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Flexible Database Structures for Land Records

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Introduction

- Standardised conceptual models for land records
  - Land Administration Domain Model (LADM), Social Tenure Domain Model, Open Source Cadastral and Registry (OSCAR) toolset and its accompanying OSCAR Conceptual Data Model (OCDM), Semantic web approaches, Talking Titler model.
- Uncertain situations include complex customary systems, urban informal settlements where tenure practices draw on both western and traditional custom, post-conflict situations , post-disaster
  - justice and fairness should be the principal values which drive the improvement of a land administration system
- Useful technical design of a land record system should be flexible
- Research Agenda: Evolution of database model using schema evolution, schema versioning, and we want to automate this (self adapting database model)

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System Effectiveness

- We acknowledge , but exclude, ease of use, as critical IS design component
- Ease of Use versus Usefulness are the most basic of technical elements in information system design.
  - Major tension between these two concepts in developing land administration information systems for fragile or unconventional situations.
- Politics, governance, power relations, regulatory constraints, tensions between what officials want and the people whom the system is supposed to serve, and other control factors are also excluded.

Problem

SLUMS → 1 billion plus

Problem

GIS didn't work, but written notebook (sort of) did!

Problem

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Post-conflict

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Problem

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Customary –Urban Tenure Evolution and Racketeering

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Land Restitution – Community Boundaries?

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Talking Titler Model

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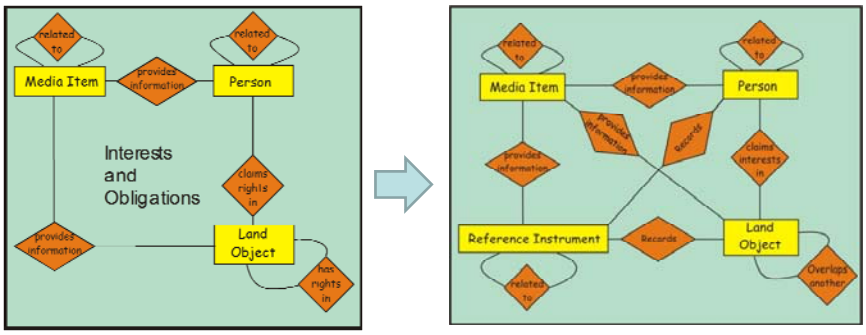

In a fragile or uncertain situation, we require flexibility to be able to document and model all the possible relationships that might exist.

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Talking Titler Model

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Parent Classes

Person	Reference Instrument	Land Object	Media Item

John Doe	14 Jones St	ID19420713	Free form description of entry
Jane Doe	14 Jones St	ID19621011	
Arthur Other	14 Jones St	ID19621011	

Relationships

Person	Reference Instrument	Land Object	Media Item

Jane Doe	Daughter	Relationship: Expects to inherit house
Arthur Other	Adopted Son	Relationship: Expects usufruct rights

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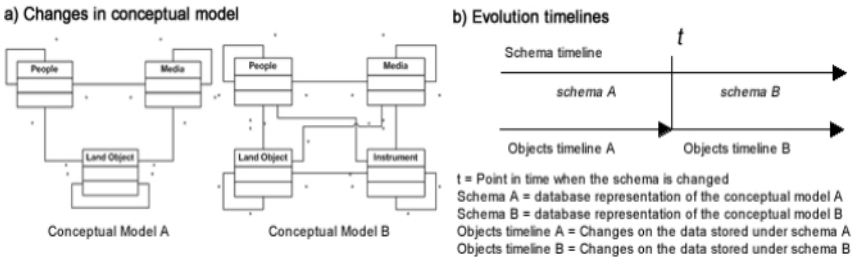
Definitions

- Database schema
- Schema modification – on physical db
- Schema evolution – physical db
- Schema Versioning – preserves historical chain of schemas in a manner that allows access to all the historical data (full schema versioning) – partial schema versioning allows access to the current data.
- Self adaptation / self management – how do we automate this with no or minimal user intervention?

Reality is we can automate parts of change form conceptual change to physical change and schema versioning. Change in conceptual model should trigger changes down to schema versioning requirements.

Experimental Work

- Conceptual Schema Changes: change from 3 base classes to four. Reference instrument is 4th class.
- Schema evolution: modify physical schema.



The conceptual model B is the result of applying changes to the conceptual model A (new class and new associations). These models represent actual changes on the Talking Titler model (Muhsen and Barry 2008).

Experiments

- Which (FLOSS) database model will provide greatest flexibility?
  - Object –Relational (e.g. PostgreSQL)
  - Document Oriented (not relational)
    - MongoDB – JSON (JavaScript Object Notation)
      - JSON defines the schema and the queries
    - eXist or Sedna – native XML database
    - Divided opinion whether PostgreSQL is a native XML database as this system can handle XML queries by extending SQL.

Work to Date

- PostgreSQL – created the 3 class model.
- Queries use SQL - conventional database approach.
- No schema evolution yet
- Defining views to hide the structure of the database; so communication done through views.

Document Oriented (XML)

- These are not mature and still evolving
- Created the 3 class schema and implementing Schema Evolution
- Dealing with Many: Many relationships are not trivial – the support is not built into the database software.
- Queries – use XQuery uses several "X" technologies (XPath, Xpointer, XSL to transform results)
- At this early stage, XML seems to be simpler to implement schema evolution than SQL on the given problem!

Middleware / Database Interface Software

- Library on top data model (API) to provide Schema Evolution and Schema Versioning on selected database models
  - Collection of coded functions
  - Manage process from conceptual schema change to database versioning
- User interface is very basic – to demonstrate concepts

Conclusion

- The real world problems are not trivial
- Technical information tools can alleviate these to an extent, but not a simple nor linear process
  - Power, politics and (sustainable) capacity are major
  - Long term horizon for this type of technical development
- Technical work will keep us occupied for a while.
- Easy to use system is critical lesson.
- Right now – computer assisted systems appear to be most sensible in many situations.