MHE9102
Research Methodology

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ANOL BHATTACHERJEE (2012). University of South Florida Tampa, Florida, USA

Chapter 4
Theories in Scientific Research

- As we know from previous chapters, science is knowledge represented as a collection of "theories" derived using the scientific method. In this chapter, we will examine what is a theory, why do we need theories in research, what are the building blocks of a theory, how to evaluate theories, how can we apply theories in research, and also presents illustrative examples of five theories frequently used in social science research.

Theories

- Theories are explanations of a natural or social behavior, event, or phenomenon. More formally, a scientific theory is a system of constructs (concepts) and propositions (relationships between those constructs) that collectively presents a logical, systematic, and coherent explanation of a phenomenon of interest within some assumptions and boundary conditions (Bacharach 1989).[1]

- Theories should explain why things happen, rather than just describe or predict. Note that it is possible to predict events or behaviors using a set of predictors, without necessarily explaining why such events are taking place. For instance, market analysts predict fluctuations in the stock market based on market announcements, earnings reports of major companies, and new data from the Federal Reserve and other agencies, based on previously observed correlations. Prediction requires only correlations.

- In contrast, explanations require causations, or understanding of cause-effect relationships. Establishing causation requires three conditions: (1) correlations between two constructs, (2) temporal precedence (the cause must precede the effect in time), and (3) rejection of alternative hypotheses (through testing). Scientific theories are different from theological, philosophical, or other explanations in that scientific theories can be empirically tested using scientific methods.

- Explanations can be idiographic or nomothetic. Idiographic explanations are those that explain a single situation or event in idiosyncratic detail. For example, you did poorly on an exam because: (1) you forgot that you had an exam on that day, (2) you arrived late to the exam due to a traffic jam, (3) you panicked midway through the exam, (4) you had to work late the previous evening and could not study for the exam, or even (5) your dog ate your text book. The explanations may be detailed, accurate, and valid, but they may not apply to other similar situations, even involving the same person, and are hence not generalizable.

- In contrast, nomothetic explanations seek to explain a class of situations or events rather than a specific situation or event. For example, students who do poorly in exams do so because they did not spend adequate time preparing for exams or that they suffer from nervousness, attention deficit, or some other medical disorder. Because nomothetic explanations are designed to be generalizable across situations, events, or people, they tend to be less precise, less complete, and less detailed. However, they explain economically, using only a few explanatory variables. Because theories are also intended to serve as generalized explanations for patterns of events, behaviors, or phenomena, theoretical explanations are generally nomothetic in nature.

- There are many benefits to using theories in research. First, theories provide the underlying logic of the occurrence of natural or social phenomenon by explaining what are the key drivers and key outcomes of the target phenomenon and why, and what underlying processes are responsible driving that phenomenon. Second, they aid in sense-making by helping us synthesize prior empirical findings within a theoretical framework and reconcile contradictory findings by discovering contingent factors influencing the relationship between two constructs in different studies. Third, theories provide guidance for future research by helping identify constructs and relationships that are worthy of further research. Fourth, theories can contribute to cumulative knowledge building by bridging gaps between other theories and by causing existing theories to be reevaluated in a new light.

- However, theories can also have their own share of limitations. As simplified explanations of reality, theories may not always provide adequate explanations of the phenomenon of interest based on a limited set of constructs and relationships. Theories are designed to be simple and parsimonious explanations, while reality may be significantly more complex. Furthermore, theories may impose blinders or limit researchers' "range of vision," causing them to miss out on important concepts that are not defined by the theory.

Approaches to Theorizing

- How do researchers build theories? Steinfeld and Fulk (1990)2 recommend four such approaches. The first approach is to build theories inductively based on observed patterns of events or behaviors. Such approach is often called “grounded theory building”, because the theory is grounded in empirical observations. This technique is heavily dependent on the observational and interpretive abilities of the researcher, and the resulting theory may be subjective and non-confirmable. Furthermore, observing certain patterns of events will not necessarily make a theory, unless the researcher is able to provide consistent explanations for the observed patterns. We will discuss the grounded theory approach in a later chapter on qualitative research.

- The second approach to theory building is to conduct a bottom-up conceptual analysis to identify different sets of predictors relevant to the phenomenon of interest using a predefined framework. One such framework may be a simple input-process-output framework, where the researcher may look for different categories of inputs, such as individual, organizational, and/or technological factors potentially related to the phenomenon of interest (the output), and describe the underlying processes that link these factors to the target phenomenon. This is also an inductive approach that relies heavily on the inductive abilities of the researcher, and interpretation may be biased by researcher's prior knowledge of the phenomenon being studied.

- The third approach to theorizing is to extend or modify existing theories to explain a new context, such as by extending theories of individual learning to explain organizational learning. While making such an extension, certain concepts, propositions, and/or boundary conditions of the old theory may be retained and others modified to fit the new context. This deductive approach leverages the rich inventory of social science theories developed by prior theoreticians, and is an efficient way of building new theories by building on existing ones.

- The fourth approach is to apply existing theories in entirely new contexts by drawing upon the structural similarities between the two contexts. This approach relies on reasoning by analogy, and is probably the most creative way of theorizing using a deductive approach. For instance, Markus (1987)3 used analogic similarities between a nuclear explosion and uncontrolled growth of networks or network-based businesses to propose a critical mass theory of network growth. Just as a nuclear explosion requires a critical mass of radioactive material to sustain a nuclear explosion, Markus suggested that a network requires a critical mass of users to sustain its growth, and without such critical mass, users may leave the network, causing an eventual demise of the network.

Examples of Social Science Theories

- In this section, we present brief overviews of a few illustrative theories from different social science disciplines. These theories explain different types of social behaviors, using a set of constructs, propositions, boundary conditions, assumptions, and underlying logic. Note that the following represents just a simplistic introduction to these theories; readers are advised to consult the original sources of these theories for more details and insights on each theory

Agency Theory

- Agency Theory. Agency theory (also called principal-agent theory), a classic theory in the organizational economics literature, was originally proposed by Ross (1973)4 to explain two-party relationships (such as those between an employer and its employees, between organizational executives and shareholders, and between buyers and sellers) whose goals are not congruent with each other. The goal of agency theory is to specify optimal contracts and the conditions under which such contracts may help minimize the effect of goal incongruence. The core assumptions of this theory are that human beings are self-interested individuals, boundedly rational, and risk-averse, and the theory can be applied at the individual or organizational level.

Theory of Planned Behavior

- Theory of Planned Behavior, Postulated by Azjen (1991)5, the theory of planned behavior (TPB) is a generalized theory of human behavior in the social psychology literature that can be used to study a wide range of individual behaviors. It presumes that individual behavior represents conscious reasoned choice, and is shaped by cognitive thinking and social pressures. The theory postulates that behaviors are based on one's intention regarding that behavior, which in turn is a function of the person's attitude toward the behavior, subjective norm regarding that behavior, and perception of control over that behavior (see Figure 4.2).

- Attitude is defined as the individual's overall positive or negative feelings about performing the behavior in question, which may be assessed as a summation of one's beliefs regarding the different consequences of that behavior, weighted by the desirability of those consequences.

Figure 4.2. Theory of planned behavior

Innovation diffusion theory

- Innovation diffusion theory. Innovation diffusion theory (IDT) is a seminal theory in the communications literature that explains how innovations are adopted within a population of potential adopters. The concept was first studied by French sociologist Gabriel Tarde, but the theory was developed by Everett Rogers in 1962 based on observations of 508 diffusion studies. The four key elements in this theory are: innovation, communication channels, time, and social system. Innovations may include new technologies, new practices, or new ideas, and adopters may be individuals or organizations. At the macro (population) level, IDT views innovation diffusion as a process of communication where people in a social system learn about a new innovation and its potential benefits through communication channels (such as mass media or prior adopters) and are persuaded to adopt it.

- Diffusion is a temporal process; the diffusion process starts off slow among a few early adopters, then picks up speed as the innovation is adopted by the mainstream population, and finally slows down as the adopter population reaches saturation. The cumulative adoption pattern therefore an S-shaped curve, as shown in Figure 4.3, and the adopter distribution represents a normal distribution. All adopters are not identical, and adopters can be classified into innovators, early adopters, early majority, late majority, and laggards based on their time of their adoption. The rate of diffusion also depends on characteristics of the social system such as the presence of opinion leaders (experts whose opinions are valued by others) and change agents (people who influence others' behaviors).

- At the micro (adopter) level, Rogers (1995)6 suggests that innovation adoption is a process consisting of five stages: (1) knowledge: when adopters first learn about an innovation from mass-media or interpersonal channels, (2) persuasion: when they are persuaded by prior adopters to try the innovation, (3) decision: their decision to accept or reject the innovation, (4) implementation: their initial utilization of the innovation, and (5) confirmation: their decision to continue using it to its fullest potential (see Figure 4.4).

- Five innovation characteristics are presumed to shape adopters' innovation adoption decisions: (1) relative advantage: the expected benefits of an innovation relative to prior innovations, (2) compatibility: the extent to which the innovation fits with the adopter's work habits, beliefs, and values, (3) complexity: the extent to which the innovation is difficult to learn and use, (4) trialability: the extent to which the innovation can be tested on a trial basis, and (5) observability: the extent to which the results of using the innovation can be clearly observed.

- The last two characteristics have since been dropped from many innovation studies. Complexity is negatively correlated to innovation adoption, while the other four factors are positively correlated. Innovation adoption also depends on personal factors such as the adopter's risk-taking propensity, education level, cosmopolitanism, and communication influence. Early adopters are venturesome, well educated, and rely more on mass media for information about the innovation, while later adopters rely more on interpersonal sources (such as friends and family) as their primary source of information. IDT has been criticized for having a "pro-innovation bias," that is for presuming that all innovations are beneficial and will be eventually diffused across the entire population, and because it does not allow for inefficient innovations such as fads or fashions to die off quickly without being adopted by the entire population or being replaced by better innovations.

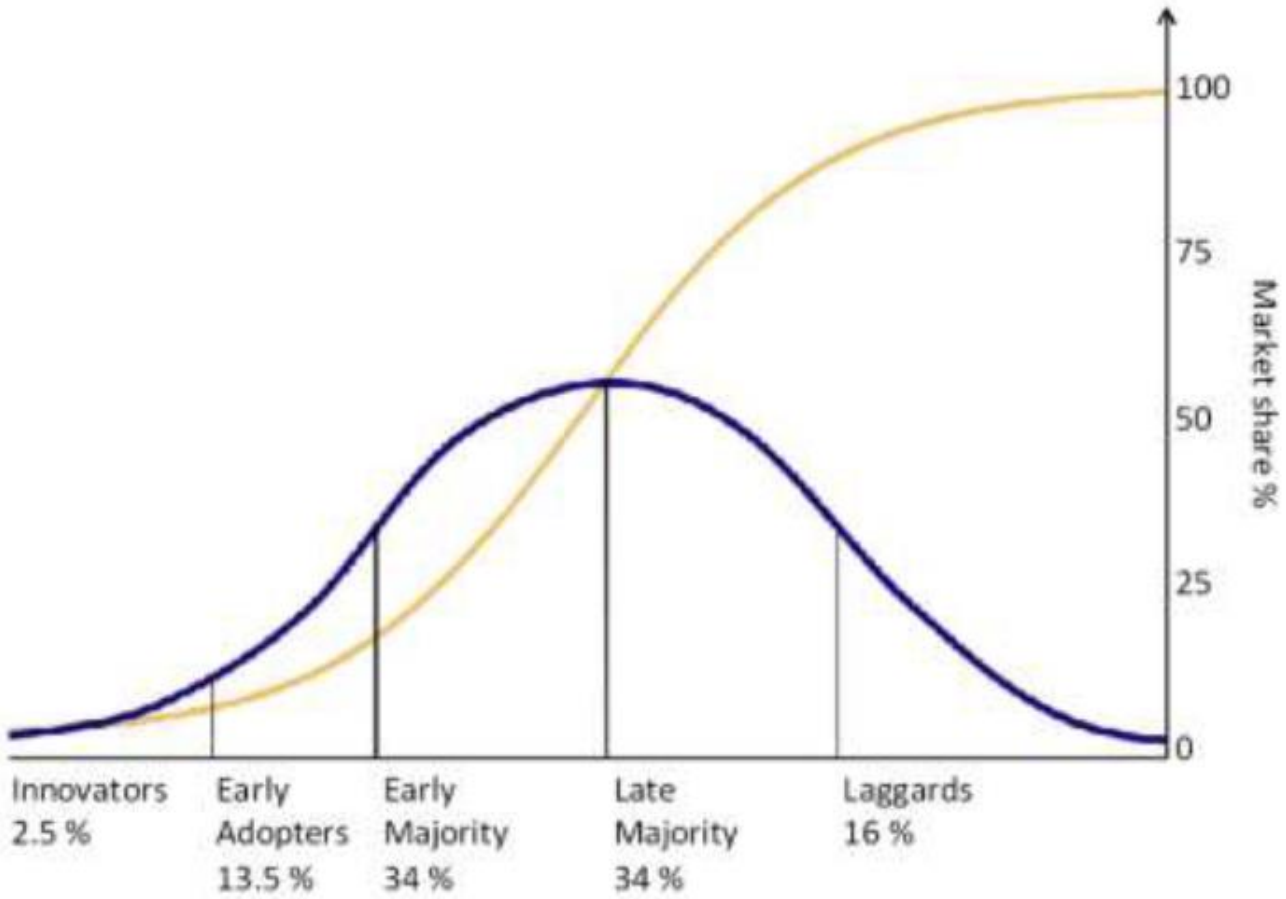

Figure 4.3. S-shaped diffusion curve

Figure 4.4. Innovation adoption process

Elaboration Likelihood Model

- Elaboration Likelihood Model. Developed by Petty and Cacioppo (1986)7, the elaboration likelihood model (ELM) is a dual-process theory of attitude formation or change in the psychology literature. It explains how individuals can be influenced to change their attitude toward a certain object, events, or behavior and the relative efficacy of such change strategies. The ELM posits that one's attitude may be shaped by two "routes" of influence, the central route and the peripheral route, which differ in the amount of thoughtful information processing or "elaboration" required of people (see Figure 4.5).

- The central route requires a person to think about issue-related arguments in an informational message and carefully scrutinize the merits and relevance of those arguments, before forming an informed judgment about the target object. In the peripheral route, subjects rely on external “cues” such as number of prior users, endorsements from experts, or likeability of the endorser, rather than on the quality of arguments, in framing their attitude towards the target object. The latter route is less cognitively demanding, and the routes of attitude change are typically operationalized in the ELM using the argument quality and peripheral cues constructs respectively.

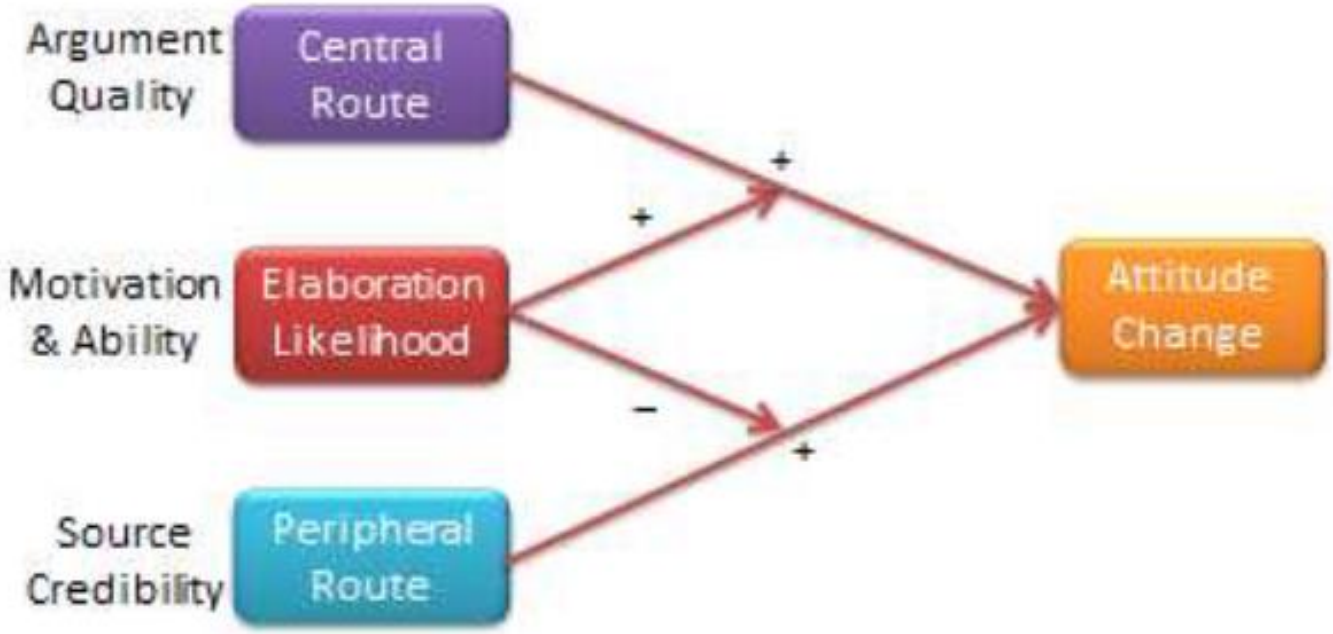

Figure 4.5. Elaboration likelihood model

Assessment for Students

- Please choose a theory that you will use in your research and describe in detail the relationship between the theory and your research.

  (Students can choose a theory in class or search from another website)

Please send me on email: ckerdpitak@gmail.com

The end