Heuristics, biases and wrong lessons learned in humanitarian operations

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How many people need assistance in a disaster affected area? Which and how many items (eg. tents, plastic sheets, water and sanitation kits, etc) should be pre-positioned in a regional depot? How much money should organizations appeal for? These are a sample of important questions in humanitarian relief operations. Correctly answering them may make the difference between an effective relief operation and an ineffective one. It is common to assume that these questions can be answered more precisely once humanitarians with significant field experience have access to the proper information. The common belief behind such assumptions is that field experience allows humanitarians to make the most adequate decisions in the field. While these beliefs are often correct – experienced humanitarians can rely on their knowledge to make better decisions than inexperienced ones – field experience may not be enough to prevent humanitarians from making irrational decisions.

A vast body of literature has identified a number of cognitive and informational bounds on human rationality. [1] In addition, recent empirical studies suggest that these bounds lead to behavior that is inconsistent (ie. irrational) with the predictions of rational models in fields as widely varied as economics, finance, accounting, marketing, and operations management. [2] Hence, evidence from judgment and decision theory suggests that individual decisions for a large fraction of the population (whether they are experienced or not) deviate systematically from rational decisions. These deviations are usually classified in heuristics and biases. [3] Heuristics are rules-of-thumb that people use to make decisions, instead of making fully rational (considering an optimal set of) choices. Biases are deviations in the outcomes of individual decisions. Both heuristics and biases are often identified using (laboratory or field) experiments where participants are asked for their estimates in different treatments. Through careful analysis of participants answers, researchers learn about heuristics and biases used. Examples of possible implications of heuristics and biases for decisions in humanitarian settings are provided below. In the last section, an aspect of experience that may harm (instead of benefit) individual's decisions is presented.

Heuristic: anchoring and insufficient adjustment

In a simple experiment, I ask my MBA students to answer from recollection how many countries there are in Africa. (The correct answer is 53). Preceding that question, I usually tell them that I had a nice walk to school and (to one set of students) that the outside temperature was very pleasant at 25 degrees Celsius. To another set of students, I tell them that the outside temperature was very pleasant at 77 degrees Fahrenheit. Now, despite the

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[1] For cognitive and informational bounds on rationality see for instance the works of : Kahneman, D., A. Tversky. 1979. Prospect theory: An analysis of decision under risk. Econometrica, 47(2), 263-291; Simon, H.A. 1979.Rational Decision Making in Business Organizations. *The American Economic Review*. **69** (4) 493-513, and Tversky, A., D. Kahneman. 1974. Judgment under uncertainty: Heuristics and biases. Science, 185(4157), 1124-1131.

[2] For boundedly rational behavior in economics see Plott, C.R. 1986. Laboratory Experiments in Economics: The Implications of Posted-Price Institutions. *Science* **232**(4751) 732-738, and Smith, V.L. 1986. Experimental Methods in the Political Economy of Exchange. *Science* **234**(4773) 167-173; for inconsistent behavior in finance see Kahneman, D., J.L. Knetsch, R.H. Thaler. 1986. Fairness and the Assumptions of Economics. *J. Bus.* **59**(4) S285-S300, Kahneman, D., J.L. Knetsch, R.H. Thaler. 1990. Experimental Tests of the Endowment Effect and the Coase Theorem. *J. Polit. Econ.* **98**(6) 1325-1348, Shiller, R.J. 1981. Do Stock Prices Move Too Much to be Justified by Subsequent Changes in Dividends? *Am. Econ. Rev.* **71**(3) 421-436, and Thaler, R.H. 1988. Anomalies: The Winner's Curse. *J. Econ. Perspect.* **2**(1) 191-202; for anomalies in marketing see Glazer, R., J.H. Steckel, R.S. Winer. 1992. Locally Rational Decision Making: The Distracting Effect of Information on Managerial Performance. *Manage. Sci.* **38**(2) 212-226, and for behavior in operations management see Diehl, E., J.D. Sterman. 1995. Effects of Feedback Complexity on Dynamic Decision Making. *Organ. Behav. Hum. Dec.* **62**(2) 198-215, Schweitzer, M.E., G.P. Cachon. 2000. Decision Bias in the Newsvendor Problem with a Known Demand Distribution: Experimental Evidence. *Manage. Sci.* **46**(3) 404-420, and Sterman, J.D. 1989. Modeling Managerial Behavior: Misperceptions of Feedback in a Dynamic Decision Making Experiment. *Manage. Sci.* **35**(3) 321-339.

[3] The discussion on heuristics and biases borrows its structure from Bendolly, E., R. Croson, P. Gonçalves, and K. Schultz. 2009. Bodies of Knowledge for Behavioral Operations Management. Forthcoming Production and Operations Management.

fact that the outside temperature is completely irrelevant to the correct number of countries in Africa, students that have been exposed to the temperature in Celsius provide answers that are significant lower that the ones provided the temperature in Fahrenheit, on average 30 and 65 respectively.

The anchoring and adjustment heuristic is commonly used by individuals when they attempt to estimate facts that they do not know. Several studies show that the estimates are often *anchored* on environmental or situational factors that are irrelevant. When the individuals *adjust* their estimates, they usually do so less than what would be necessary. Consider now two examples of operational decisions more relevant to humanitarian relief operations: an ordering decision in a supply chain and a needs assessment decision. In an inventory management example, the anchoring and adjustment heuristic is used to explain participants' ordering behavior in a four-echelon supply chain game (The Beer Distribution Game).[4]). Participants anchor their orders on the demand forecast and adjust them up or down to maintain desired levels of inventory and orders-in-transit. The study found that the anchoring and adjustment heuristic captured participants' ordering decisions well. It also found that the heuristic lead to systematic supply chain instability, as participants insufficiently adjusted for orders-in-transit.

In another example, I asked master students in the humanitarian logistics and management program to estimate the affected population in a massive earthquake that took place in an urban area. I also informed them that the government estimated that 25 percent (or 75 percent) of the structures in this 2 million people city were completely destroyed or severely damaged. The students had to answer three questions:

1. How many people need assistance?
2. How confident are you in your estimate (percentage)?
3. Generate a range for your estimate (minimum and maximum).

In both treatments (25 percent and 75 percent of structures damaged), the estimates of people needing assistance were very close to the expected means (500 thousand and 1,500 thousand, respectively). The answers were 475 thousand and 1,679 thousand, respectively. But the answers to the other two questions were more revealing. People in the 25 percent treatment reported a low confidence in their assessments, averaging 40 percent, and generated a broad confidence interval for their estimate, with a minimum of 330 thousand (34 percent below the expected mean) and a maximum of 659 thousand (32 percent above). In contrast, people in the 75 percent treatment reported a high confidence in their estimates (76 percent confident), and accordingly generated a narrow interval for their estimate, with a minimum of 1,190 thousand (21 percent below the expected mean) and a maximum of 1,580 thousand (5 percent above). Since no information had been provided on the accuracy of the estimation, a no response would be appropriate, but experienced humanitarians anchored on the relative size of the impact to generate an estimate for their confidence.

Through the above examples, the anchoring and adjustment heuristic cautions us that individuals anchor their estimates on irrelevant information to make important decisions about things they do not know. It is important to be aware of how we may use such heuristic and its potential influence by irrelevant anchors on our decisions

Bias: loss aversion, the reflection effect and framing

A number of studies demonstrate that individuals treat gains and losses differently. *Loss aversion* suggests that individuals hurt more when experiencing losses than they enjoy when experiencing gains. As a consequence of losses hurting more than gains, humanitarian organizations may maintain ineffective programs because abandoning them may hurt more than the benefit gained from developing a new one. In addition, the *reflection effect* suggests that individuals make risk-averse decisions when facing gains, but make risk-loving decisions when facing losses. Taken together, *loss aversion* and the *reflection effect* suggest that individuals' decisions can be influenced by the way the problem is presented, also known as *framing*.

Following a classic framing experiment, I asked my humanitarian students to choose between two vaccination programs to deal with a new epidemic that was expected to claim the lives of 600 people. The two vaccination programs were mutually exclusive; using one would eliminate the possibility of using the other. One set of students received the following description (lives saved treatment):

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[4] The beer game represents a serial supply chain with four echelons: retailer, wholesaler, distributor, and factory (R, W, D, and F, respectively). Each supply chain is managed by a team charged with minimizing the supply chain cost. Each echelon incurs an inventory holding cost of $0.50 per unit/week and a backlog cost of $1.00 per unit/week. Each simulated week players must (1) receive shipments, (2) fill customer orders, if sufficient inventory is available, otherwise accumulate a backlog; and (3) place an order with its supplier.

Program A: 200 people will be saved
Program B: there is a probability of 1/3 of saving 600 people and a probability of 2/3 of not saving anyone

The second set of students received the same alternatives framed differently (lives lost treatment):

Program C: 400 people will die
Program D: there is a probability of 1/3 that no one will die and a probability of 2/3 that 600 people will die

It is important to recognize that the two vaccination programs are identical; they are simply described differently. When the vaccination programs were framed in terms of gains (lives saved), 71 percent of the students preferred the risk-averse choice (program A).[5]). When asked why they preferred program A, several students suggested that it was better to save 200 people for sure than to risk not saving anyone. When the vaccination programs were framed in terms of losses (lives lost), 89 percent of the students preferred the risky choice (program D).[6] When I asked them why they preferred program D, they told me that they had to take the gamble because it was unacceptable that 400 people would die for sure. As one student pointed out: "[He] had to do something to try to save them." In each of the two treatments (lives saved and lost) the two vaccination programs are identical; they are simply described differently. However, the minor difference in description is sufficient to elicit very different systematic responses from experienced practitioners. Humanitarians working in relief operations face life-and-death (gains-and-losses) situations all the time and are constantly faced with similar decisions. In several specific situations, it might be unclear whether a risk-averse or a risk-seeking choice might be best. However, depending on the way individuals perceive (and frame) the problem, they may be systematically more prone to adopt one course of action than another. Limiting the number of options upfront due to framing may lead to ineffective responses. More important, in situations where there may be clear advantages of a risk averse or a risk-seeking option, framing the problem in the proper way could be used to help decision-makers make the appropriate choice.

Learned helplessness
Here is how past experience might actually lead to bad outcomes. The term *learned helplessness* comes from animal psychology and experiments conducted with animals. However, it also applies to human beings. It describes a condition where individuals learn to feel helpless and powerless over a situation. To exemplify the problem, I asked my humanitarian students to place themselves in the position of a cluster lead in charge of putting together an appeal for an emergency. Managers in the cluster came up with an initial requirement of $200 million to meet the needs of the beneficiaries. The initial assessment is uncertain and as the cluster lead, students had flexibility to appeal for more. However, I also cautioned them that if they would ask too much the appeal could lose credibility. Finally, I told them that, from past experience, appeals only get partially funded. To one set of students (the low percentage funding), the average funding amount had been 50 percent of the requested appeal. To another set of students (the high percentage funding), the average funding had been 90 percent of the appeal. I asked them:

1. How much money do you appeal for?
2. What is your rationale for choosing this amount?

In the low funding condition (when people needed $200 million, but expected to receive only half -$100 million), it would be rational to expect students to ask up to $400 million. In the high funding condition (when people expected to receive 10% less of what they needed) it would be rational for students to ask up to $222 million. In the low funding condition, students asked (on average) $203 million (a 1.5% increase in the initial requirement). Half of the students asked for exactly $200 million. As one student explained: "Always ask what you need or the donors will not trust you." A few students asked for a bit more to compensate for the expected shortage of funds. However, almost 30 percent of the students asked for ***less*** than $200 million. One student who asked for $100 million explained that "chance is that even 50 percent won't be funded." So they ordered less than the requirement from the outset. However, in the high funding condition (when people needed $200 million, but expected to receive $180 million), students asked (on average) $221 million (an 11% increase in the initial requirement). Most students asked 10% more to compensate for the expected shortage and ***no one*** asked

[5]The original study found 72% of participants choosing program A.
[6] The original study found 78% of participants choosing program D.

for less than $200 million. Given that the low (50%) funding condition brings much less money to meet the initial requirement than the high (90%) funding condition, it would be rational to expect that students would appeal for more when they observe a low funding situation. Instead, the opposite took place. Students had little problem compensating the 10% upwards required to meet the need of beneficiaries. However, when it was even more important to adjust the initial requirement, they stopped short of doing so. Instead, they rationalized that the requirements had to be proven, be consolidated, etc. Some students felt helpless enough to ask less than the initial requirement. These decisions were highly influenced by past experience in the sector having significant implications for important humanitarian decisions.

Conclusion

We commonly think of individuals as fully rational with unparallel cognitive abilities. We also tend to think of past experience as always good. However, a number of studies show that individuals' decisions are boundedly rational. Instead of making fully rational decisions, individuals adopt simple rules-of-thumb to solve problems. Individuals' decisions often lead to biases, systematically deviating from what's optimal. Experience is only as good as the lessons that are learned. Further understanding of possible heuristics, biases and wrong lessons learned in humanitarian settings has the potential to improve the effectiveness and appropriateness of common and frequent decisions made by humanitarians during relief operations.

About the author

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About the organization

The Master of Advanced Studies in Humanitarian Logistics and Management is a part time master program intended for professionals in the humanitarian sector interested in advancing their managerial, quantitative, analytical and decision making skills. The program is based on an interdisciplinary and integrative approach aimed at building understanding of pressing humanitarian issues and development of policies capable of addressing them.