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A Causal Model of Individual Decision Making Under Time Pressure

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Introduction

In Figure 1 we present a causal model of the relationship between time pressure and decision quality. The model represents causes and effects in an individual actor working toward a decision. This model distinguishes between the actor's perception of high effort per unit time and the psychological stress that may result from such a perception. An explanation of the model is followed by recommendations for the design of compensatory decision aids for use under time pressure.

The model is founded on three assumptions: decision-making requires effort, effort is a limited resource, and effort is motivated by vested interests.

Decision Making Effort

People are continuously faced with the need to choose one course of action over another. Such choices must be made year-to-year, day-to-day, moment-to-moment. Where shall we locate our new plant? Where shall I put this truck-load of parts? Should I buy soy beans now or ten seconds from now? The making of a choice requires some cognitive effort to frame the choice, access information, and select a course of action. Some choices require very little effort, others require a great deal of effort, but they all require some effort.

There is a limit on how much effort a person can make in a given time slice. The best runners can only cover a quarter of a mile in one minute. The best analyst can only assimilate one stock quotation per second. The more effort a person makes per unit time, the shorter the time a person can sustain the rate of effort. A person can jog for hours, but can sprint for only seconds.

People have more choice-making opportunities than they have resources to make the choices. They must therefore develop strategies deciding which choices to make and how much effort to spend on making those choices. This model posits that people expend their limited effort resources to achieve some set of desired end states, or goals. People may hold multiple goals: to survive, to thrive -- to impress one another, to have fun -- the possibilities are many and varied. These goals may even be mutually exclusive. At any given time a person may be more aware of some goals and less aware of others. People will expend effort on choice making to the degree that they believe the effort will lead to some outcome they want.

Causes of Decision Quality

The model posits that decision quality is a positive function of the amount of effort made, the quality of the decision process, and the consistency with which the process is applied. For a given actor, the quality of a given decision is a positive function of the effort expended to make the decision. Decision making requires cognitive effort to find and assimilate enough information to understand the situation and to generate a choice. While the relationship between effort and decision quality is positive, it is not linear. The difference in decision quality between no effort and a little effort may be great, but at some point the expenditure of large quantities of additional effort will yield very little increase in decision quality.

Effort as a function of Perceived Effort per unit time Required

The actor who faces a time-bounded choice develops some perception of the amount of effort per unit time required to make a good quality decision. This in turn controls the level of effort per unit time actually expended. The simplest explanation of this relationship would be that the person works as hard as they think they need to work to get the job done in the time available. If the actor perceives that little effort were required, little effort would be made. If the actor perceives that great effort were required, great effort would be made. However, the relationship between perceived effort required and actual effort made is not that simple. It is moderated by two other constructs: Desire-for-end-state and Self-Efficacy. These two constructs act as valves on the causal connection between perceived effort per unit time required and actual effort expended.

Moderators of Effort Expended

Consider first the moderating influence of vested interest, or the desire for end-state, on the amount of effort expended. A person may understand that a particular decision will require a certain level of effort. The person may decide however, that the desired end-state is not sufficiently valuable to warrant that amount of effort. In that case the actor will make less effort than is required, or perhaps no effort at all.

Consider next the moderating influence of self-efficacy on the causal relationship between perceived effort per unit time required and the actual level of effort spent. Self-efficacy is a probabilistic assessment by the actor that the actor is actually capable of achieving the task. A person may strongly desire a particular outcome, and so may be willing to expend a great deal of effort to achieve it. However, if the person perceives that there is no possibility that the effort will result in a desired outcome, the person will choose not to expend the effort. Self-efficacy therefore acts as a valve on the causal connection between perceived level of effort required and actual effort expended.

When facing a time-bounded choice an actor develops not only a sense of how much effort per unit time will be required to accomplish the task, the actor also develops a perception of how much effort per unit time is available. We assert that it is the ratio of the perceptions of available and required efforts that determine a decision maker's self-efficacy. We characterize self-efficacy as a subjective probabilistic assessment ranging from 0.0 to 1.0. Self-efficacy is high if the actor is absolutely certain that there is sufficient effort available to finish the task on time. Self-efficacy is low if the actor believes there is little chance that the task can be finished on time with available effort. Self-efficacy drops to zero if the actor believes that there is no chance the task can be finished on time given the effort available.

An actor experiencing very low self-efficacy may still elect to make a substantial effort in hopes of achieving the goal. An actor whose self-efficacy drops to zero, however, will expend no effort toward the goal, believing that all such effort would be wasted.

Time Pressure as a Function of Self-efficacy and Vested Interest

We have defined time pressure as: a feeling of stress derived from a perception that there may not be enough time to achieve a desired end state. We do not frame time pressure simply as the presence of a time-bounded task. Nor do we frame it as the perception that there may not sufficient time to complete the task (self-efficacy). The presence of a time-bounded task and low self-efficacy are both necessary conditions for time pressure, but they are not sufficient to fully explain it. An actor may well face a time-bounded task, perceive that there is insufficient time to achieve the task, and yet if the actor has no stake in the outcome of the task, the actor may feel no stress. Only if the actor has a vested interest in the outcome will the actor be stressed by the possibility that the outcome will not be achieved. The stronger the desire for the end state, the more stress the actor may feel as self-efficacy drops. Thus time pressure is thus caused by an interaction between self-efficacy and vested interest, rather than by either construct alone.

Decision Quality

It is tempting to measure the quality of any single decision in terms of the outcome that it obtains. However, in situations with risk and uncertainty, good outcomes sometimes result from poor decisions. For example, a casino gambler who makes completely random bets may occasionally win a large sum. Similarly, an actor who makes very well informed, deliberate choices may still sometimes obtain bad outcomes because of factors that are outside of his control. In general, we expect that a good process will lead to favorable outcomes more often than not. Therefore we measure the quality of a decision through examination of the quality of the decision process.

Given a particular decision process, the quality of decisions that ensue will depend on the degree to which the actor applies the process consistently. Consider the analogy of two golfers who play the same hole repeatedly. The first golfer uses a high quality decision process to choose his club, then executes an absolutely consistent swing which always places the ball in exactly the same spot, 4 feet left of the hole. The second golfer uses the same process to choose the same club, but swings inconsistently and places the ball in a widely-scattered pattern that averages 4 feet left of the hole, but some of the shots may go in the sand trap, some in the water, and some through the clubhouse window. Both golfers use the same decision process to arrive at their choice of clubs. The second golfer may even accidentally get a hole-in-one from time to time, but the first golfer is likely to have a better average score over time.

In like manner a decision maker who applies a strategy consistently will obtain results that are consistent with the risks inherent in the environment. Over time the decision maker may even be able to improve the process based on the consistent results that obtain. An inconsistent application of the process will lead to more varied results, which will leave the decision maker with less information about the quality of the process and less opportunity to improve it.

The stress of time pressure imposes a cognitive load on the actor who experiences it. If there is no time pressure, the actor may work through a decision process without distraction. As time pressure mounts, the actor may have a harder time focusing on the details of the decision process. The stress may become something of a distraction. Under high stress the actor may be so distracted that the actor loses the ability to execute components of the task completely. Thus, process consistency will be an inverse function of Time Pressure

Summary

The model suggests that the only direct influence of time pressure on decision quality is through process consistency. Therefore any compensatory aid which enforces a structure on a decision process should improve the process consistency, thereby improving decision quality under time pressure. The model predicts that for a given situation, decision quality will improve if the actor perceives that more effort is available, less effort is required, or that they have higher self-efficacy. Any decision aid that influences these perceptions in the proper direction should have a positive effect on decision quality.

Figure 1. A Causal Model of Individual Decision Making Under Time Pressure

