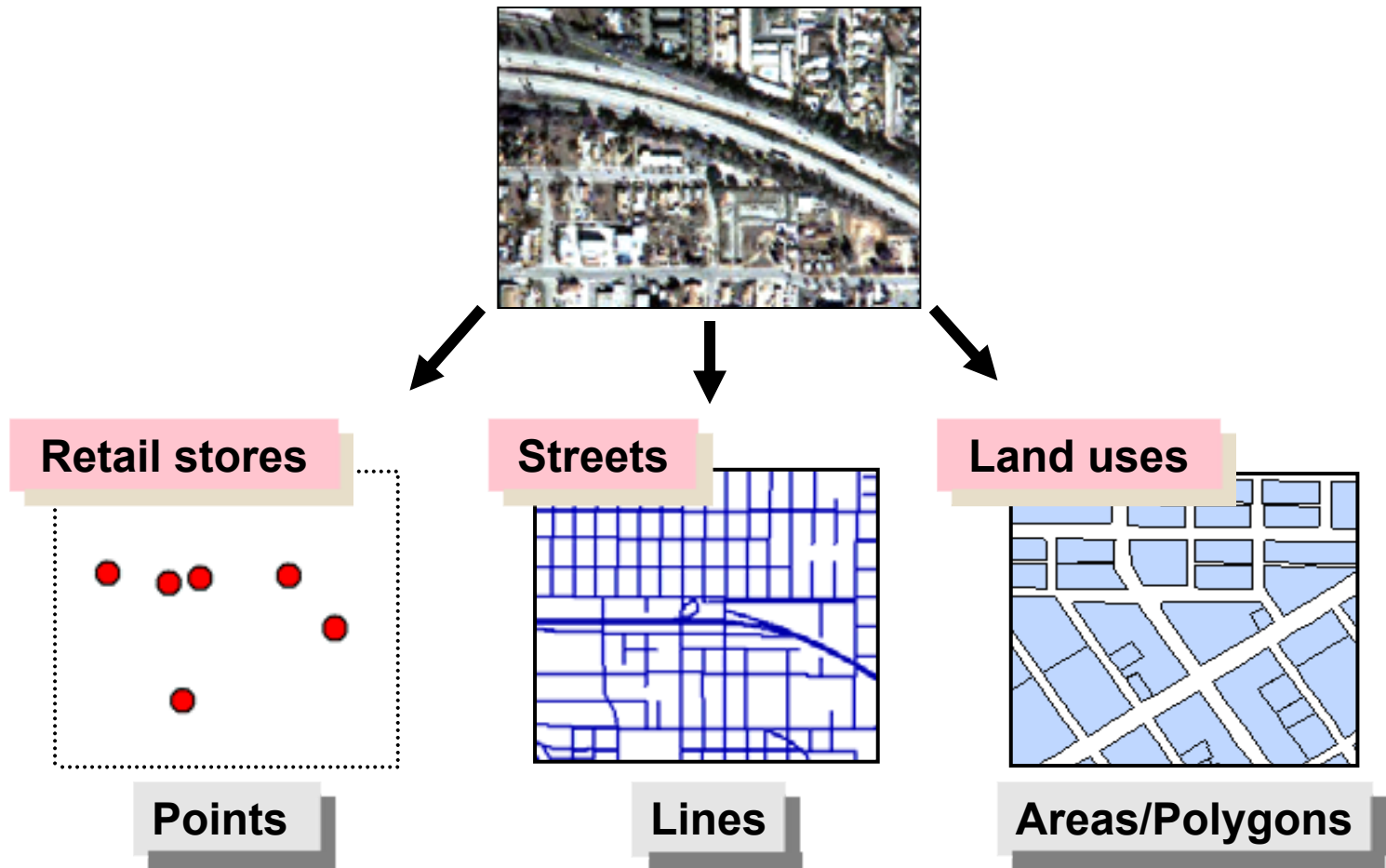
# Agenda:

- ❑ GIS Definition
- ❑ GIS Role as Supporting System
- ❑ The Integration Capabilities of GIS
- ❑ Major Business Objectives
- ❑ Risk Management Processes
- ❑ Defining Asset Management
- ❑ Asset Management Information System Requirements
- ❑ Asset Management System Elements
- ❑ Critical Success Factors
- ❑ GIS Utilization
- ❑ Asset Management Functions(case study)
- ❑ Conclusions

# GIS Definition

Mapping the reality through capturing, storing, analyzing and visualizing geographic objects in computerized database management system organized in spatially related (geo referenced ) thematic layers in 3 basic schema structures (point, line, polygon). Geographic data spatially analyzed (Geospatial Analysis) in GIS environment results in producing new decision making support information with respect to business interest (target).

# GIS Definition (Cont.)

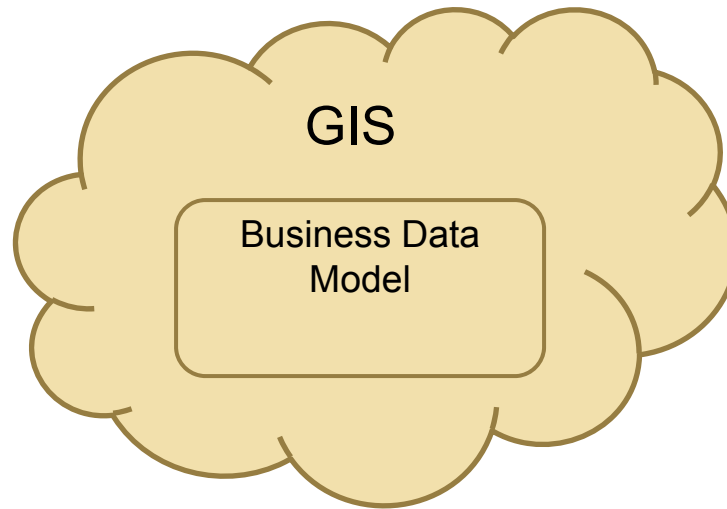


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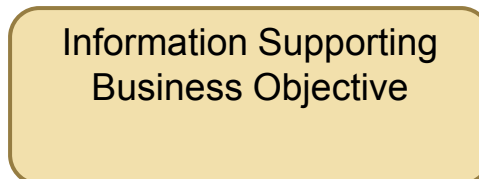
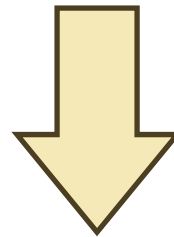
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# GIS Role as Supporting System

Phenomena  
Surface Generation



Best Workflow  
Route process



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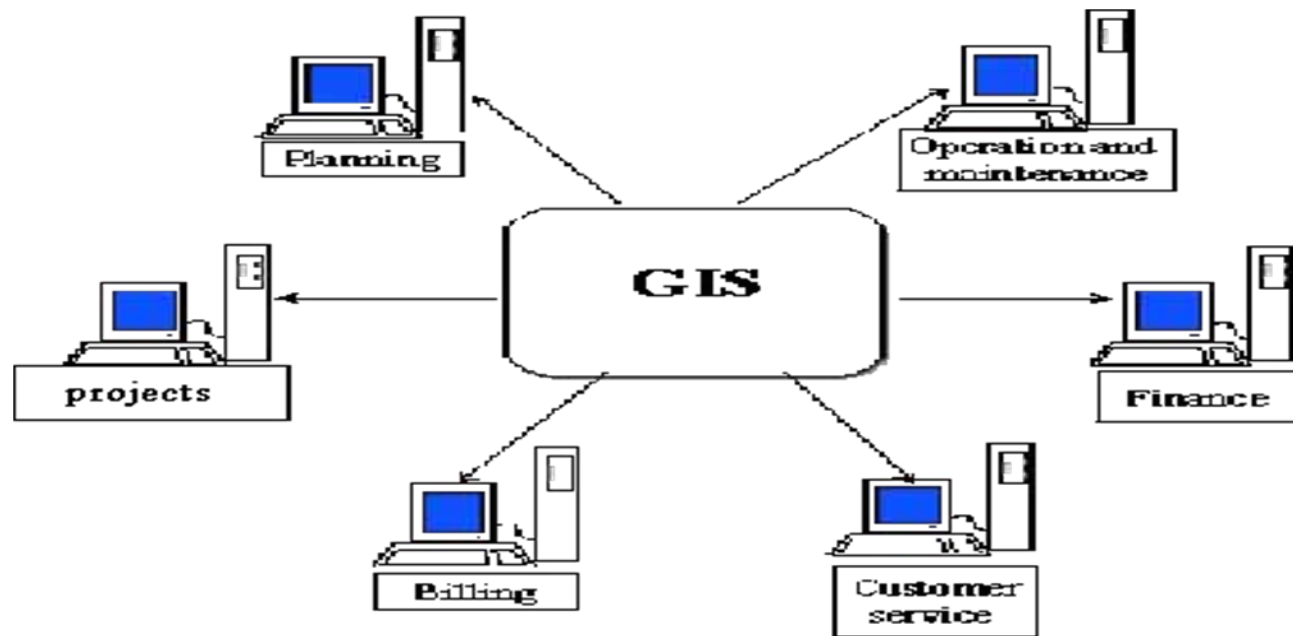
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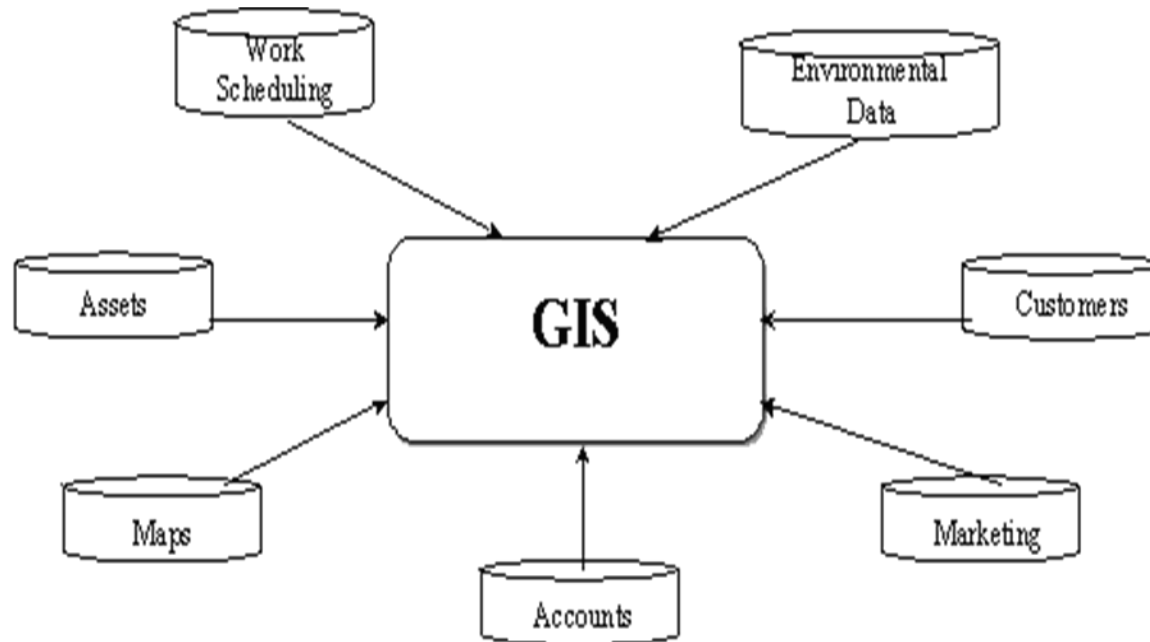
# The Integration Capabilities of GIS

- The unique structure of data, which GIS provides, offers organizations radically different ways of delivering their services. GIS can act as the IT integrator for an organization. Various studies have shown that some 60-70% of data is shareable between the different functions within utilities and similar organizations.

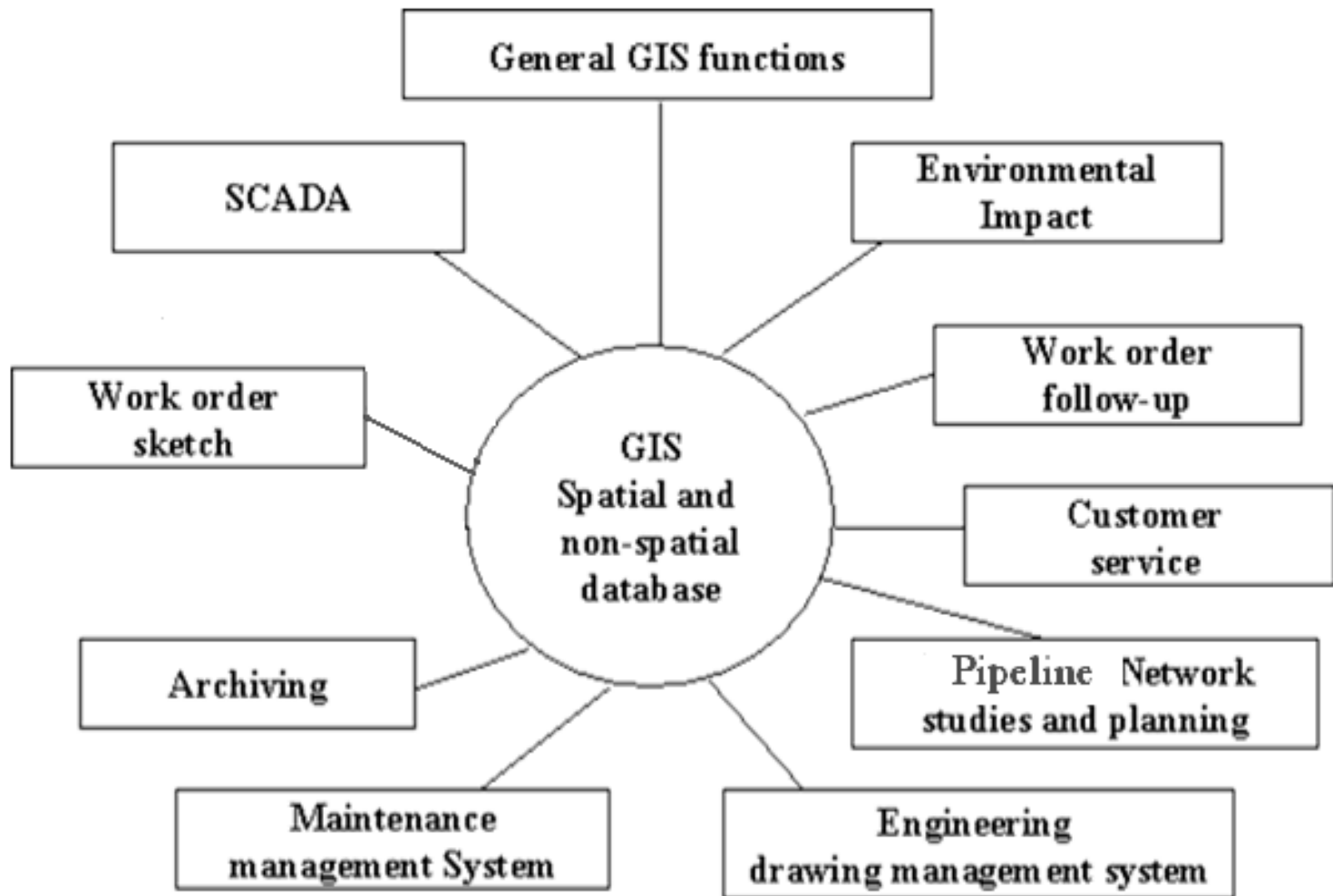
# The Integration Capabilities of GIS (User Perspective)



# The Integration Capabilities of GIS (Info Perspective)



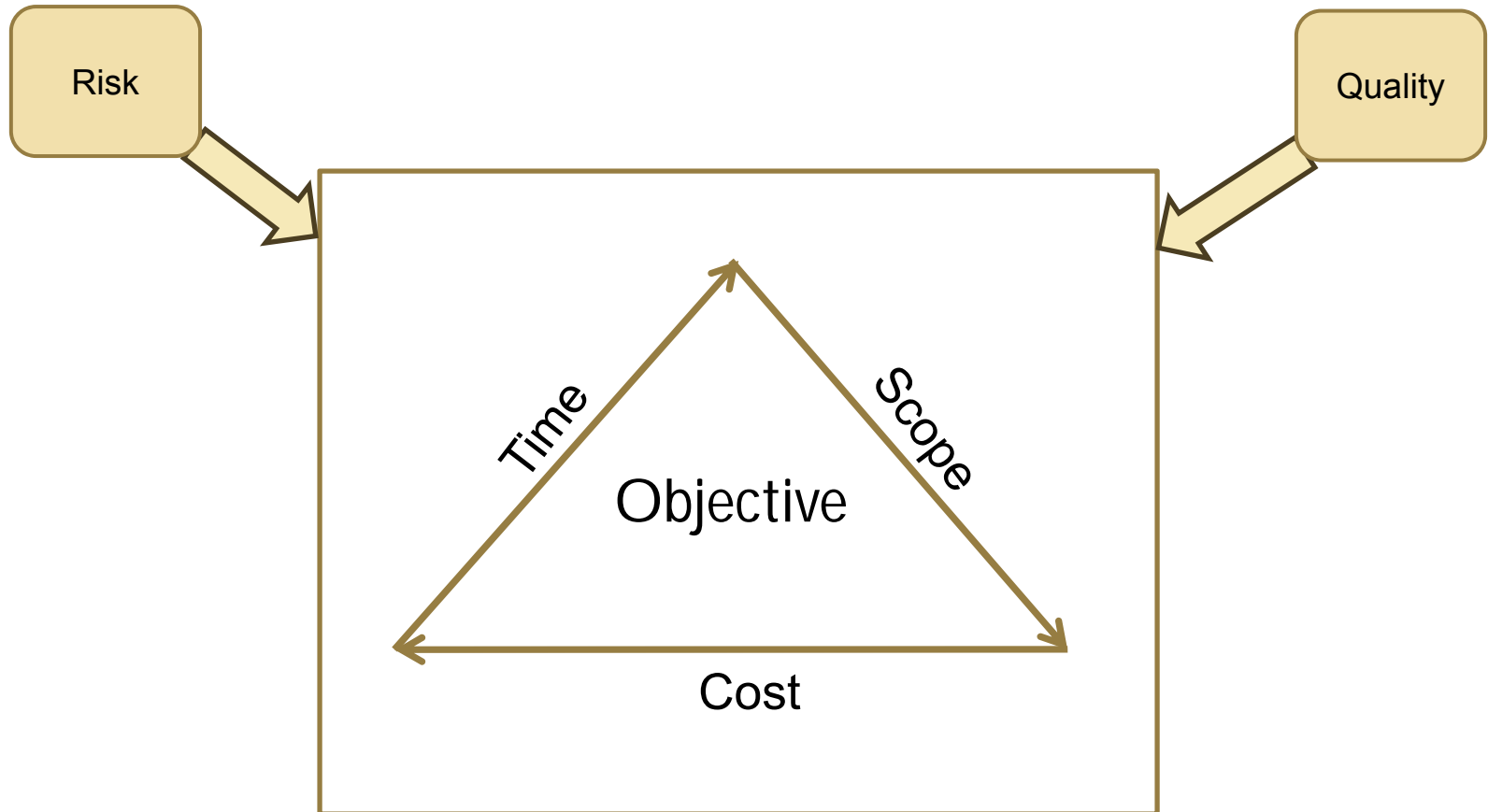
# The Integration Capabilities of GIS (Application Perspective)



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# Major Service Objectives

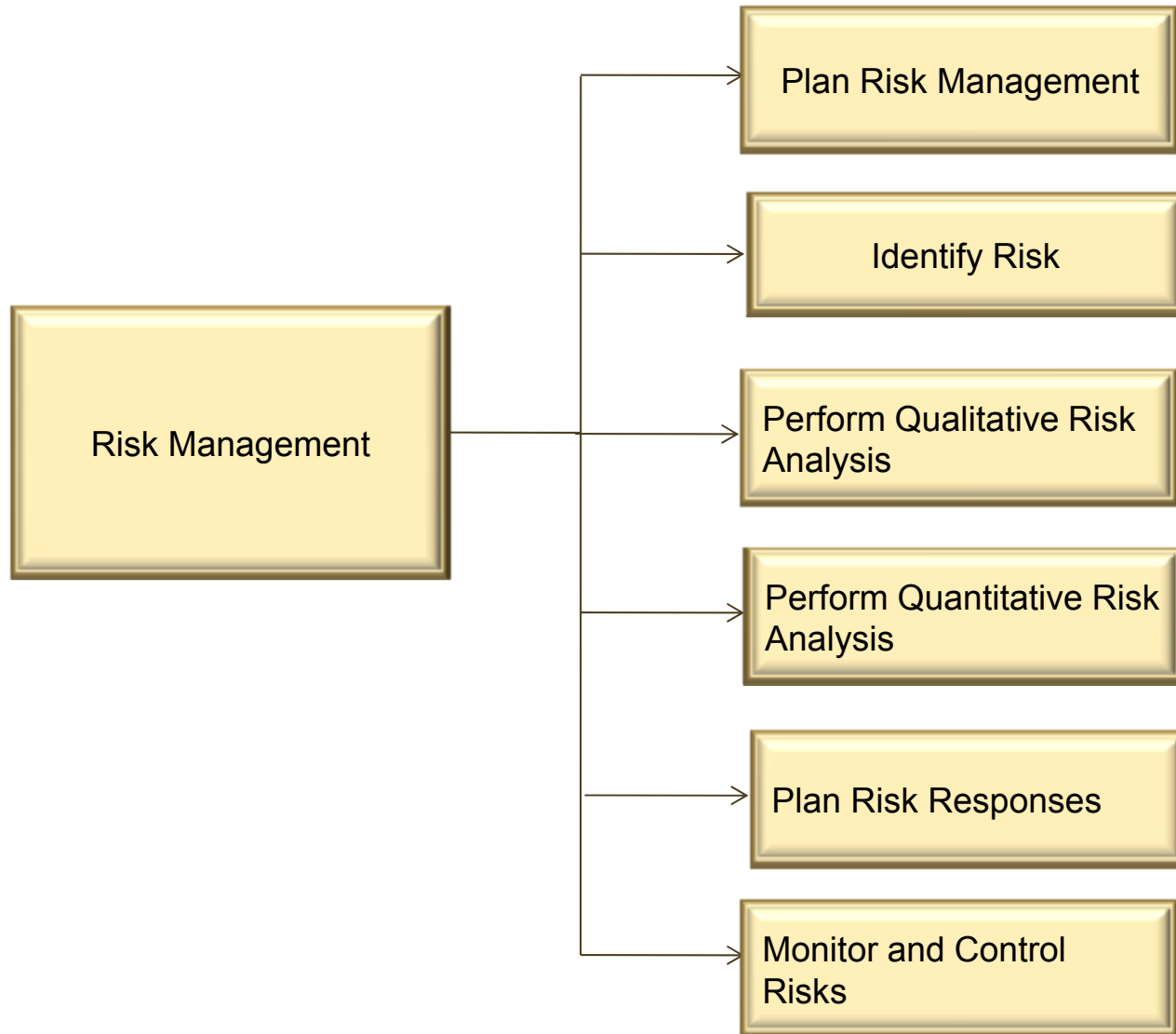




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# Risk Management





# Risk Management Processes

- Risk Management is an uncertain event or condition that, if it occurs, has a positive or negative impact on at least one of the organization's objectives such as time, cost, scope, or quality.
- One of the most important processes in the risk management is to determine which risk might affect the business objective. This process is called "Identify Risk".
- Why identify risks spatially: Various data models integrity could be established through the spatial relationship thus the spatial identify risks process (What, Where, when, How) could be preformed on the implemented data models in GIS environment via geospatial analysis.

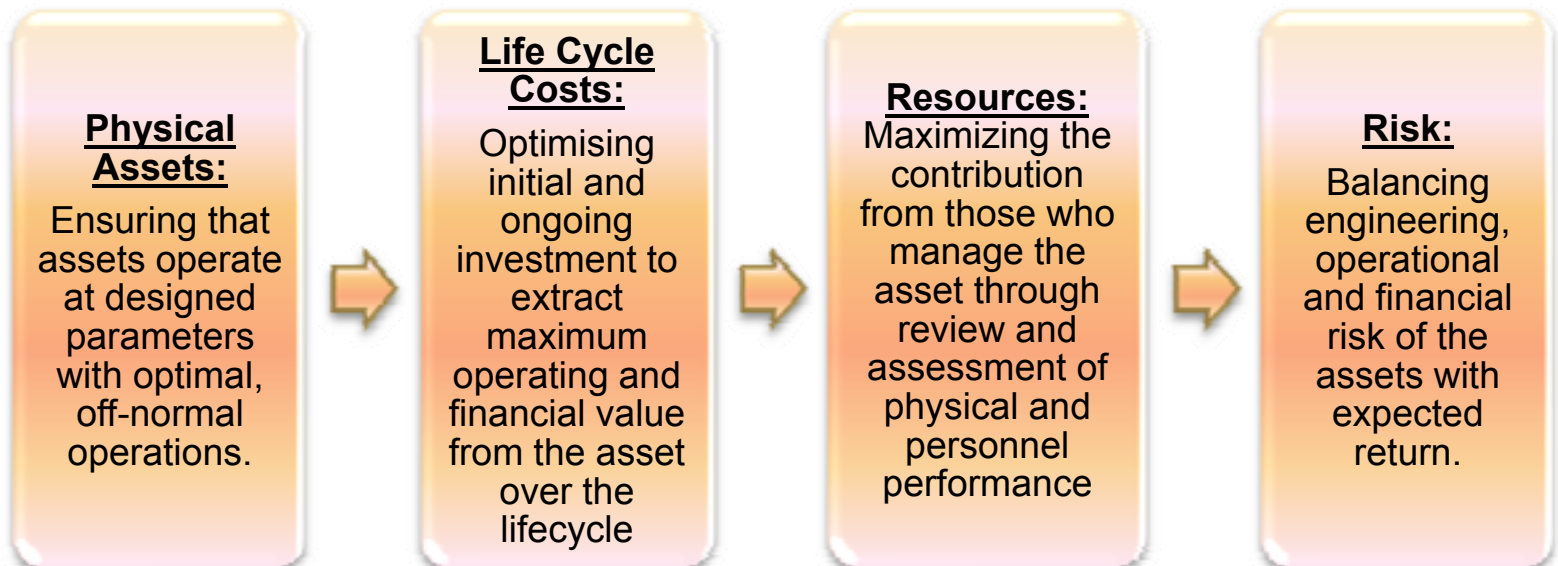
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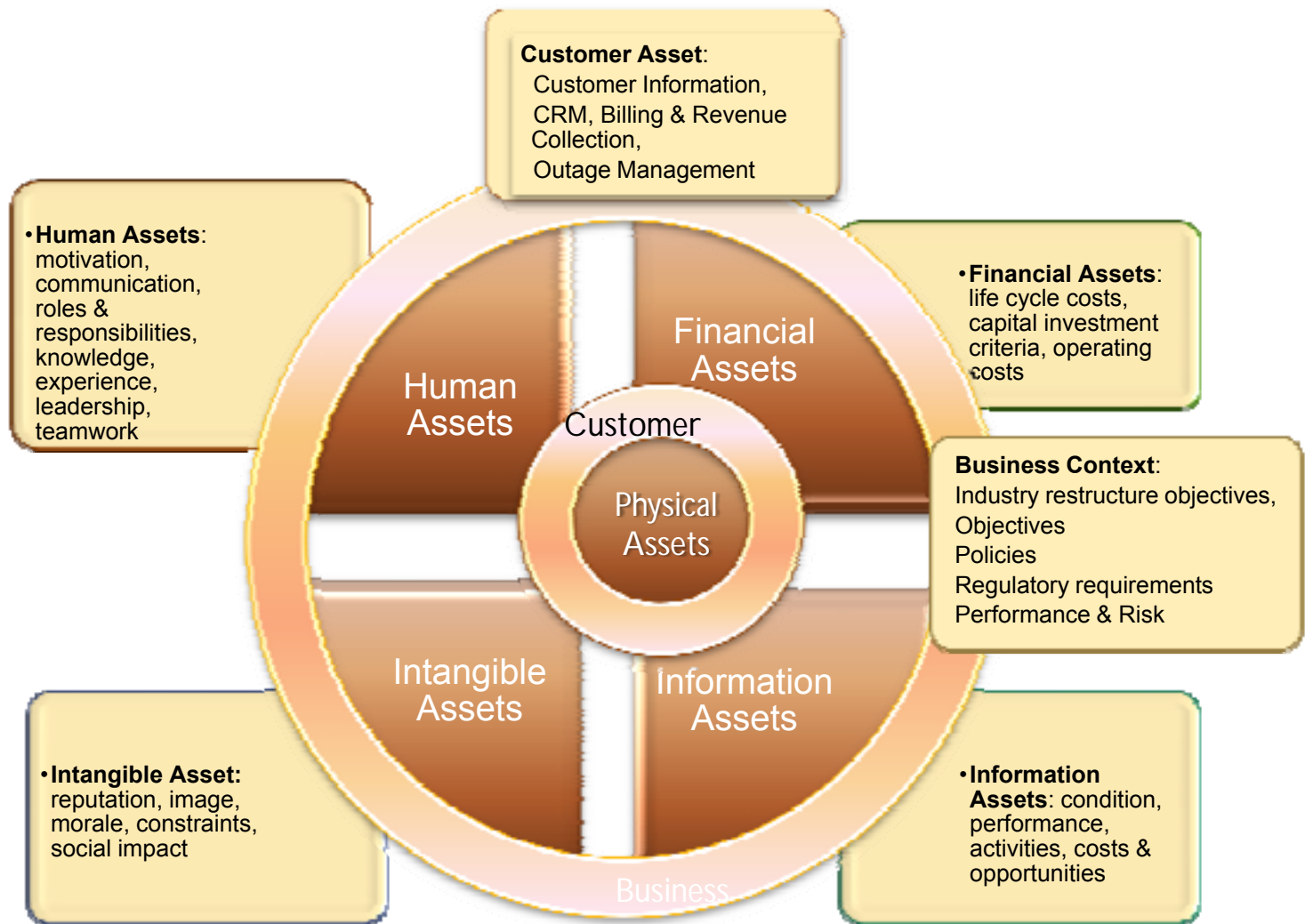
# Defining Asset Management

Enterprise Asset Management is a **pragmatic approach** to managing organisations assets, to achieve its **strategic goals** while providing tools for **making decisions** which allow a utility to meet a **required standard of service** in the most **cost effective way**.

Effective Asset Management is all about the optimisation of :



# Defining Asset Management (cont)...





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# Asset Management Information System Requirements

- Correct
- Accurate
- Available
- Relevant
- Consistent (in form between systems)
- Timely (or current in it's validity)
- Common or standard
- Secure
- Recoverable

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# Asset Management System Elements



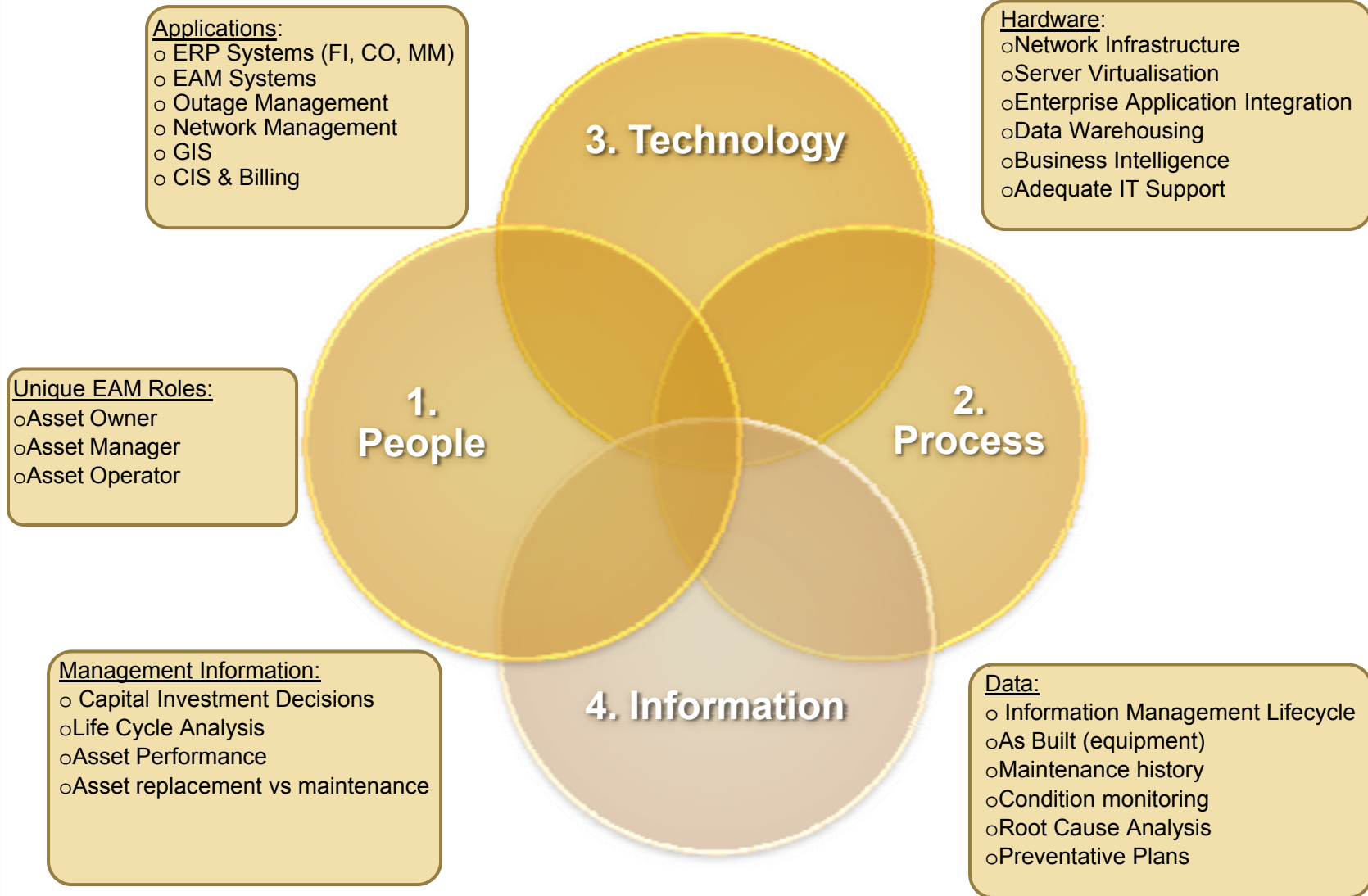




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# Critical Success Factors



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# GIS Utilization

GIS is not just a tool for the visualization of geographic objects yet it could act as a supporting system in integrating various organization data models (business core systems) to generate information supporting organizational target objectives with respect to time, cost and quality.

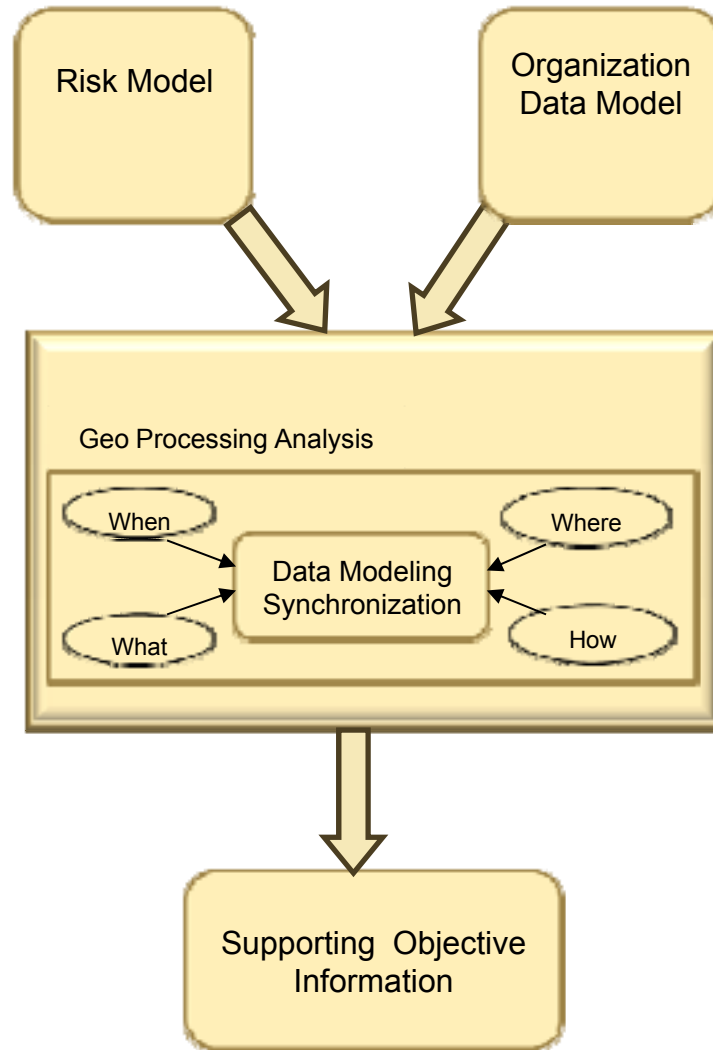
# GIS Utilization(Cont.)

- Data Synchronization Between AM Model , Risk Model & GIS Model:

Scalable standardized Data  
Model

Non specific Standardized Data  
Model

# GIS Utilization (Cont.)





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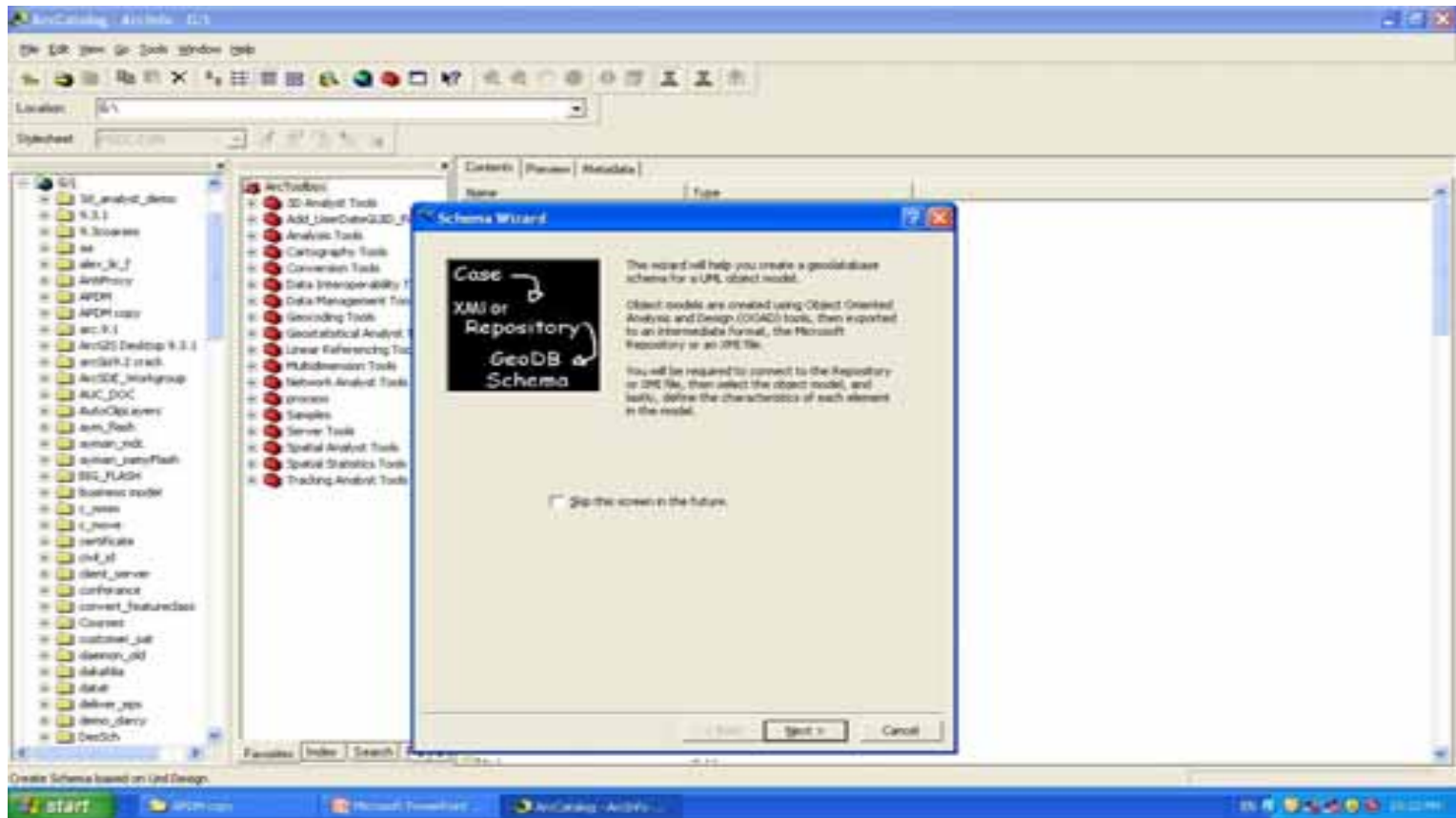
# Asset Management Functions(case study)

- a. Import APDM schema in GIS environment.
- b. Generate APDM core elements from existing geographic pipelines.
- c. Establish data model relationship between APDM control points and existing risk analysis geographic model.
- d. Calculate quality performance indicator (QPI) based on total risk analytical values.
- e. Generate quality performance surface based on derived QPI.



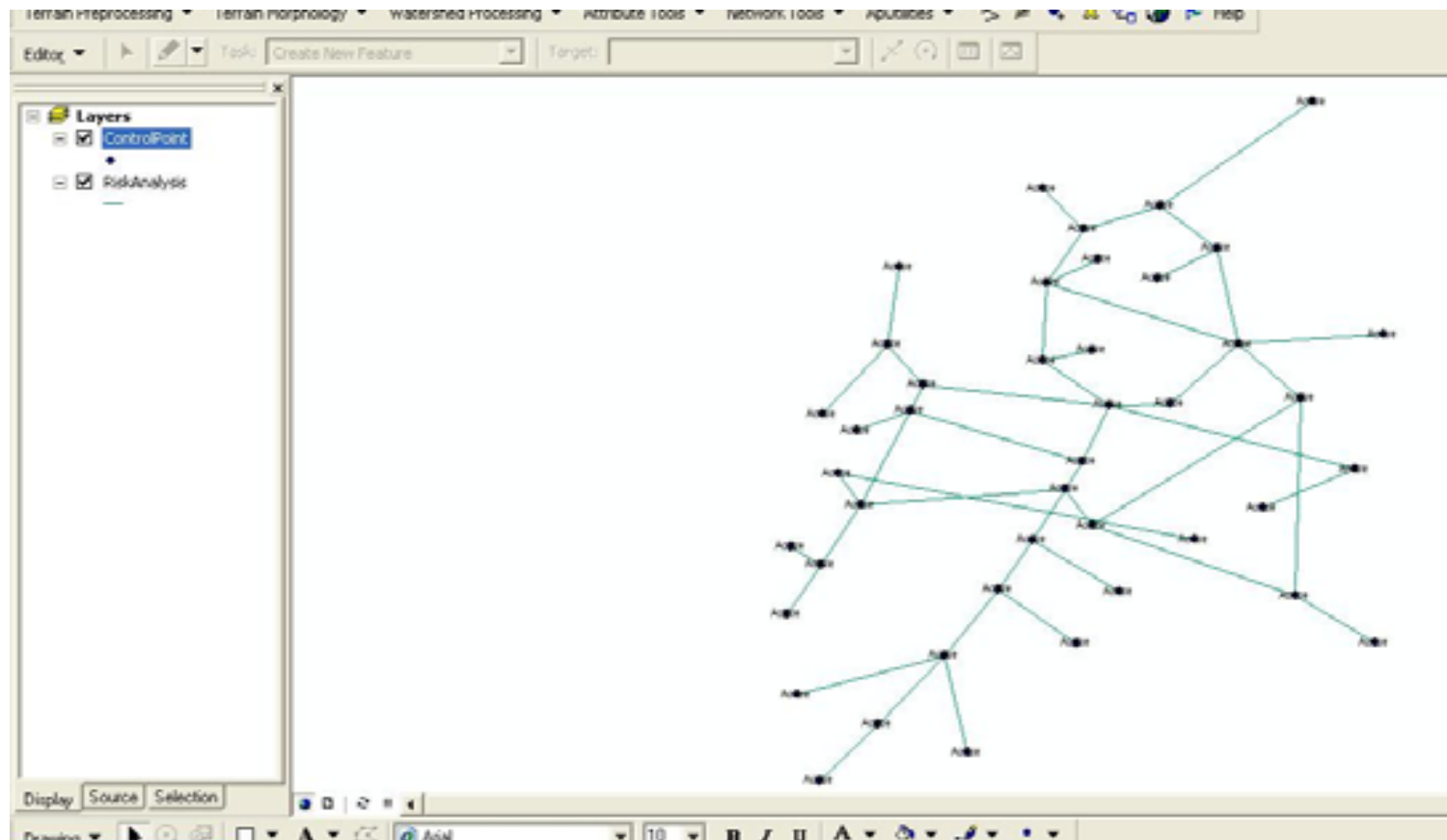
# Asset Management Functions(case study cont.)

Import APDM template



# Asset Management Functions(case study cont.)

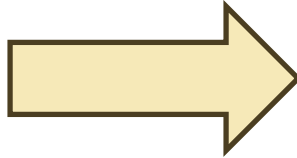
Generate APDM core elements & establish control points / risk analysis relationship



# QPI Calculations

Calculate QPI from equations below:

GENERAL FORMULA



$$f(x) = \frac{1}{\sqrt{2\pi}\sigma} e^{-(x - \mu)^2 / 2\sigma^2}$$

Total Risk (TOR) =  $\sum$  Consequence \*  $\sum$  POF

WHERE



$$\mu = \frac{\text{TOR}}{2}$$

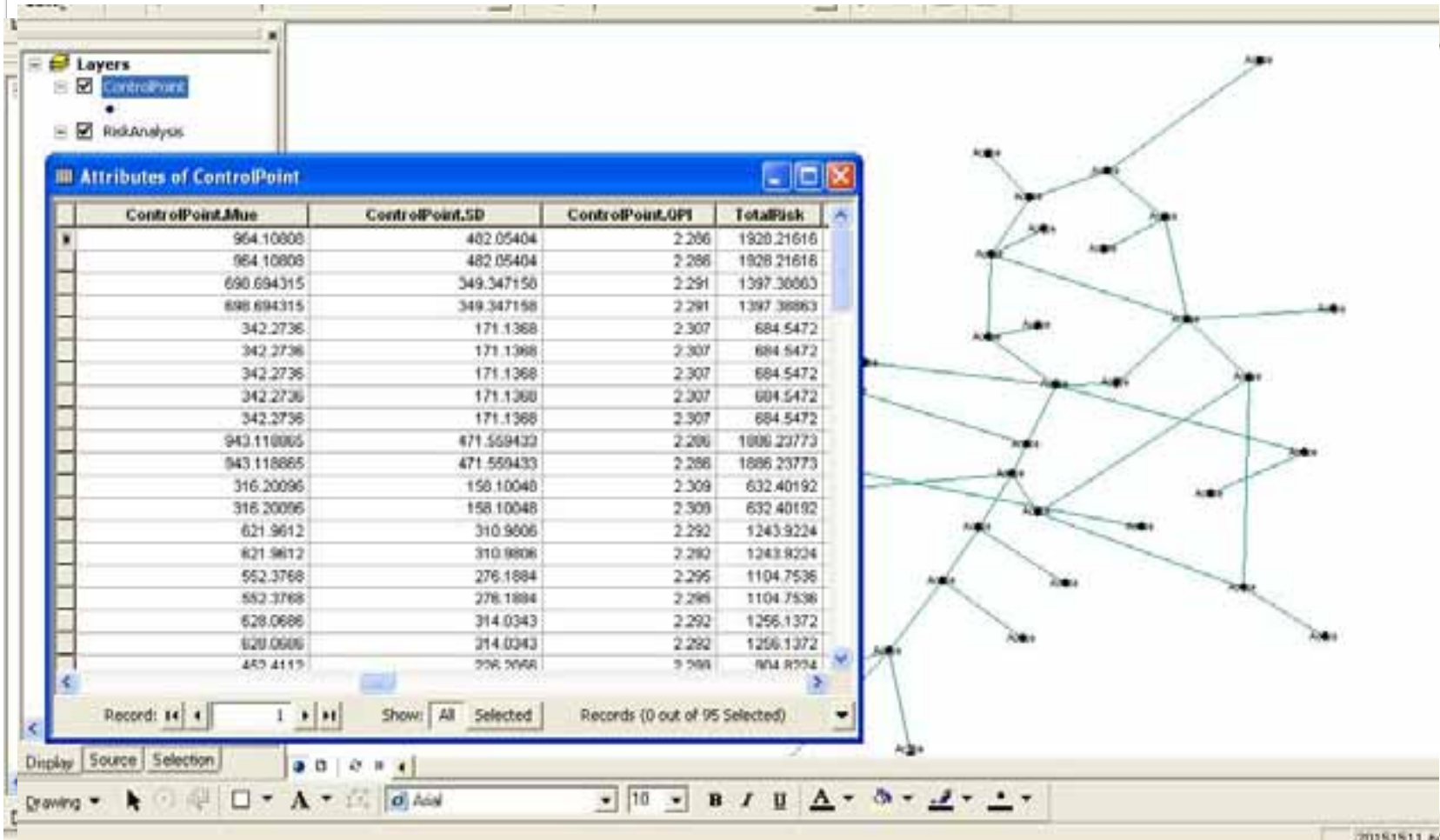
$$\sigma = \sqrt{\frac{\text{TOR}^2}{4}}$$

Assume: random variable  $x = 1$  and Scale Factor = 100

$$\text{QPI} = f(x) \times 100$$

# Asset Management Functions(case study cont.)

View geographic pipeline asset data in terms of QPI



# Asset Management Functions(case study cont.)

Through quality performance surface we could:

- Generate strategic base map for top management analytical view of business service objective.
- Generate quality surface for binary distribution in supporting automation of managing asset management risk parameters which leads to success or failure of asset service.
- Generate quality surface based on DMPO derived from QPI to produce analytical surface for sigma level distribution with respect to spatial properties of interested assets as well as spatial relationship between them.



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# Conclusions

GIS is not just an optional supporting system for enhancing asset management system only, yet it turns to mandatory system for AM success due to risk management high impact on AM success or failure



# Thank You

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