

The Use of Goals to Surface Requirements for Evolving Systems

Annie I. Antón

University of South Florida
(anton@adm.csc.ncsu.edu)

Colin Potts

Georgia Institute of Technology
(potts@cc.gatech.edu)

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Summary of Presentation

1.0 Introduction and Motivation

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3.0 CommerceNet Web-Server Requirements

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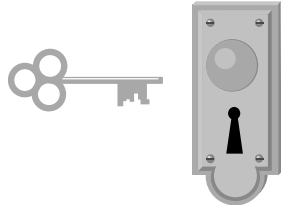
5.0 Summary of Contributions & Future Work

Why Requirements Engineering?

- ◆ Requirements must be stated accurately before they can be implemented correctly.
- ◆ Requirements are useful for:
 - communication & negotiation
 - contract definition
 - subsequent design & validation
- ◆ Obtaining requirements is conceptually complex.



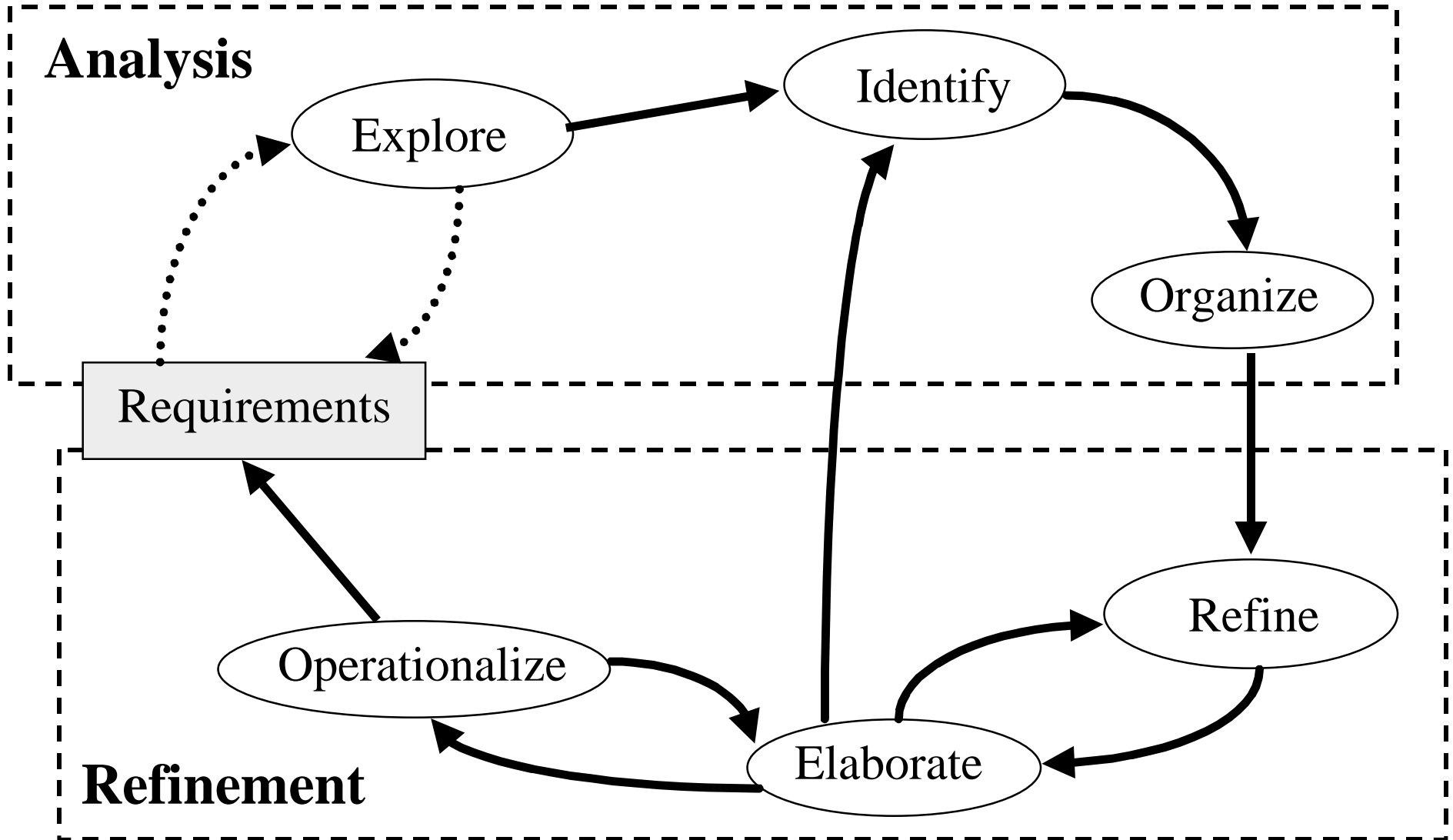
Key Questions:



Practical Consequences of Adopting a Goal-Refinement Approach

- ◆ Is it practical to specify the goals for legacy (or partly implemented) systems?
- ◆ Is it practical to derive requirements from abstract goals rather than descriptions of concrete behaviors?
- ◆ Given multiple viewpoints, can we derive goal networks to aid in detecting and resolving stakeholder conflicts?

Goal-Based Requirements Analysis



Goal-Based Requirements Analysis Method

1. Identify goals and objectives

- 1.1 Explore existing documentation
- 1.2 Identify agents & agent responsibilities
- 1.3 Identify stakeholders

2. Organize and Classify Goals

- 2.1 Eliminate redundancies
- 2.2 Reconcile synonymous goals
- 2.3 Classify goals
- 2.4 Specify goal dependencies
- 2.5 Construct goal hierarchy

3. Refine and elaborate goals

- 3.1 Specify obstacles for each goal
- 3.2 Construct scenarios
- 3.3 Identify constraints

4. Operationalize goals into requirements

Analysis and Refinement Principles

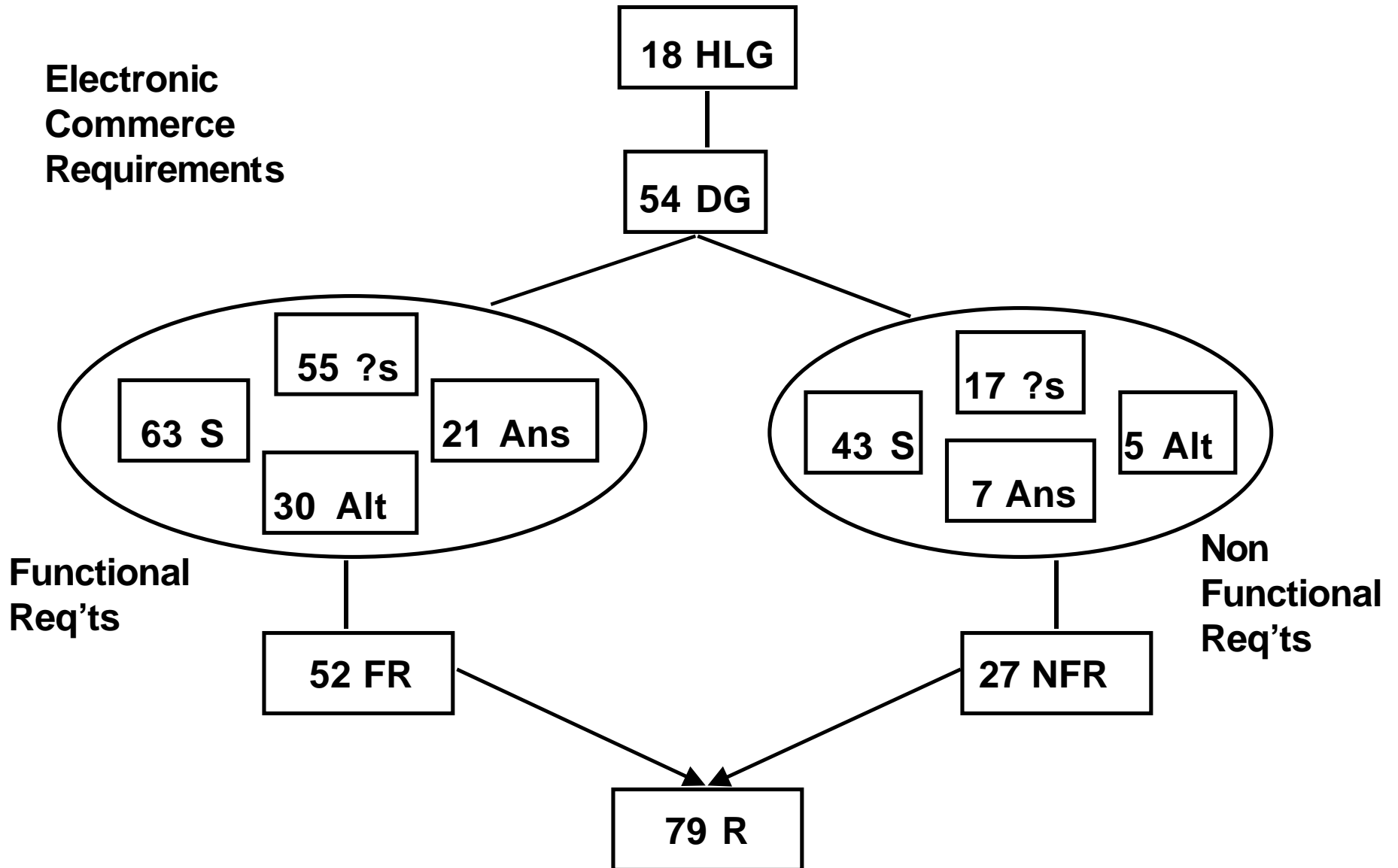
- ◆ Infer goals from descriptions of current process and incomplete statements of behavioral requirements
- ◆ Goal classifications are useful in posing questions
- ◆ Goals exist at different levels of abstraction
- ◆ Gradual and incremental process requiring maintenance of informal information

The CommerceNet Web Server



- ◆ Four analysts & various stakeholders
- ◆ Four month effort
- ◆ Weekly conference meetings (MBONE)
- ◆ EColabor room at NTT Multimedia Communications Laboratories

Evolving Requirements



Requirements Identified via Inquiry: Electronic Commerce Example

Goal: Member payment approved

Question: *Who* approves member payments?

Answer: Certification authority approves payments

Question: *What* determines whether a member payment is approved?

Answer: Member's credit history

Scenario: Certification authority finds outstanding / overdue balance

Scenario: Member has poor credit history

Scenario: Certification authority does not approve member payment

CommerceNet Requirements Specification

- ◆ Goals
- ◆ Functional Requirements
- ◆ Nonfunctional Requirements
- ◆ Organizational Requirements
- ◆ Relevant Questions
- ◆ Answers
- ◆ Alternatives
- ◆ Scenarios

Application of Heuristics

- ◆ Stakeholders may express goal in terms of activities.
- ◆ Categories of goals need to be differentiated.
- ◆ The posing of systematic questions enables the derivation of a more complete set of goals and requirements.
- ◆ Scenarios facilitate the identification of goals and the evaluation of implementation alternatives
- ◆ Goals are named using a standardized set of verbs as the first word

Example GBRAM Heuristics

- HIG₁ Goals are named using a standardized subset of natural language, in which the first word is a verb that describe the target of the goal.
- HIG₂ Abstraction may be used to extract goals from documentation by asking: What goal(s) does this statement exemplify or block?
- HIG₃ Stakeholders often express requirements in terms of desired operations rather than goals. Goals are inferred by matching the closest goal verb (HIG₁) to the operational term used by the stakeholder.
- HIC₂ Constraints can be identified by searching for temporal connectives. Restate as constraints statements that describe when a condition is true or when a goal can be completed.

CommerceNet Goal Classes

- ◆ Process support
- ◆ Security and access control
- ◆ Electronic commerce
- ◆ Information display and organization

CommerceNet Scenario Example

Step #	Agent	Action
1	User	Find the membership application form page
2	User	Fill out membership application form
3	User	Select “echeck” as payment method
4	User	Enter public key
5	User	Submit membership application form
6	Certification authority	Approve user payment
7	Web server	Give user receipt
8	Web server	Increase budget balance
9	Web server	Create user entry in membership database
10	Web server	Add user to membership mailing list
11	Web server	Add user to membership web page
12	Web server	Send user membership kit

Example: Goal, Obstacles and Scenarios

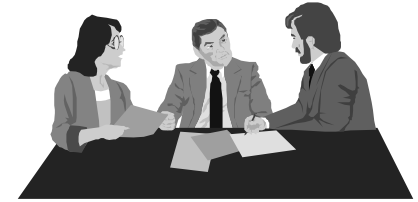
Goal	Obstacles	Scenarios
MAKE payment method selected	(1) Payment method not selected (2) Payment method choices are not clear	(1) User selects “e-check” as payment method (2) George isn’t sure whether Burdell & Associates has an account set up yet and need to know how to get one.

Example: Goals and Goal Types

Goal	Goal Type
AVOID obsolete information	Maintenance
ENSURE secure transactions	Maintenance
IMPROVE content maintenance	Improvement
INCREASE profits from seminars	Improvement
KEEP soliciting participation	Maintenance
KNOW member access privileges	Achievement
MAKE member registered	Achievement
REDUCE time required to secure approval for modification updates	Improvement

Lessons Learned

- ◆ Stakeholders express goals in terms of activities
- ◆ Categories of goals need to be differentiated
- ◆ Posing of questions enables the derivation of more complete set of goals and requirements
- ◆ Scenarios facilitate the identification of goals & evaluation of implementation alternatives



Discussion

- ◆ Integrative requirements approach
 - abstract goals & concrete behaviors
- ◆ Inquiry can be simplified by categorizing goals according to their target conditions & subject matter
- ◆ Obstacle analysis helps in identifying goal conflicts & pre/post-conditions for operationalization
- ◆ Evolutionary nature of requirements requires management of rationale & auxiliary notes

Generalizable Goal Classes

- ◆ Messaging Goals
- ◆ Process Support Goals
- ◆ Security and Access Goals