

# Lab Report on the "Sweden Game" Educational Gaming Experiment

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## 1. Objective

[cite\_start]The objective of this experiment was to experience the "Sweden Game" as a part of educational gaming, and to learn the process of consensus-building for a complex cost-sharing problem with competing interests. [cite\_start]By analyzing the difference between a solution derived from theoretical calculation methods (like the Shapley value) and one obtained through practical negotiation, the experiment aims to foster an understanding of the importance of bargaining and teamwork in real-world problem-solving.

## 2. Method

[cite\_start]The "Sweden Game" is based on a scenario where six regions in the south-east of Sweden (A, H, K, L, M, T) plan to jointly construct a water supply pipeline.

[cite\_start]While joint construction lowers the total cost, the core issue is how to allocate this cost among the regions. [cite\_start]Each region naturally wants to minimize its own financial burden. [cite\_start]Simple methods like proportional distribution by population or water demand can lead to complaints, as some regions may find it cheaper to withdraw from the partnership and build their own pipeline.

[cite\_start]Participants, acting as representatives for each region, aimed to reach a consensus on the shoulder costs through negotiation.

## 3. Results

Our group (Group1) successfully reached a consensus among all six regions. The final agreed-upon shoulder costs for each region are as follows:

Region	A	H	K	L	M	T	Total
Shoulder Cost	189.5	111.9	63.5	102.7	180.8	189.8	838.2

During the negotiation, it was confirmed that the coalition "HKL" provided the maximum surplus (savings) with a value of 5.5.

## 4. Discussion

[cite\_start]To analyze our result, we compare our group's agreed-upon costs with the "Shapley Value," which is a concept from cooperative game theory for fair distribution based on each participant's contribution.

**Comparison of Agreed Cost vs. Shapley Value** (Unit: 100,000 Crone)

Region	Group1 Agreed Cost	[cite_start]Shapley Value	Difference (Agreed - Shapley)
A	189.5	200.1	-10.6
H	111.9	107.1	+4.8
K	63.5	66.1	-2.6
L	102.7	103.7	-1.0
M	180.8	169.4	+11.4
T	189.8	191.8	-2.0

The comparison shows that regions H and M agreed to pay more than their theoretical Shapley Value, while regions A, K, L, and T paid less.

[cite\_start]According to the lecture materials, the solution obtained through gaming reflects the interests of each team and has different features than the Shapley value. In our result, region M accepted a significantly higher cost than its theoretical share, which in turn allowed region A (with the highest individual cost) to achieve a large reduction. [cite\_start]This suggests that practical "strategy" and "bargaining" took place, where certain regions made concessions to achieve a consensus for the entire group. [cite\_start]This outcome supports the lecture's conclusion that achieving success in a stressful environment involving money and benefits requires **teamwork**.

5. Conclusion

Through this experiment, we experienced a consensus-building process for a complex cost-sharing problem using the gaming method. The solution our group negotiated differed from the purely mathematical Shapley Value, reflecting practical elements like group dynamics and compromise. [cite\_start]This experience served as valuable real-world training for negotiation and collaborative problem-solving.