

REQUIREMENTS ENGINEERING FOR DATA WAREHOUSES

APRIL 2015

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LITERATURE REVIEW

❖ Problem:

GORE-based methods in the literature:

- ✓ Targeted various RE problems

- Some of them focus on the understanding the organisational context of a DW

- Some others focus on the information requirements of a DW ...

- ✓ Developed based on different principles

- The i* framework

- Toropos methodology

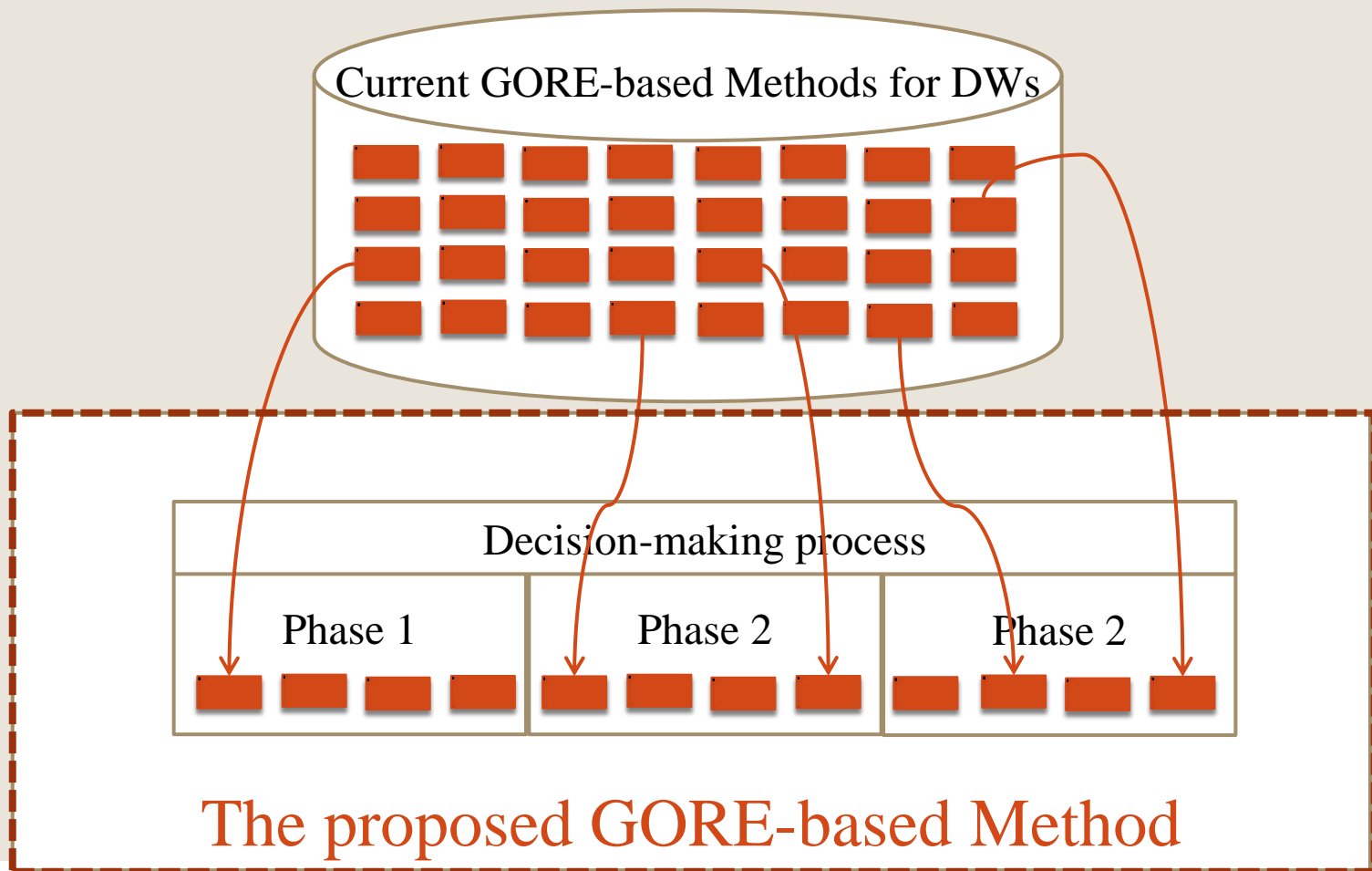
- KAOS

- URN including GRL and UCM

It is difficult to give a comprehensive GORE approach in the DW domain where a complete and consistent set of the DW requirements are taken into account.

METHODOLOGY

Method engineering approach: a discipline to construct a method from existing ones



PROPOSED METHOD

Decision-making process

Phase 1: Searching for conditions that call for decision-making

Phase 2: Analysing possible courses of actions

Phase 3: Selecting a proper course of action from available options

GORE approach

GORE approach: using goals for requirements elicitation, requirements model and analysis, requirements negotiation and modification.

Goal: an objective that the system under consideration should achieve

Goal model: a graphical representation of the reduction of goals

✓ Elaborate how a goal is achieved

✓ Supports heuristic, qualitative or formal reasoning schemes during RE

PHASE 1: CONDITIONS FOR DECISION MAKING

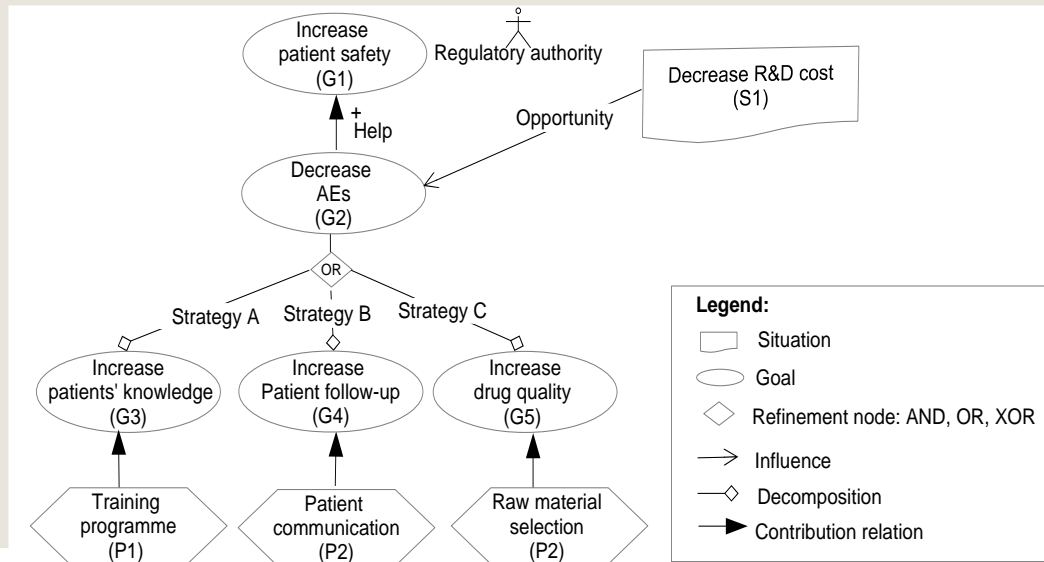
◆ Translating a strategic goal to decisions that need to be made to achieve that goal

Objective

Modeling

Running example

◆ Providing a formal modeling foundation and proper representation of variables important for decision-making (developing a business conceptual model)



PHASE 2: ANALYSING POSSIBLE COURSES OF ACTIONS

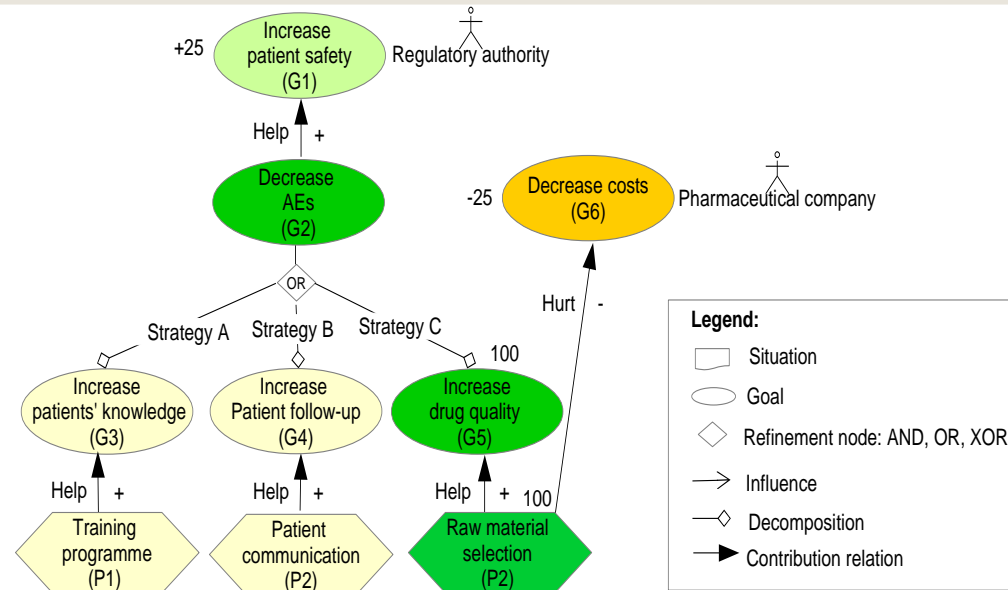
◆ Evaluating the effect of decision alternatives on the strategic goal achievement

Objective

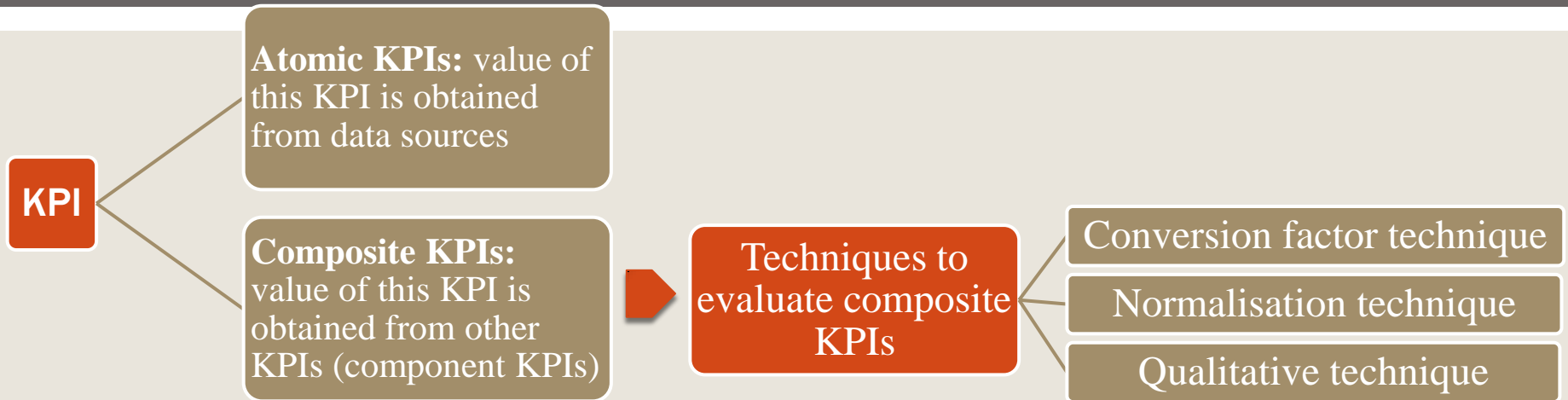
◆ Providing a proper analysis foundation to evaluate qualitatively or quantitatively the strategic goal satisfaction

Modeling

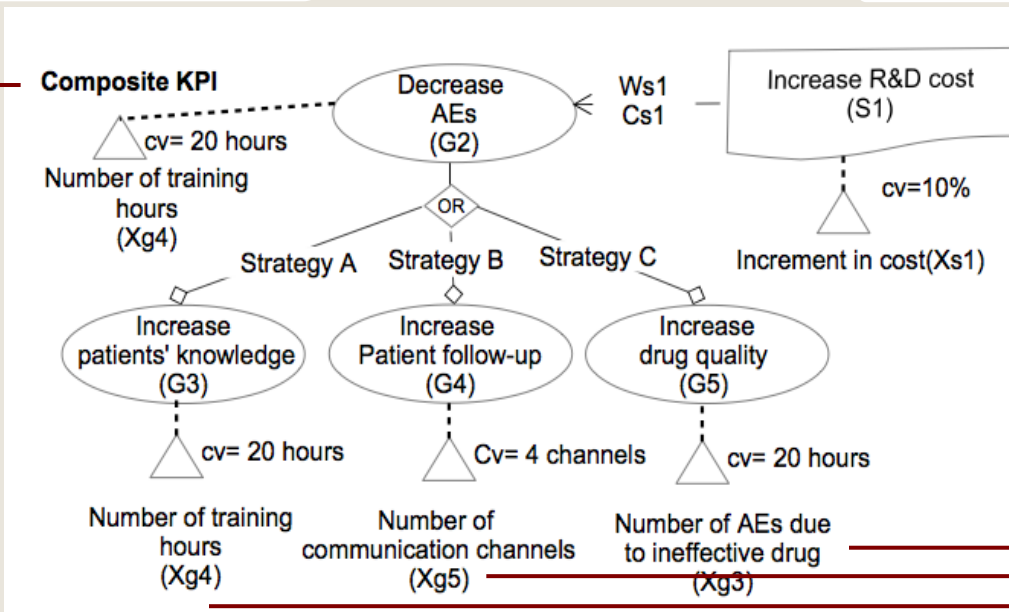
Running example



PHASE 2: ANALYSING POSSIBLE COURSES OF ACTIONS



Composite KPI ←



→ **Atomic KPI**
 → **(Component KPIs)**

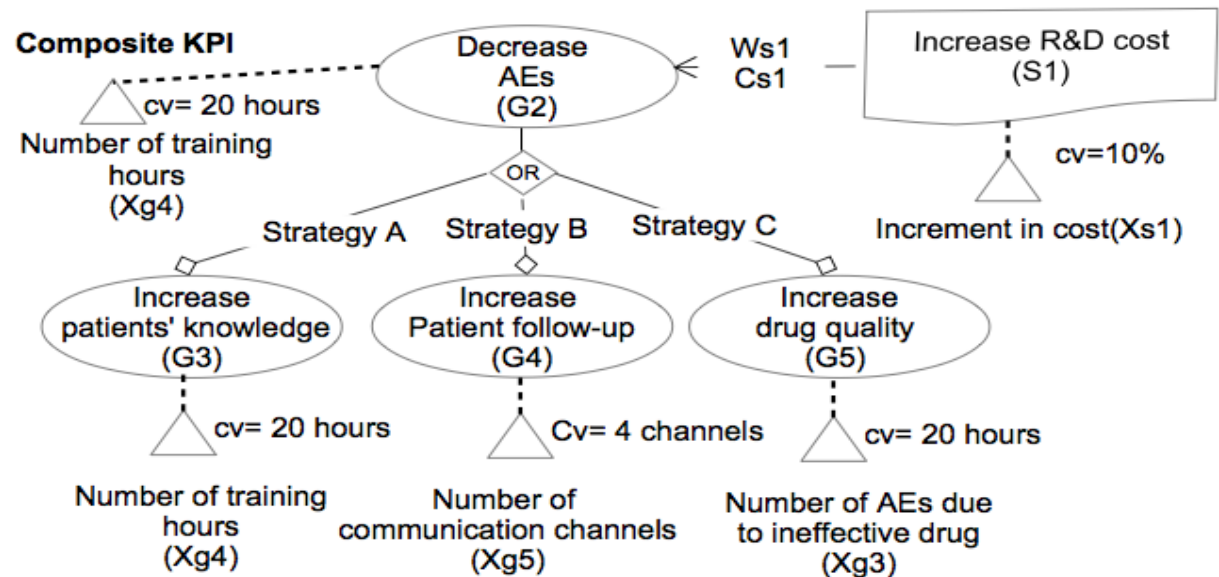
PHASE 2: ANALYSING POSSIBLE COURSES OF ACTIONS

Techniques to evaluate composite KPIs

Conversion factor technique

$$X_{g2} = X_{g2}^e + W_{s1} \cdot C_{s1} \cdot X_{s1} + \sum_{i=3}^5 W_{gi} \cdot C_{gi} \cdot X_{gi}$$

- X_{gi}^c composite KPI
- X_{gi} component KPI
- X_{si} Situation-related component KPI
- W_{gi} influence strength
- W_{si} Situation-related influence
- X_{gi}^e expected value of a composite KPI
- C_{gi} conversion factor
- C_{si} situation-related conversion factor



PHASE 2: ANALYSING POSSIBLE COURSES OF ACTIONS

- Each KPI has a current value evaluated against:
- Target, Threshold, Worst

- $PL = (\text{threshold} - \text{current}) / (\text{threshold} - \text{target}) * 100$
- $\text{target} < \text{current value} < \text{threshold}$

- $PL = (\text{threshold} - \text{current}) / (\text{worst} - \text{threshold}) * -100$
- $\text{threshold} < \text{current value} < \text{worst}$

Techniques to evaluate composite KPIs

Normalisation technique

$PL(X_{gi}^c)$ performance level of composite KPI

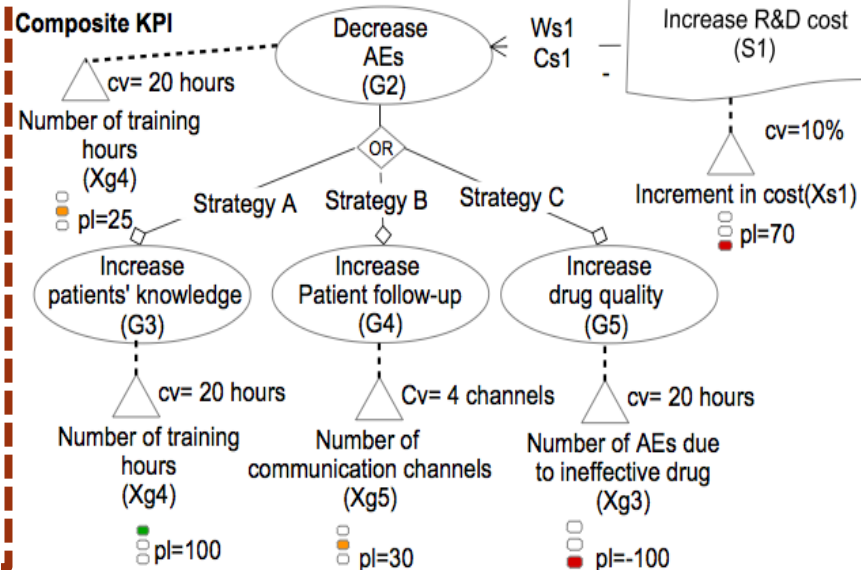
$PL(X_{gi})$ performance level of component KPI

$PL(X_{si})$ performance level of situation-related component KPI

W_{gi} influence strength

W_{si} situation-related influence strength

$$X_{g2} = CX_{s1} * PL(X_{s1} + \max[PL(X_{g3}), PL(X_{g4}), PL(X_{g5})])$$



Legend:

- Situation
- Goal
- ◇ Refinement node: AND, OR, XOR
- △ KPI
- Influence
- ◇ Refinement
- cv= current value
- W=weight
- C=conversion factor



PHASE 2: ANALYSING POSSIBLE COURSES OF ACTIONS

Mapping rules

$cv \geq t$	$M \leq cv < t$	$th \leq cv < M$	$w \leq cv < th$
$per^+ = \text{"Full"}$ $per^- = \text{"None"}$	$per^+ = \text{"Partial"}$ $per^- = \text{"None"}$	$per^+ = \text{"None"}$ $per^- = \text{"Partial"}$	$per^+ = \text{"None"}$ $per^- = \text{"Full"}$

per^+ Positive performance
 per^- Negative performance
 }
}
 Ranged from (Full, Partial, None)
 F > P > N

Propagation rules

$(X_i^a, X_j^a) \xrightarrow{and} X^c$	$X_i^a \xrightarrow{+S} X^c$	$X_i^a \xrightarrow{-S} X^c$	$X_i^a \xrightarrow{++S} X^c$	$X_i^a \xrightarrow{--S} X^c$
$\min \begin{cases} per^+(X_i^a) \\ per^+(X_j^a) \end{cases}$	$\min \begin{cases} per^+(X_i^a) \\ P \end{cases}$	N	$per^+(X_i^a)$	N
$\max \begin{cases} per^-(X_i^a) \\ per^-(X_j^a) \end{cases}$	N	$\min \begin{cases} per^+(X_i^a) \\ P \end{cases}$	N	$per^+(X_i^a)$

(+D), (-D), (++)D, (- -D) Influence strength-satisfied

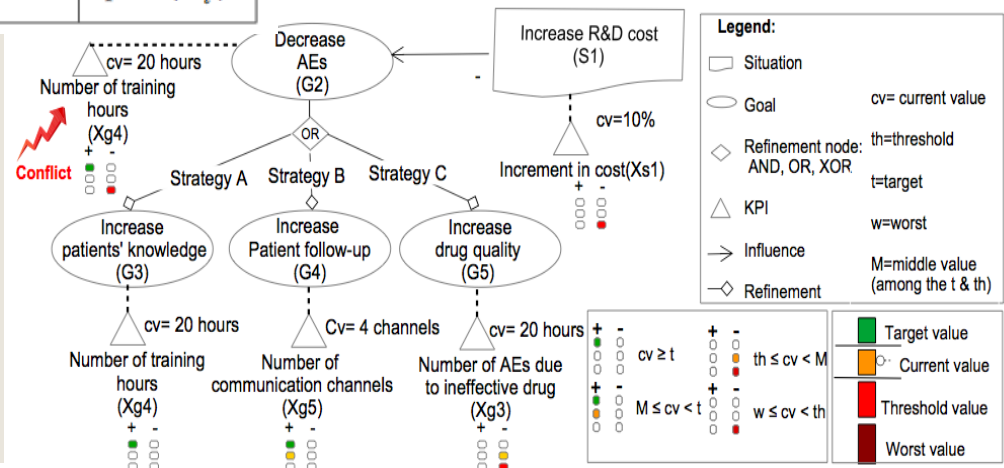
(+S), (-S), (++)S, (- -S) Influence strength-denied

X^c Composite KPI

X^a Component KPI

Techniques to evaluate composite KPIs

Qualitative technique



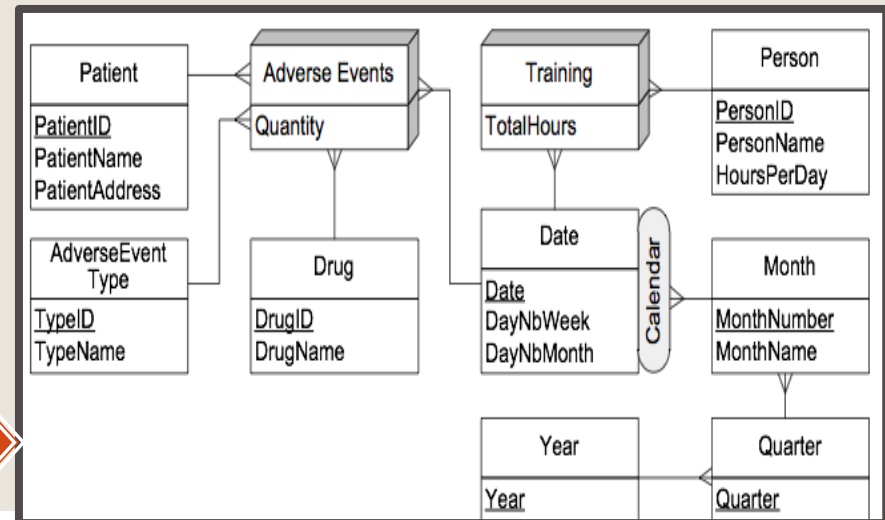
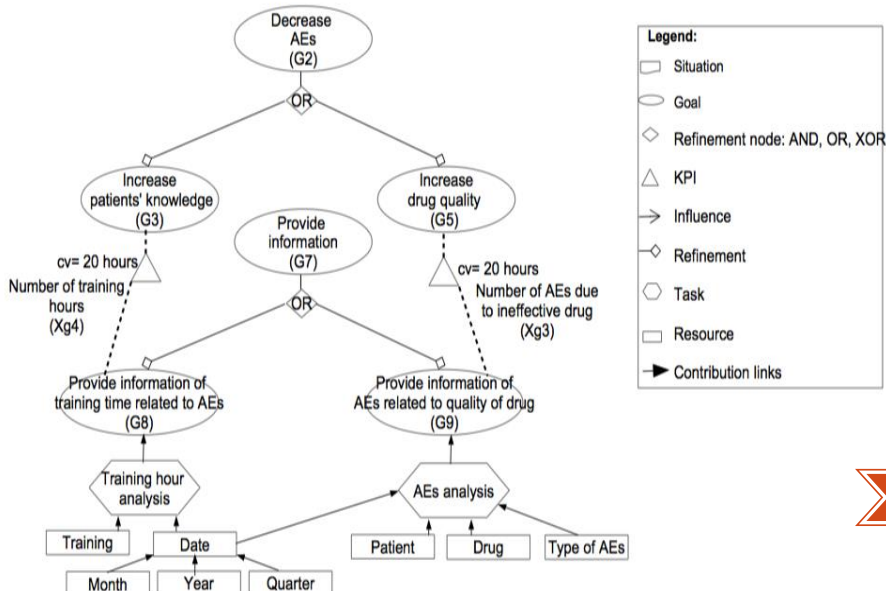
PHASE 3: SELECTING A PROPER COURSE OF ACTION

Objective

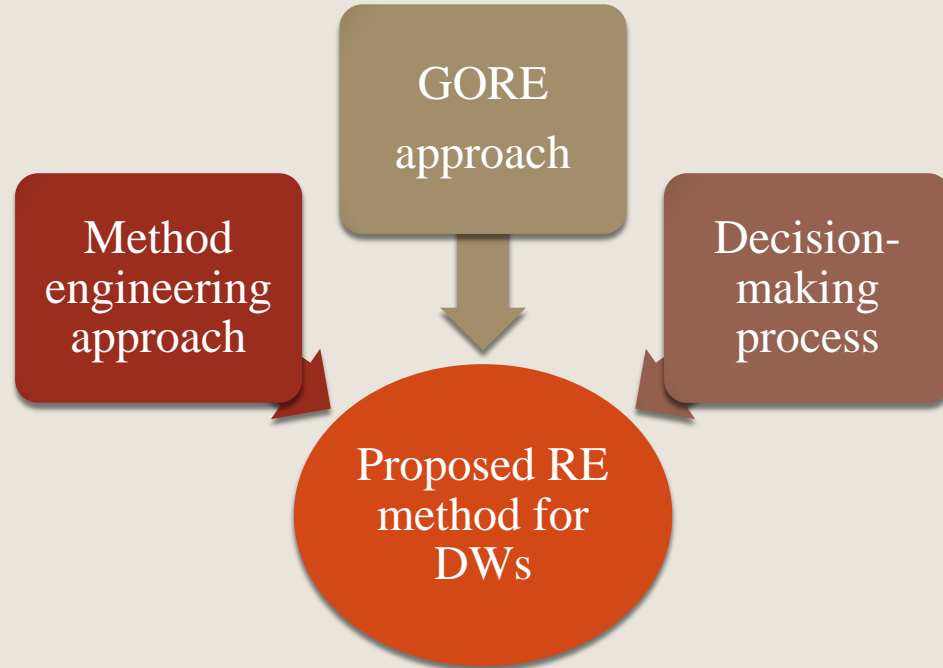
- ◆ What data and in which form is of particular interest for decision makers to store in DWs

Modeling

- ◆ Adopting goal models to eventually represent the information in the Multidimensional (MD) schema with elements of facts (the center of analysis) and dimensions (the context of analysis)



CONCLUSION



Advantages:

- ✓ Taking advantage of the contribution of existing works in the RE for BI systems
- ✓ Giving a big picture of what a GORE approach needs to support in the RE for DWs
- ✓ Involving the decision-making process in the early phase of the system development
- ✓ Covering all phases of the decision-making process

FUTURE WORK

- Extending the method with the dynamic part of the DW, where the requirements of operations on the DW are captured
- Extending goal models with UML to capture the interaction of users with a DW

THANK YOU FOR YOUR ATTENTION