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A computational modeling of rapid attitude formation during surveys about immigrants and immigration

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ABSTRACT

Several theoretical models provide the basis for the interaction of the constructs of external social pressures during rapid attitude formation. Current modes of survey research have difficulty dealing with the complex non-linear dynamic effects such as social pressures on attitudinal formation. The interaction of the resultant constructs within the context of this study is due to the inherent confounding nature of the constructs themselves during the critical formative time for attitudes during questioning. During questioning and attitude formation, overlapping constructs link together psychologically. While the linkage between similar constructs is understandable, the lack of descriptive and computational causal models creates difficulty in identifying a mechanism of action. More importantly, the underlying confounding factors reduce the effective targeting of items during survey administration. The authors of this study seek to develop a causal and empirical computational model through a structural equation model and an underlying artificial neural network allowing for an argument outlining the psychological nature of the linkage between two interrelated constructs. Results suggest good model fit for both the structural equation model and the underlying artificial neural network. Results further illustrate that the artificial neural network acts as a sufficient means to model rapid attitudinal formation.

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1. Introduction

Social context and group identification play crucial roles in the development of attitudes within the individual (Bohner & Dickel, 2011). The role of social context is also evident in the construction of beliefs during rapid attitudinal formation (Sterelny, 2010). Rapid attitudinal formation is the development of semi-crystallized attitudes, on the spot, as the person is asked about a topic with which they have little prior experience (Petty & Cacioppo, 2012). These beliefs are expressed as individual behavioral correlates in the form of item response about the attitude (Mischel, 2013). Recursively, due to group identification, multiple individuals exhibiting similar behaviors result in the formation of generalized attitudes within a group, community, or society. At the level of the state, these generalized attitudes can take the form of laws and policy that affect large numbers of people (Galeperin, Bennett &

Aquino, 2011). Individuals link their attitudes to a wider array of expressed attitudes and behaviors that generate normative and informative pressures for both the individual and the society.

Researchers in social psychology, education, and sociology often confound wider social pressures with personal attitudinal constructs (Crano, Brewer, & Lac, 2014). By confounding these constructs, researchers are far more likely to miss subtle effects and reduce the accuracy of measures of personal attitudes (Rudmin, 2009). An example of these complications arises when researchers miss the subtle interaction effects present in answers from research participants. This difficulty occurs particularly during face-to-face interviews and surveys. Often the interaction effects arise out of the very complexity of the construct the researchers hope to capture. In the example used for this study, the complexity of the constructs concerning immigration and immigrants confound the clear measure of these two constructs when engaging in surveys and interviews. This confounding effect is of increasing importance as it skews the data that frame the social and public debate on immigration and immigrants.

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1.1. Purpose, research question and hypothesis

The purpose of this study is to establish a computational model and underlying mechanism of action identifying the relationship between social pressures and attitudes. The context of the study examines the closely related constructs of immigrants and immigration queried through face-to-face survey responses as a test case. The authors hope to effectively model these interactions computationally using artificial intelligence and machine learning algorithms in the form of an artificial neural network (ANN). Specifically, the authors seek to develop a causal model and ultimately simulate the cognitive processes occurring as survey participants confound two closely related constructs (immigrants and immigration). The research questions (RQ) addressed in this study are:

Research Question 1: Does the proposed Multiple Indicator Multiple Cause (MIMC) bi-factor model fit the data structure of the examined item and thus providing a causal framework for the computational model of attitudinal formation?

Research Question 2: Does the proposed computational model provide a sufficient means to measure and examine the relationship of multiple cognitive constructs such as immigrants and immigration as a dynamic system of interactions?

Research Question 3: What is the role of external stimuli such as social pressure in rapid attitudinal formation regarding immigration and immigrants?

Consideration of the research question and literature supports the following hypotheses:

Hypothesis 1. *Social pressure acts as a generalized malleable factor for the formation of attitudes.*

Hypothesis 2. The data structures used for the proposed MIMC model adequately fit and provide an explanatory causal model of rapid attitude formation.

Hypothesis 3. The resultant computational model sufficiently simulates rapid attitude formation allowing for the exploration of these constructs through computational experiments such as in this study.

Substantiation of these hypotheses would provide evidence to establish the position of social pressure as a causal agent and support social psychological arguments that the interrelatedness of constructs, such as immigration and immigrant, confound adequate measurement during on the spot survey data collection. More importantly, substantiation of these hypotheses would be beneficial in developing an understanding of the ecology of attitudinal formation for future study. Given that the interplay of individually constructed attitudes and values with social pressures creates competing structures within the individual cognitive conceptions resulting in confusion (Kuhn, 2011). Substantiation of the hypotheses would also provide evidence that social pressure interactions requires individual survey participants when initially asked about constructs to rely on internalized values developed prior to questioning. Without these intrinsic values, the survey participants rely on extrinsically available information during the rapid attitudinal formation leading to confused semi-crystallized attitudes (Glockner & Witteman, 2010). Confirmation of the hypotheses would provide evidence of the utility of machine learning, computational model of human behavior, and its values across multiple social sciences.

1.2. Literature review

Previous studies on attitudes towards immigrants and immigrations suggest that these constructs exist cognitively as schemas

consolidated in memory and interrelate though the interaction with different schemas within cognitive systems during questioning (Doyle, 2011). Within the social cognitive framework, attitudes are expressed as behaviors or responses and can be measured accordingly via face-to-face surveys or interviews (Levitán & Visser, 2009). Literature related to the construction of attitudes within psychology suggests that attitudes are intrinsic and often quickly constructed during the moment they become stimulated via questioning, such as during face-to-face survey administration (Cote & Levine, 2014; Heider, 2013; Rydell & Durso, 2011). During this rapid attitudinal construction, the attitudinal schema is fluid and maybe be influenced and reconsolidated by environmental factors such as social pressures (Berthon, Pitt, & Morris, 2011). These pressures that trigger reconsolidation arise from information sources or group norms (triggering of known stereotypes, beliefs, or ideas from a participants culture, sub-culture, or community), presented to the participant prior to and around the time of questioning and attitude consolidation (Fulmer & Frijters, 2009).

1.3. Rapid attitudinal formation

Attributional theories under a social cognitive framework are explicit in suggesting that behavioral outcomes and consolidation of attitude schemas arise from two distinct causes (Braxton, Riccardi, & Kettle, 2013). The first cause is the internal predisposition of the individual towards a concept embedded in an existing schema (Fonagy & Luyten, 2012). The second is that the external stimuli resulting from situational causes that may warp and change the schema (Krueger, 2009). Due to this interaction, it is difficult to predict the behavioral outcomes on survey responses. In the case of this study, the resulting externalized outcomes of the constructs are attitudes about immigrants and immigration.

As the authors suggest in this computational study, individual persons are often hard to predict within current statistical modeling techniques. Successful modeling using existing statistical techniques often requires complex parameterization of the data (Haselton & Nettle, 2012). While computational modeling does not completely solve the problem of modeling human psychological states, it does create a system of models and equations that can account for large amounts of complexity and interactions associated with people. A person's attitude become even more difficult to predict and model when presented with situations (i.e. external stimuli) in which there is pressure to respond to questions regarding internal representations of latent constructs not considered previously. In this case immigrants and immigration (i.e. a survey interviewer stopping a participant to question them about their views on immigrants and immigration during political polling) (Mirolli & Parisi, 2011).

1.4. Theoretical framework

Using the framework of Social Cognitive Theory (SCT) developed by Bandura (1989) the authors seek to link the experiences, interviewer inputs, expectancies, and actualizations. The SCT model shown in Fig. 1 illustrates how sociopsychological aspects mold attitude responses predicated on individual patterns of pressures and norms, which ultimately are modeled as a computational model in this study. For example, positive or favorable social pressure about immigrants and immigration will increase the likelihood that a person will respond to interview or survey questions with positive endorsements. As the level or positive social pressure develops along with experiences and actualizations, the person establishes domain specific positive attitudes. Overtime the specific attitudes and resultant and related traits stabilize. Stabilization occurs through the crystallization of the attitude and

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