


# Creating Quantitative Goal Models: Governmental Experience



**Okhaide Akhigbe**, Mohammad Alhaj,  
Daniel Amyot, Omar Badreddin,  
Edna Braun, Nick Cartwright,  
Gregory Richards and Gunter Mussbacher,

*okhaide@uottawa.ca*



# About Goal Models

- Used to structure requirements towards achieving business objectives
- Different languages exists:
  - **i\*, Tropos, KAOS, GRL, BIM...**
- Have a contribution concept:
  - **Qualitative or Quantitative**



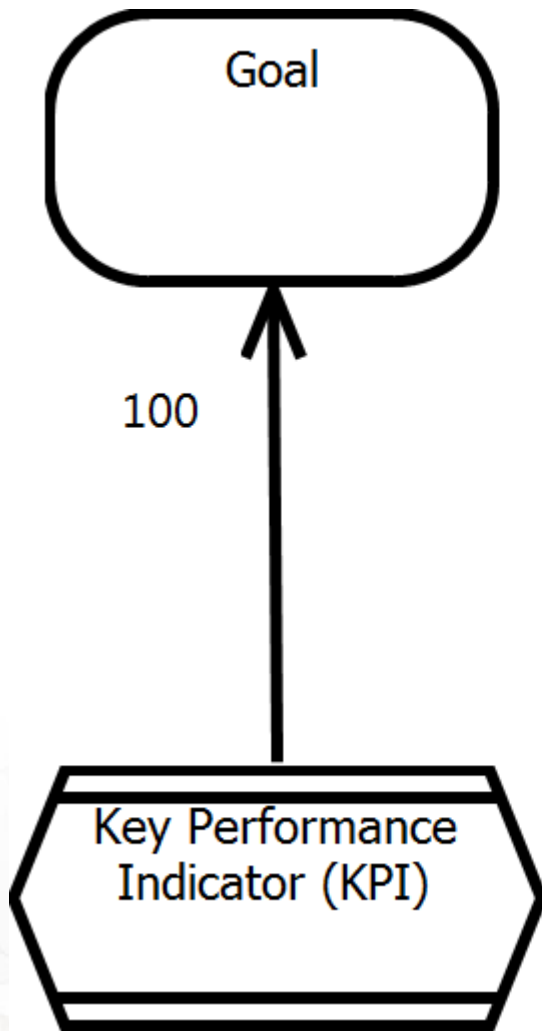
# Qualitative vs Quantitative

- Qualitative contributions are useful where little information is known or where there is uncertainty about exact contributions
- Quantitative contributions enhance precision
- *How do we decide on valid contribution?*
  - **Large number of stakeholders**
  - **Different groups and interests**



# Why the Goal-oriented Requirement Language (GRL)?

- Part of an international standard
  - User Requirements Notation (ITU-T Z.151)
- Support for indicators
- Evaluation strategies
  - ... and color feedback!
- Extension mechanisms for profiling the language
- Mature open source tool (jUCMNav)



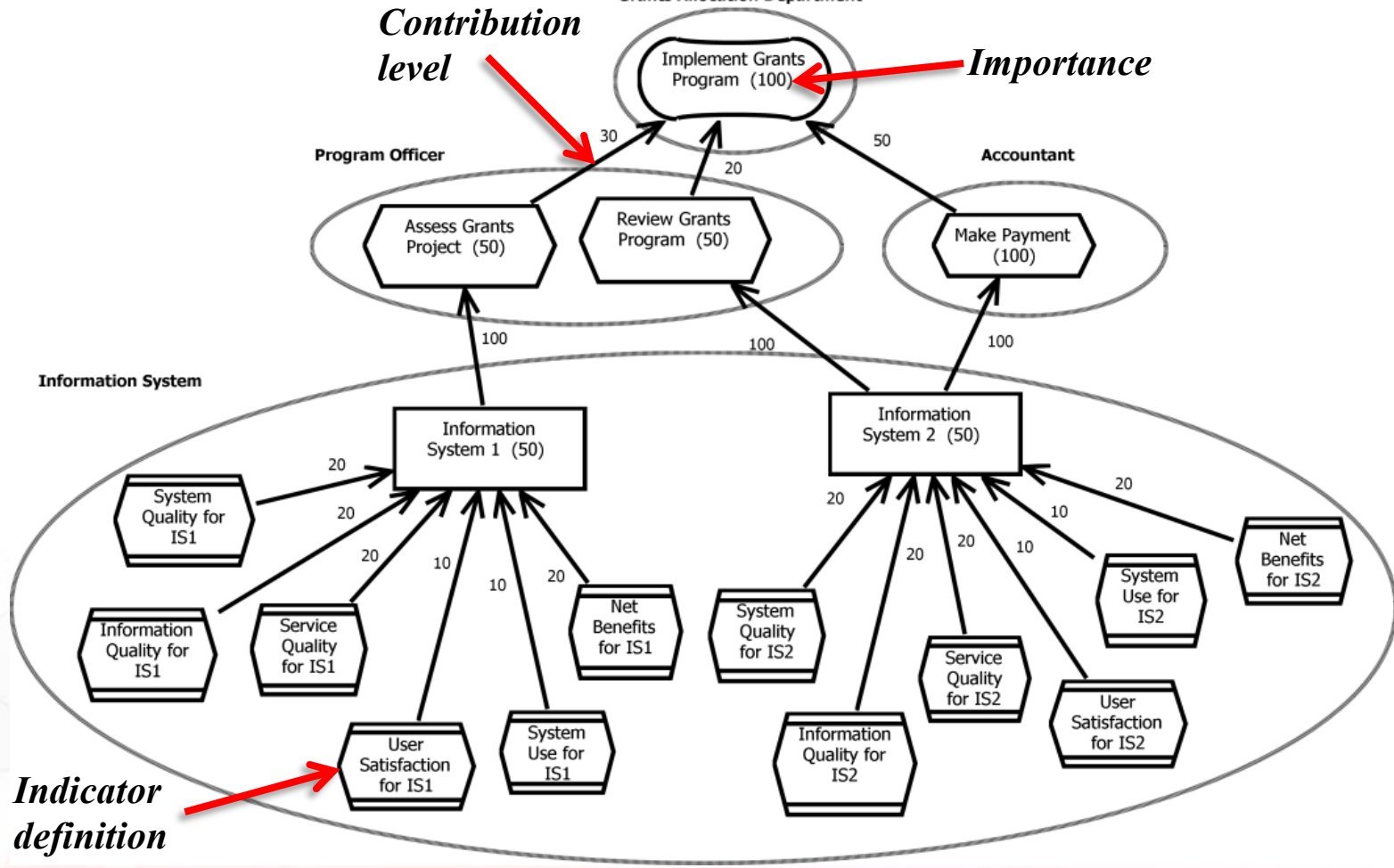
- Unit
- Worst Value
- Threshold Value
- Target Value
- Evaluation Value



Grants Allocation Department

*Contribution level*

*Importance*



*Indicator definition*



# Project Context

- Government Regulators  
Investigation of goal models to capture regulations and measure compliance
- Government Department  
Application of goal models to support decision making during the adaptation of an enterprise architecture



# Group Decision Approaches (GDA)

- Fall into two groups:
- Generic approaches
  - **Equal Relative Weights (ERW)**
  - **Round-Table Discussion and Consensus (RTD&C)**
  - **Delphi Process (DP)**
  - **Analytical Hierarchy Process (AHP)**
  - **Approximate Weighting Method – Rank Order Centroid (ROC)**
- Domain-specific approaches
  - **Relative Weights Derived from Regulatory Penalties (RP)**
  - **Relative Weights Derived from Frequency of Inspection Requirements (FIR)**





# Comparison of GDA

| Criteria       | Group Decision Approaches |      |          |      |        |        |        |
|----------------|---------------------------|------|----------|------|--------|--------|--------|
|                | RTD&C                     | DP   | AHP      | ERW  | ROC    | RP     | FIR    |
| Setting        | FF                        | FF   | FF/VM    | VM   | VM     | VM     | VM     |
| Peer Pressure  | Yes                       | No   | No       | No   | No     | No     | No     |
| Record Keeping | Yes                       | Yes  | Yes      | Yes  | Yes    | Yes    | Yes    |
| Group Thinking | Yes                       | Yes  | Yes/No   | No   | No     | No     | No     |
| Anonymity      | No                        | Yes  | Yes      | Yes  | Yes    | Yes    | Yes    |
| Time           | Medium                    | High | High/Low | Low  | Low    | Low    | Low    |
| Precision      | Low                       | Low  | Low      | High | High   | High   | High   |
| Accuracy       | High                      | High | High     | Low  | Medium | Medium | Medium |

FF = Face to Face VM = Virtual Meeting



# Experience Using Consensus

- Project on two separate sets of regulations
- High accuracy required with minimal meeting time
- Project 1  
Convert management based regulations to outcome-based regulations and derived goal models
- Project 2  
Derive inspection/evaluation questions from a large set of prescriptive regulations



# Experience Using AHP

- Busy enterprise architects
- Anonymous feedback
- The Enterprise Architecture GRL model covered the main and provincial offices with:
  - 4 diagrams
  - 8 actors
  - 40 intentional elements (12 goals, 9 softgoals, 8 tasks, and 11 resources)
  - 30 indicators
  - 102 links



## Lessons Learned

- Quantification of GRL goal model is practical
- Government departments need numbers to decide
- Opportunities to collaborate and learn
- Quantification in large models is feasible
- GDA improves modeling



# Limitations

- Data collected as we developed and experimented
- Are our approaches optimal or fit the task?
- Can our approach be replicated outside policy/regulation context?
- Can we be confident and certain in agreed quantities?

# You're Invited

<http://re15.org/>



23rd IEEE  
International  
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August 24-28, 2015.  
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# Thanks! Questions?



Okhaide Akhigbe  
okhaide@uottawa.ca