Using Simulation To Evaluate Funding Models For SDI Implementation

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Problem Definition

We need to implement SDIs to improve the dissemination of SI

SI Community Representatives

Problem Definition Cont'd

But how are we going to fund the implementation of these components

SI Community Representatives

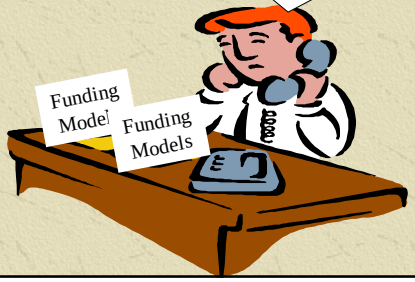
Problem Definition Cont'd

We can create funding models for the implementation of these SDIs

SDI Economic Groups

Problem Definition Cont'd

So many models! How do I select the most appropriate models for my Environment?



Presentation Outline

- Funding Models
- Model Evaluation Techniques
- System Dynamics Simulation Modelling
- The Application of SDSM to SDI Funding
- Building The Simulation Models
- Example of SDS Models
- Analysis
- Conclusion

Introduction to SDI Funding Models

- Required: Structured long-term funding of the implementation and maintenance of SDIs
- Funding Models were designed based on:
  - Classification of an SDI
  - The levels of an SDI and
  - The government structure operating within the implementation environment

Introduction to SDI Funding Models

- Twenty different taxa of funding models were designed for SDI implementation and maintenance

Model Evaluation Techniques

1. Testing of the models in real life situation
2. "Business as Usual" versus target approach
3. Computer Simulation Modelling

Model Evaluation Techniques Cont'd

- The problems with the application of the first two techniques are:
  - The ***results*** can only be determined after implementation
  - They are ***Time consuming***
  - ***Costly*** when compared to the simulation technique

Simulation Modelling

- Selected over the others because of the following features:
  - Ability to include the qualitative components of the environment
  - Facilitate the evaluation of complex systems that do not have explicit mathematical solutions
  - Supported by a variety of software packages

Simulation Modelling Cont'd

- Supports the translation of the model into a computer-based environment
- Can be modified to evaluate both changes in the variables as well as changes to the overall structure of the model

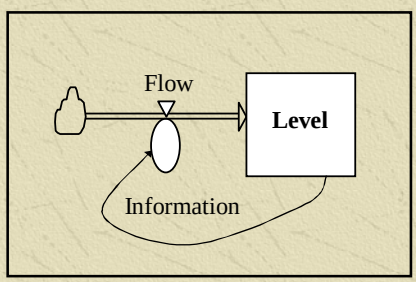
System Dynamics Simulation Modelling

- System Dynamics Simulation Modelling (SDSM)
- A simulation technique that integrates both qualitative and quantitative variables
- Uses feedback loops and time delay techniques to model complex no-linear systems

SDSM Cont'd

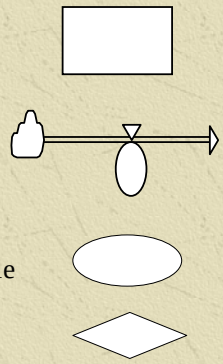
- Feedback Loop
  - Fundamental building blocks of SDSM
  - Uses flows and levels to represent the dynamics of the system
  - Decision variable (flow) controls an action that is integrated into the system to generate a system level
  - Information pertaining to the level is then fed back to the decision variable which is in turn used to control the flows

Feedback Loop



Symbols used in SDSM

- Level
- Flow
- Auxiliary Variable
- Constant



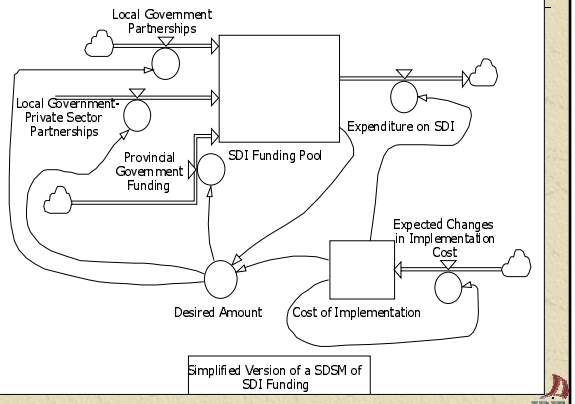
Model Evaluation Using SDSM

- What is expected from the evaluation?
  - An indication of the performance of the model(s)
    - Over time and under specific conditions
  - Graphic illustration of the performance
  - The sensitivity of the models to changes
  - The possible integration of the models

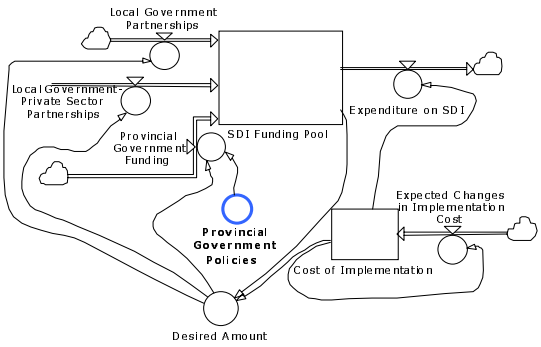
Building the Simulation Models

- PowerSim Software
- Coding of the Knowledge
  - Knowledge of the funding models
  - Knowledge of the environment
- Verification and Validation
  - Are the simulation models built and implemented correctly?
  - Are the models valid representation?

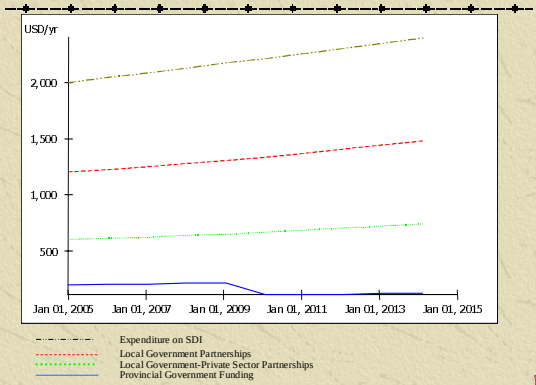
Example of a Simple SDS Model



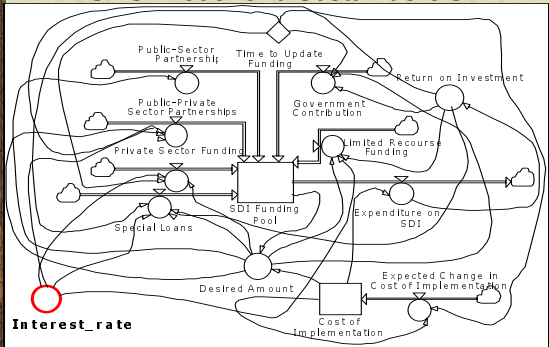
Example of a Simple SDS Model



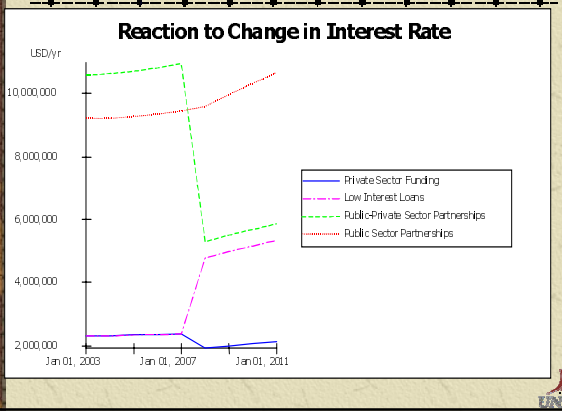
Results of the Simulation



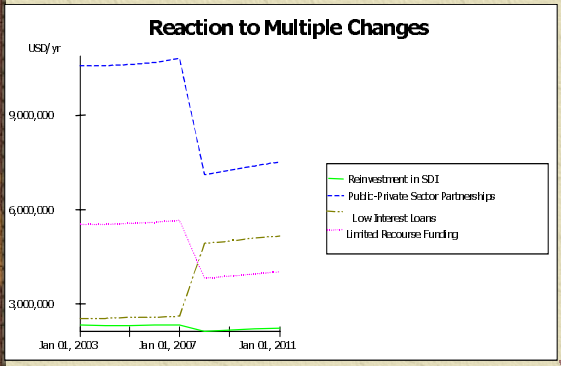
SDS Model of a Sustainable SDI



Results



Results Cont'd



Analysis of the Application of SDSM

- SDSM facilitate the following:
  - Tracking the behaviour of the models over time
  - Analysis of the performance of the model(s)
  - Analysis of the implementation environment

Analysis Cont'd

- The prediction of the model(s) to changes
- The determination of the best possible integration of the models
- The visualisation of the performance of the models

Conclusion

- SDSM can assist program coordinators in the selection of funding models
- Further research is necessary to realise the full potential of the application of SDSM to SDI

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