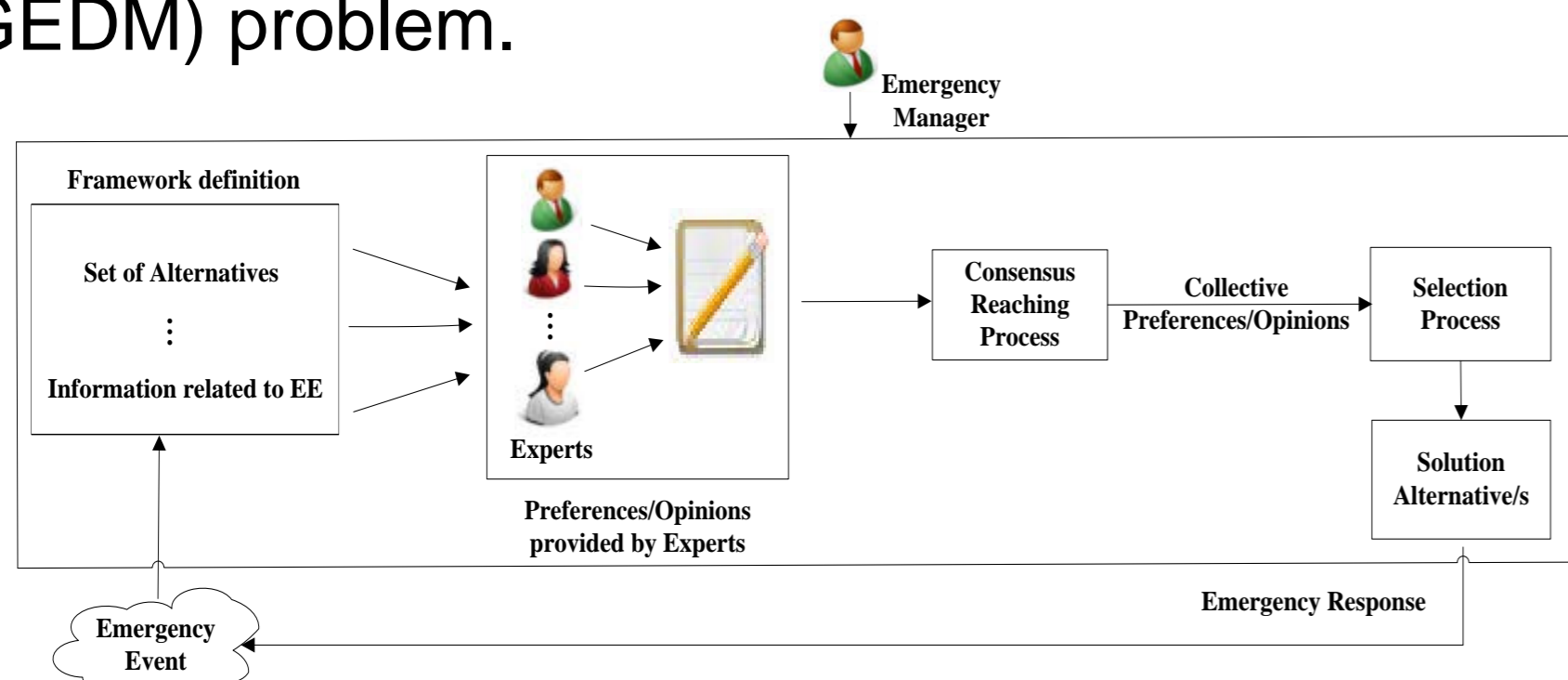


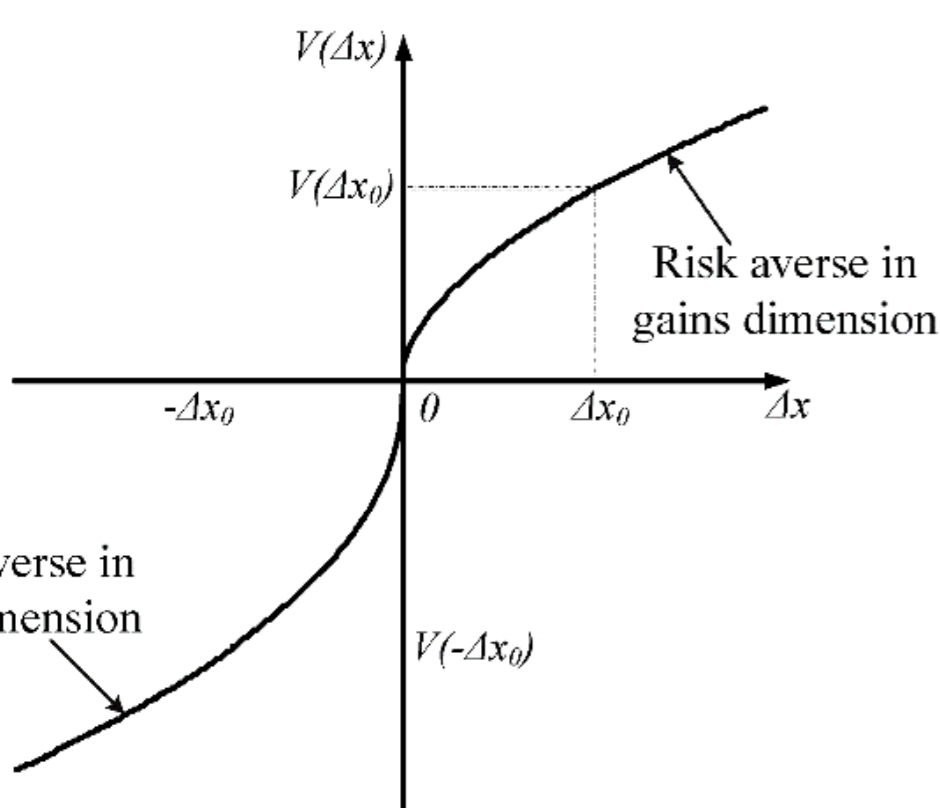
Group Emergency Decision Making

When an emergency event (EE) occurs, emergency decision making (EDM) is featured by lack of information and time pressure, resulting in potentially serious losses. In real world, just one decision maker (DM) may not be enough to deal effectively with the emergency decision problem and multiple experts with diverse backgrounds are invited to be a think tank supporting the DM in the decision process, which leads to the group EDM (GEDM) problem.



- Experts' psychological behaviours
 - Experts are bounded rational under risk and uncertainty hence, their psychological behaviors play an important role in GEDM process and it must be considered.
- Attribute weights determination
 - Previous EDM approaches set attribute weights mostly in terms of DM's subjective judgments, adding subjectivity to the decision and reducing its accuracy and correctness.

Taking into account these bullet points, a new GEDM method based on prospect theory to include experts' psychological behaviors in the group decision process has been developed. It also uses a data envelopment analysis model to determine the attribute weights in an objective way.



Prospect Theory

$$\text{Maximize } \theta_0 = \frac{\sum_{i=1}^B u_i y_{i0}}{\sum_{i=1}^J v_i x_{i0}}$$

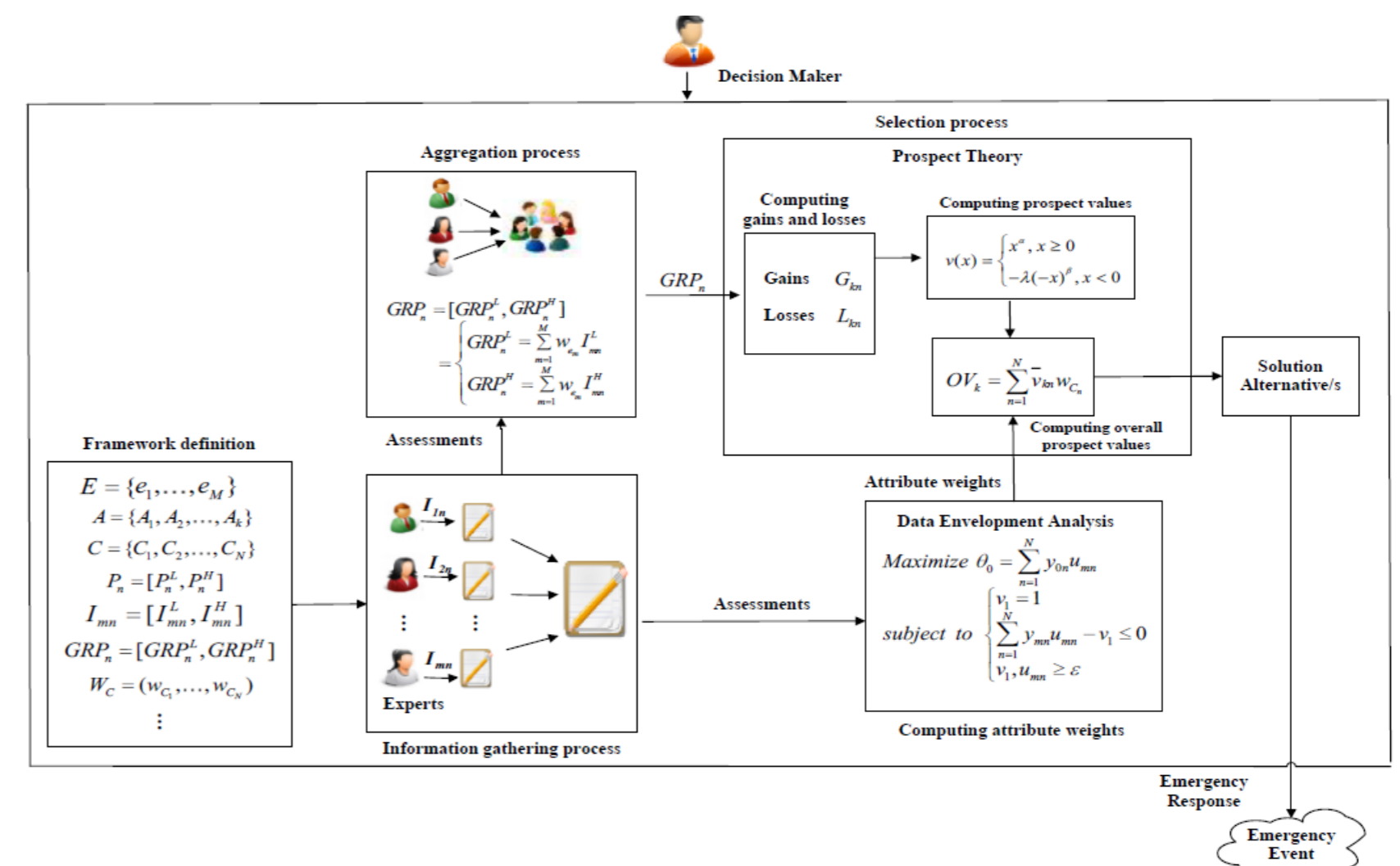
$$\text{subject to } \begin{cases} \sum_{i=1}^B u_i y_{ij} - \sum_{i=1}^J v_i x_{ij} \leq 0, & i=1, \dots, I, j=1, \dots, J \\ v_i, u_i \geq \varepsilon, & b=1, \dots, B \end{cases}$$

Data envelopment analysis

Group Emergency Decision Supporting System. GENESIS

In order to deal properly with real-world GEDM problems and make timely and effectively decisions, we have implemented a GDSS named GENESIS to support the proposed GEDM method.

GENESIS scheme



Illustrative example

Dataset: 5 experts, 4 alternatives, 3 criteria

Compute attribute weights

Aggregation process

Selection process

References

- Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica: Journal of the econometric society*, 263-291.
- Cosgrave, J. (1996). Decision making in emergencies. *Disaster Prevention and Management: An International Journal*, 5(4), 28-35.
- Charnes, A., Cooper, W. W., & Rhodes, E. (1978). Measuring the efficiency of decision making units. *European journal of operational research*, 2(6), 429-444.