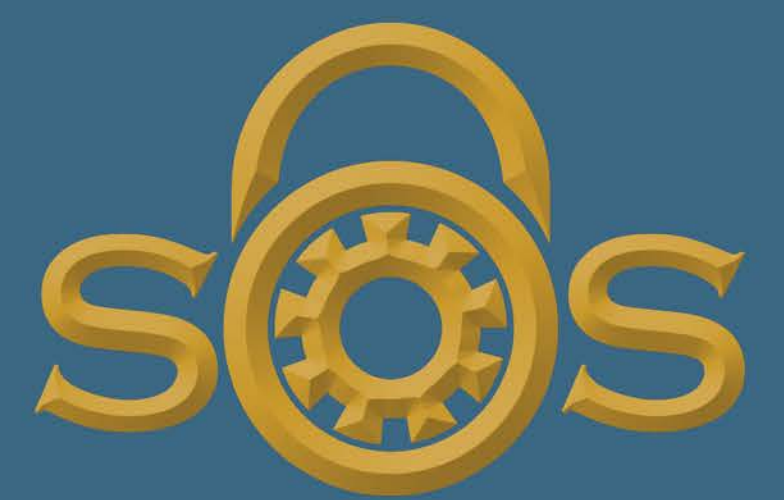


# Human Decision Models

In Computer Security

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SCIENCE OF SECURITY  
VIRTUAL ORGANIZATION

The Science of Security Initiative is funded by  
the National Security Agency.

## MOTIVATION

- In order to improve the security of our systems, we must consider the the human piece of the puzzle
- To do this, we must examine the underlying aspects of human decision-making behavior
- By identifying the patterns of theories underlying studies in the field, we can gain a better understanding of what has been done, and identify future steps for research

## RESEARCH GOALS

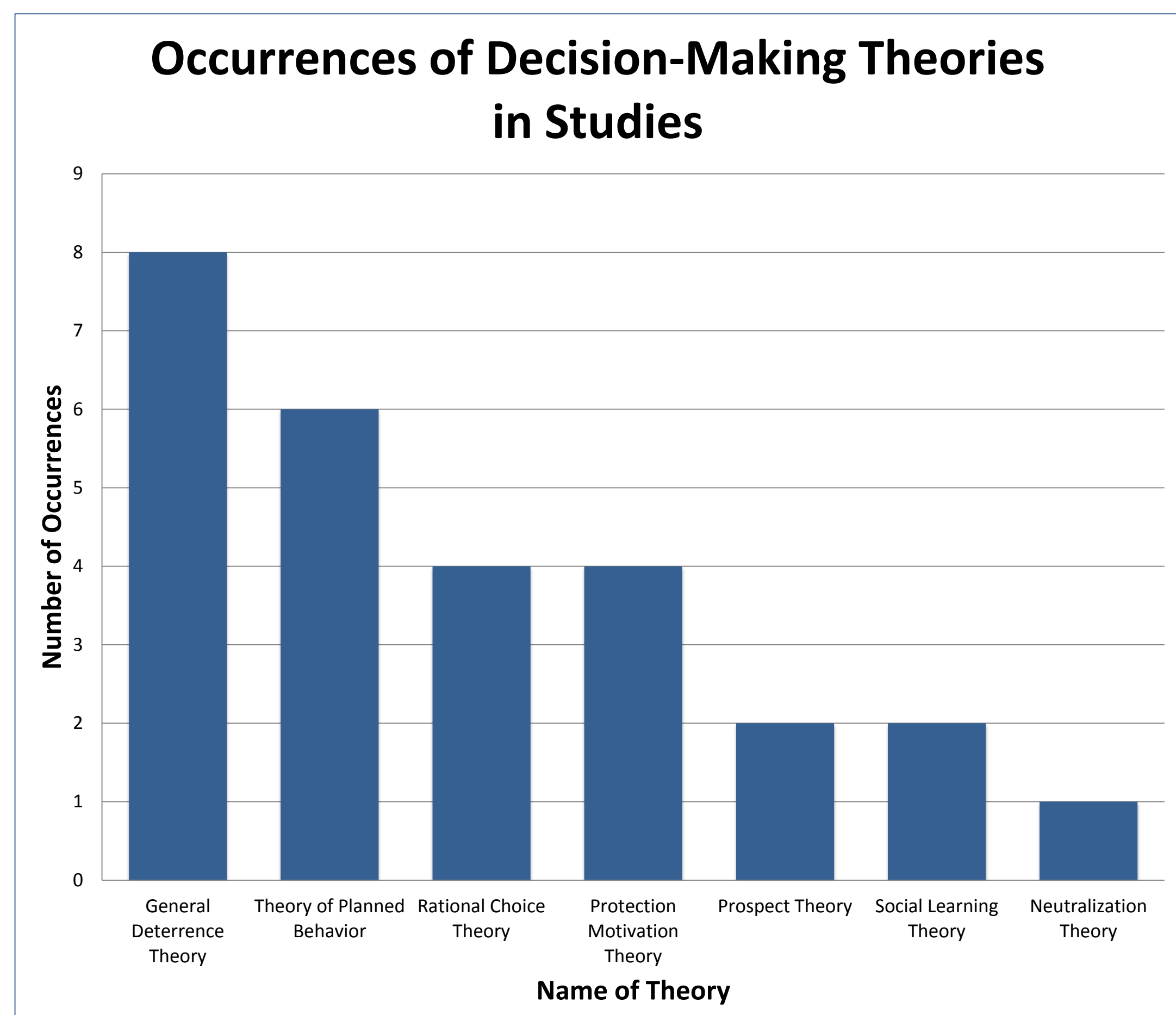
- Examine relevant studies dealing with human decision-making models in computer security
- Identify the psychological theories on which those studies have their basis
- Quantify the occurrences of said theories, and examine the data for patterns and connections to progress related research

## METHODOLOGY

- A systematic review of literature was conducted on human decision-making models in security
- Studies were found by searching keyword combinations (perceived risk, password policy, risk decision-making, security awareness, security decision-making models) in 6 major library databases
- Pared down from the original 513 results by specific criteria:
  - Concrete data presented for validation
  - Psychological basis of theory
  - Published between 2000 and 2015
- After screening, 32 papers were reviewed

## FINDINGS

- Several theories of human decision-making were yielded by the literature review, each appearing in numerous studies
- Descriptions of the relevant theories appear in the order of how frequently they appeared in the studies examined
- Additional analysis will be carried out as we continue to explore the topic



## GENERAL DETERRENCE THEORY

- Disincentives or sanctions against committing a criminal act, where sanctions are formal punishments for failing to follow established security policy
  - *Certainty of Sanctions*: probability of being punished
  - *Severity of Sanctions*: degree of punishment associated with the act
- **Referenced 8 times in eligible studies**

## RATIONAL CHOICE THEORY

- An individual determines how they will act by balancing the costs and benefits of their actions
- The individual recognizes alternative courses of action, and contemplates the likely outcomes of each course of action
  - *Outcome*: the state of the world after an action is taken (a given action can lead to various outcomes)
- **Referenced 4 times in eligible studies**

## THEORY OF PLANNED BEHAVIOR

- An individual's intention is a key factor for predicting their behavior
- Focuses on an individual's perception and the beliefs of those around them to predict behavior
  - *Attitudes Toward Behavior*: the degree to which a person views a behavior, positively or negatively
  - *Social Factors (subjective norms)*: degree to which a person is willing to comply with the social demands of a behavior
  - *Control Factors (perceived behavioral control)*: how a person shapes their intentions based on their personal beliefs
- **Referenced 6 times in eligible studies**

## PROTECTION MOTIVATION THEORY

- Motivation emanates from not only threat appraisal, but from the coping appraisal as well
- *Coping Appraisal*: a person's assessment of how well they can deal with a threat
  - Self-Efficacy
  - Response Efficacy
  - Response Cost
- **Referenced 4 times in eligible studies**

## FUTURE WORK

- Conduct a more comprehensive and robust review on this topic
- Apply theories more concretely to predictive models for human decision-making behavior