Informing the Design of Group Recommender Systems

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Abstract
In this paper we present a literature study on social psychological concepts, which informs the design of group recommender process models in group recommender systems. We matched core concepts to well-established factors influencing satisfaction in groups, and obtained three most relevant social psychological concepts: group identification, group norms, and social roles.

Author Keywords
Group Recommender System; Group Recommender Process; Social Psychology.

ACM Classification Keywords
H.5.2 [Information Interfaces and Presentation]: User Interfaces — Graphical User Interfaces, User-Centred Design; H.5.3 [Information Interfaces and Presentation]: Group and Organisation Interfaces — Computer-Supported Cooperative Work.

General Terms
Human Factors.

Introduction

Recommender systems help users during decision-making by suggesting alternatives that best suite their taste or needs. Most recommender systems focus on providing recommendations to single users. However, users undertake many activities and consume many products in groups (e.g., selecting a restaurant to eat with business associates, deciding on a vacation resort to travel to).

Group recommender systems provide recommendations to groups—that is, they take all individual group members' preferences into account and satisfy them optimally with a single recommendation (e.g., PolyLens [23], MusicFX [19], Collaborative Advisory Travel System (CATS) [20], Travel Decision Forum [14]). However, the group recommender process goes beyond the presentation of generated recommendation and needs to support the whole group interaction from the moment when the group meets over the presentation of a recommendation to the final group decision. This process is critical for the users' overall satisfaction with the system; yet at the same time, it is complex and involves many subtleties [2].

In this paper we present a literature study on social psychological concepts, which informs the design of group recommender process models in group recommender systems. Social psychology has a huge body of knowledge that provides insight into this process. In the following we glance at initial research that includes social psychological concepts. Then we identify relevant social psychological concepts, describe them, and derive design implications.

Background

Some social psychological concepts have recently been addressed in a few group recommender systems.

The concept of *social influence* was investigated by Masthoff and Gatt [18] and characterises how group members influence each other in behavioural, cognitive, and affective ways. The two key processes of social influence are: emotional contagion and conformity. Emotional contagion is the process of being affected by emotional responses of others [11]. Conformity is the adjustment of one's opinion towards the majority [1]. Masthoff and Gatt propose specific functions to capture social influence and to predict its influence on satisfaction.

The concepts of *personality characteristics* and trust between users was investigated and implemented in the HappyMovie system [26]. The system takes into account that some users are more assertive in their opinion, while others are more cooperative. The system adapts the recommendation generation process and distributes vote weights more to assertive users and less to cooperative ones. Furthermore, the integration of the system to Facebook [7] allows for the automatic computation of trust ratings from the connections among users.

The concept of *relationship strength* was investigated by Gartrell [9] to determine appropriate aggregation methods for different levels of relationship strengths (e.g., maximum satisfaction method for couples; average satisfaction method for acquaintances; least misery method for large ad-hoc groups' decision).

Social Psychological Concepts

Here we present social psychological concepts that are relevant for the group recommender process. For this purpose we aggregated satisfiers and dissatisfiers from Keyton [17] and matched them to core concepts from social psychology [esp. 13]. We obtained three most relevant social psychological concepts: group identification, group norms, and social roles (cf. Table 1).

Concept and Aspects	Description	Implications for Group Recommender Systems
Group Identification		
Interpersonal Attraction	People are differently attracted towards other group members depending on the degree of similarity	Display biased information to emphasise common preferences
Self-Categorisation	People categorise themselves as members of the group and associate with attributes that are typical for the group	Present the group terms of typical attributes; assign labels to the groups based on preference information of users
Interdependence	People need to coordinate actions within the group in order to achieve a common goal	Support mechanisms for negotiation; ensure awareness for the common goal
Group Norms		
Communication Rules	Communication rules propose adequate style of interaction that facilitates mutual understanding	Provide explicit communication rules in order to assure smooth processes
Attitude Formation	People form attitudes by assimilating norms that are prevalent in groups	Provide mechanisms that capture users' attitudes; infer norms and make them salient
Social Roles		
Cognitive Centrality	Group members differ in the degree to which their cognitive information is shared within the group	Analyse cognitive centrality information and use it to support group structure; adapt vote weights; select decision agents
Individual Characteristics	Certain group members possess individual characteristics that make them more likely to emerge as leaders	Use additional information (e.g., preferences, history, social network data) to infer relevant characteristics and assign the leader role
Expertise	Group members with expertise in a relevant domain are more likely to adopt a leader role	Analyse expertise levels to suggest leader roles and nominate content-specific experts

Table 1. Implications of social psychological concepts for group recommender systems.

Group Identification

Group identification is the awareness of and attraction towards an interacting group of interdependent members, by self-categorised members of that group [12]. It is fuelled by three sources: affect, cognition, and behaviour.

The affective source (the accompanying process is interpersonal attraction), is the extent to which group members like each other [25]. There is evidence that the perception of similarity plays an important role in the

development of interpersonal attraction and liking [22]. Group recommender systems can influence interpersonal attraction in groups by emphasising the similarity between group members. For example, the system may allow users to browse each other's profiles.

The cognitive source (the accompanying process is self-categorisation), is the process of categorising oneself as a member of the group [12]. The process focuses on associating oneself and one's attributes with attributes that are typical for the group. People show increased cooperation and altruism towards their group members [27]. Group recommender systems could facilitate self-categorisation by presenting a group's attributes (e.g., group name or aggregated demographics).

The behavioural source (the accompanying process is interdependence), is the necessity to coordinate actions within the group in order to achieve a common goal [12]. As soon as differences between personal interests and others' interests become salient, negotiations between group members become vital. Group recommender systems should provide mechanisms to support the negotiation process and ensure awareness of a common goal.

Group Norms

Group norms incorporate a code of conduct of acceptable behaviour and thinking in a group [5]. Both descriptive and prescriptive in nature, they contribute to the formation of a group identity, and provide a frame of reference for attitudes and behaviour. We concentrate on two aspects: attitude formation and communication rules.

Attitude formation refers to the way an individual builds beliefs and feelings. For group members it is profoundly influenced by salient group norms [6]. Attitudes about what constitutes appropriate behaviour may vary between individual group members and may potentially cause negative group outcomes. Group recommender systems could provide a feedback-mechanism that allows users to state their attitudes towards the group (e.g., cooperation, fairness) and aggregate them into a group profile. The group profile presents feedback to the users. As a further implication, groups may choose their aggregation method.

Communication rules specify in what style group members talk to each other [24]. People are more satisfied when communication runs along expected and reciprocal trails. If group members communicate politely rather than directly, they expect other group members to respond in the same style. Thus, for group recommender systems compatibility of group members' communication styles is a key aspect. Rules can shape the negotiation towards smooth agreement procedures.

Social Roles

Social roles are a main structural element of groups that gives guidance in group interaction. Group members hold expectations of their own behaviour and that of other members and therefore adopt social roles within a group [4]. It has been shown that the pure assignment of social roles results in higher cohesion and performance of groups [21]. Relevant aspects are: cognitive centrality, individual characteristics, and expertise.

Cognitive centrality describes the amount of shared cognition between a group member and the rest of the

group [16]. Shared cognition is thoughts, attitudes, knowledge, beliefs, and expectations that are shared to a certain degree by all members of the group. The degree of centrality can be used to infer group members' importance and to adapt vote weights in the recommendation aggregation process. The system may nominate cognitively central users as leaders or decision agents since acceptance should be provided.

Individual characteristics have been firmly established as an important predictor of leadership emergence across situations [15]. Certain individual characteristics are related to commonly accepted leadership traits and therefore increase the likelihood that fellow group members accept other group members, possessing these characteristics, as a leader. Group recommender systems may subtly infer these individual characteristics from the users' profiles (i.e., preferences and history), as well as from additional sources like social network.

Expertise in the domain of interest provides legitimacy for the leadership role and promotes respect from the group [8]. A group member with a high level of expertise is usually more talkative and influential. Group recommender systems may identify expertise by analysing users' given ratings. It is reasonable to assume that users who rated more items of a domain possess more expertise in it. Existing group recommender systems [9] already take expertise into account by implementing an expertise weight factor that derives its magnitude from the amount of watched movies from a given list. Furthermore, group recommender systems could analyse content-specific expertise levels and nominate group members that are specifically experienced in certain areas.

Conclusion

In this paper we presented a selection of social psychological concepts for group recommender systems. We do not claim that this selection is comprehensive, as we selected only those considered most relevant. Based on our experience with group recommender systems [2, 3, 10], we suggest that these concepts should inform the design of group recommender systems. Group recommender systems should provide meaningful recommendations (i.e., predict the users' satisfaction accurately), but should also promote an enjoyable group experience, by means like the identification with the group as well as the possibility to support the formation of long-lasting groups that can result in meaningful relationships. Future research should accurately measure the influence of the different concepts and their operationalisation on users' satisfaction with the group recommender process in group recommender systems.

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