To Buy or Not to Buy? That is the Question

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Introduction/Motivation

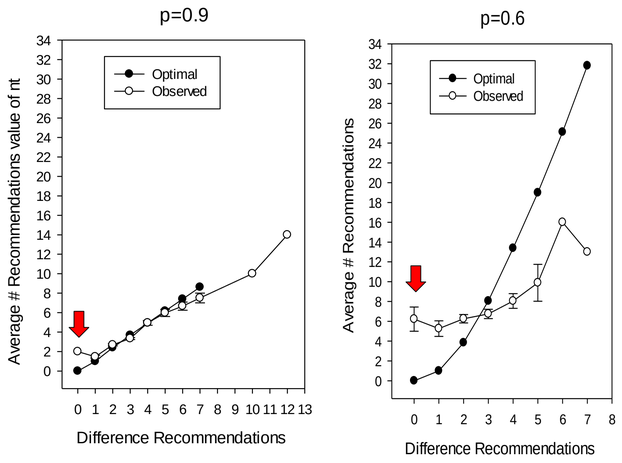
The critical step facing every decision maker is when to stop collecting evidence and make a decision. This is known as the stopping rule. Over the years, several unconnected explanations have been proposed that suggest nonoptimal approaches can account for some of the observable violations of the optimal stopping rule. **The current research proposes an unifying explanation for these violations based on a new stopping rule selection (SRS) theory.** The main innovation here is the assumption that a decision maker draws from a large set of different kinds of stopping rules and is not limited to use of a single one. The SRS theory hypothesizes that there is a storage area for stopping rules called the decision operative space (DOS)—and a retrieval mechanism that is used to select stopping rules from the DOS. The SRS theory has proven itself to be a good fit to challenging data published in the relevant literature.

Deferred decision making

- In a deferred decision making task, subjects must decide whether or not to buy a product of unknown quality, basing their decision on reviews selected.
- The reliability of the reviews varied (for example .6, .75, .9).

Non-optimal deferred decision making paradoxes

(1) People bought **too much or too little evidence** (Pitz, 1968)



(2) People terminated evidence collection when the **critical difference was zero** (*d*=0; Pitz et al., 1969)

{Buy, Buy, Don't, Don't}→Buy
{1, 1, 0, 0}→1

(3) People stopped on **nondiagnostic patterns**

{Buy, Buy, Buy, Don't}→Buy
{1, 1, 1, 0}→1

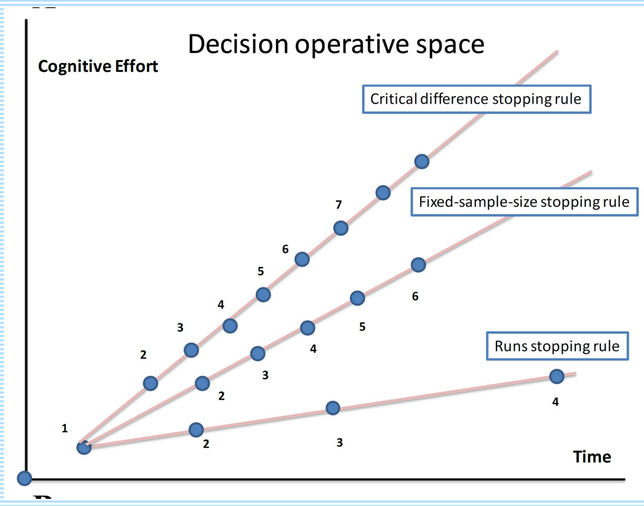
A formal description of the SRS theory

Hypothesis 1: Multiple stopping rules. The SRS theory assumes that several different stopping rules can operate concurrently. Decision makers act adaptively to changes in the environment, not only by calibrating different *stopping rule values* (value criterion), but also by switching between different stopping rules if needed.

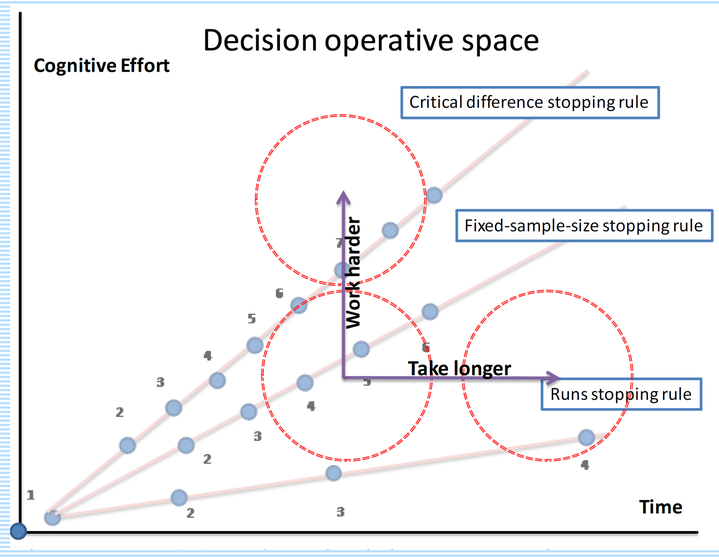
Stopping Rule: a decision rule used to decide when to stop collecting evidence, and make final decisions.

- ***Critical Difference***: stop when a total sum of bipolar evidence reaches a critical value of (*d*).
- ***Fixed Sample Size***: stop a collection on a cerain number of evidence (*s*)
- ***Runs (Streak)***: stop on a repeated sequence of evidence of a certain size (*r*).
- ***Optimal Decision Rule:*** stop when the expected value of loss is equal to, or lower than the expected loss associated with deferring the decision and collecting more evidence.

Hypothesis 2: Storage for stopping rules—the decision operative space (DOS). A major component of the SRS theory is a storage place for the stopping rules and their values, which is called the decision operative space (DOS).



Hypothesis 3: : Retrieval of the stopping rules. A retrieval mechanism called "cast-net" retrieval is proposed. Selection of stopping rules resembles throwing a cast net and catching fish. A decision maker acts much like a fisherman, casting a net into the operative space. Here, on each throw the catch is a subset of possible stopping rules. To behave adaptively in different environments, decision makers adjust the location in the DOS where the net will be cast, and the size of the net.



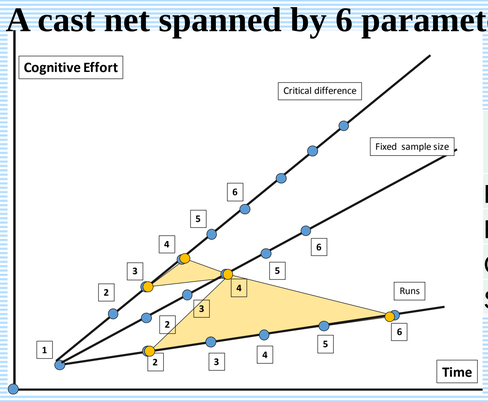
SRS model fit to Busemeyer and Rapoport (1988) data

Evidence	Response accuracy	Observed	SRS fit
Observed matched patterns			
{1, 1}	Correct	0.06	0.1
{0, 0}	Correct	0.07	0.1
{1, 1, 1}	Correct	0.19	0.17
{0, 0 ,0}	Correct	0.18	0.16
{1, 0, 1, 1}	Correct	0.05	0.04
{0, 1, 1, 1}	Correct	0.05	0.04
{1, 1, 1, 1}	Correct	0.08	0.07
{1, 1, 1, 0} *	Correct	0.001	0.01
{1, 1, 0, 1}	Correct	0.05	0.03
{1, 1, 0, 0} *	Incorrect	0.001	0.01
{1, 0, 0, 0}	Correct	0.07	0.04
{0, 0 ,0 ,0}	Correct	0.06	0.07
{0, 1, 0, 0}	Correct	0.06	0.04
{0, 0 , 1 ,0}	Correct	0.05	0.03
{0, 0 , 0, 1}	Correct	0.01	0.01
Observed non-matched patterns			
{0, 0, 1}	Incorrect	0.002388	0
{0, 1, 1}	Correct	0.009817	0
{1, 0, 0}	Correct	0.002786	0

"1" = positive evidence opinion
"0" = negative evidence opinion

R^2=.86,

A cast net spanned by 6 parameters



Stopping rule	Proportion recovered
Runs	0.25
Fixed sample size	0.46
Critical Difference	0.29
Stop on one	0.00

SRS model fit to Pitz (1969) data

d	Source reliability *p*=.6 r^2=0.93		
	Observed	**SRS**	**Optimal**
0	3.05	3.89	0
1	4.43	4.51	1
2	5.2	4.75	3.84
3	4.74	5	8.05
4	7.12	6.86	13.37

Conclusions

1. **SRS theory implies simple, suboptimal stopping rules for decision making that are not based on complex computations.**
2. **The SRS computational model can provide an excellent account of reported human data patterns. It is able to account for between 93% and 100% of the variability of Pitz's (1968) data and for about 86% of observed evidence patterns in Busemeyer and Rapoport's (1988) data.**
3. **The SRS model was able to account for all three paradoxes that falsified the optimal decision making approach.**

Recommended Readings

Busemeyer, J. R., & Rapoport, A. (1988). Psychological models of deferred decision making. *Journal of Mathematical Psychology*, *32*, 91–134.

Pitz, G. F. (1968). Information seeking when available information is limited. *Journal of Experimental Psychology*, *76*, 25–34.

Pitz, G. F., Reinhold, H., & Geller, E. S. (1969). Strategies of information seeking in deferred decision making. *Organizational Behavior and Human Performance*, *4*, 1–19.

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