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Abstract: In order to obtain social benefits, social networks have started taking benefits from private information of network users. While having increased concerns about the risk of privacy disclosure, users still generally disclosed under high privacy concerns, which directly formed the privacy paradox. The expansion and generalization of privacy paradox indicate that the implementation of privacy protection in social networks is still in a dilemma. Studying and solving the problem of privacy paradox is conducive to ensure the healthy development of social network industry. Based on this, this study has designed a research system that analyzes the privacy paradox of social networks from three dimensions: cause, existence and form. After studying existing research of privacy paradox in social networks, evolutionary game theory is determined to be introduced into the procedure of cause analysis, while data mining is used as a data analysis method for empirical research. Within the whole research process, the evolutionary game model of privacy paradox in social networks is built up first, while the necessary conditions for the generation of privacy paradox is addressed, which is derived from the evolutionary stable strategy. Secondly, the questionnaire survey method is used to collect private data of active users of both Weibo and WeChat. Lastly, Apriori and CHAID algorithm are used to determine the relationship of user privacy concerns, privacy behavior, and other factors, which then confirms the existence of privacy paradox on two social networks and makes a comparison between their forms of privacy paradox in specific. This research systematically makes a useful an in-depth analysis to the privacy paradox in social networks and is meaningful for establishing a hierarchical protection system of users' privacy for enterprises.

Keywords: Privacy paradox; Privacy concerns; Privacy behavior; Evolutionary Game Theory; Data mining

1. INTRODUCTION

With the rapid development of Network Information Technology, the theme of Internet gradually has extended from technology to all fields of economic society. Among them, the rise of social networks is particularly remarkable. As an essential element of the development of network applications, social networks build a strong relationship chain and effectively break the barriers of information monopoly, making multiple instant communication possible without time and space constraints. At the same time, a huge data collection, production and transaction mechanism has been gradually established in social networks to produce personalized products and services for users. As an important source of the data accumulation in social networks, the privacy provided by users shows great commercial value, but it also causes the privacy security issues that are widely concerned by the society. The public are increasingly concerned about the risk of privacy disclosure, but their privacy disclosure behavior does not reduce, which leads to the formation of privacy paradox.

2. RESEARCH PURPOSE AND CONTENTS

Based on the above background, the existence of privacy paradox will affect the order and efficiency of information exchange across the entire network. Therefore, the purpose of this study is to establish a systematic

research path to analyze privacy paradox, so as to provide effective suggestions on how social network service providers and users should deal with the challenges brought by privacy paradox. Specifically, the research includes three parts: 1) Research on the basic theory of social networks privacy paradox; 2) Research on the causes of social networks privacy paradox based on evolutionary game theory; 3) Research on the existence and manifestation of social networks privacy paradox using data mining.

3. RESEARCH METHODS

1) In the research of the first module, we drew on the literature and practical experience to clearly define the concepts and characteristics of privacy concerns, privacy behavior and privacy paradox. We also summarized the measurement methods of privacy concerns and privacy behavior, and determined the research paths and technical means of the latter two modules. 2) In the research of the second module, we constructed a privacy paradox evolutionary game model between social networks users and social networks service providers and got the stable strategy of the two-party game to analyze, as well as explained the formation reasons and conditions of social networks privacy paradox. 3) In the research of the third module, we selected two Chinese social software Weibo and WeChat as the research objects, designed and distributed 600 online questionnaires, and analyzed the data obtained from the questionnaire survey using association rule mining algorithms (Apriori algorithm) and classification rule mining algorithms (CHAID algorithm), so as to discuss the existence and manifestation of the privacy paradox in different social platforms.

4. RESEARCH RESULTS

1) The research of the first module has obtained two research results. First, different privacy paradox interpretation theories have certain common characteristics, that is, users make privacy behavior decisions under the condition of limited rationality and incomplete information, which is in dynamic change under the influence of comprehensive factors. Evolutionary game theory highly matches the above-mentioned privacy paradox cause analysis needs. Therefore, we choose to analyze the formation reasons for the privacy paradox through evolutionary game theory in the second module. Second, different social platforms have different functions, and there are also differences in users' service demands, which results in distinguishing privacy concerns and behavior. Therefore, we choose to discuss the similarities and differences of privacy paradox on two platforms in the third module. 2) The second research module obtained two sets of evolutionary game stable strategies. According to the analysis, when the privacy concerns of social networks users are less than the value-added benefits that can be obtained by providing privacy to the social networks service providers, the users will prefer to disclose their privacy. When the users' privacy concerns break through this limit, they may turn to a more conservative privacy behavior. However, social networks service providers will not provide users with privacy protection measures whether they obtain user privacy or not. 3) In the mining of the privacy paradox association rules of the third module, 19 Weibo privacy paradox association rules and two privacy items (gender and age) with privacy paradox characteristics were obtained, and 15 WeChat privacy paradox association rules and six privacy items (gender, age, birthday, name, photo and mood state) with privacy paradox characteristics were obtained at the same time. In the mining of classification rules, the above privacy items that exhibit the privacy paradox were selected to participate in the calculation. Finally, we got 22 privacy disclosure rules that describe the manifestation of privacy paradox.

5. CONCLUSIONS

1) Evolutionary game theory is an effective method to analyze the cause of privacy paradox. From the

results of evolutionary game analysis, we can see that users can enjoy the core value of social networks services only by providing their privacy to service providers under the current market background. Therefore, the emergence of privacy paradox has certain rationality and inevitability.2) There is privacy paradox in social networks, but the privacy paradox on Weibo and WeChat is quite different. Comparative analysis shows that users in strong social networks have higher willingness to disclose themselves, and the probability of forming privacy paradox is greater; users in weak social networks have relatively conservative privacy behavior, and the scope of privacy paradox appears is more limited. 3) The manifestation of privacy paradox is diverse, and it is related to many factors throughout the whole process of users from using social services to finally disclosing their privacy. Although the focus of privacy paradox is to discuss the positive correlation between privacy concerns and privacy behavior, it is still necessary to consider the transition and cohesion of other factors between these two factors.

In summary, this study systematically analyzes the privacy paradox. It breaks the tradition of privacy paradox study limited to qualitative analysis and enriches the quantitative research content in this field. Meanwhile, it links the quantitative analysis results with market guidance and decision-making, providing the basis for social network service providers and users to make their own privacy policies.

REFERENCES

[1] K. Li, Z. Lin, X. Wang. An Empirical Analysis of Users' Privacy Disclosure Behaviors on Social Network Sites.Inform. Manage., 52 (7) (2015), PP. 882-891

[2] S. Taddei, B. Contena.Privacy, trust and control: Which relationships with online self-disclosure? Comput. Hum. Behav., 29 (3) (2013), PP. 821-826

[3] H. Yuan, Y. T. Hou. On Personal Data Privacy Paradox of Network Generation on Basis of Wechat Usage. Journal of Intelligence, 35 (3) (2016), PP. 169-173