

The persuasive role of Explanations in Recommender Systems

Sofia Gkika, George Lekakos

Department of Management Science and Technology,
Athens University of Economics and Business,
47a Evelpidon and 33 Lefkados str, Athens, 113 62, Greece
{gkikas,glekakos}@aueb.gr

Abstract. Explanations in Recommender Systems can operate like motivators influencing consumers to purchase the recommended items. In this study, we rely upon the well established and verified framework of Cialdini's Influence Principles in order to enrich recommendations with explanations and examine their effect on the persuasive power of recommendations. The results of the experiment revealed that all six Influence Principles positively affect users' perception about the recommended movie while Authority and Social Proof seem to be the more effective ones. These findings indicate that a user's intention to consume a recommended good is increased if the item is accompanied with a persuasive explanation.

Keywords: persuasion, recommender systems, personality

1 Introduction

Recommender Systems elicit users' preferences and interests in order to filter available information and then to provide them recommendations that match their tastes (Xiao and Benbasat, 2007; Bollen et al., 2010; Pu et al., 2012).

The mainstream of research in Recommender Systems has traditionally been focused on their algorithmic aspect and more specifically on the development and evaluation of algorithms that provide accurate recommendations (Xiao and Benbasat, 2007, Pu et al., 2012). The implicit assumption that accuracy of the algorithm is the most significant factor that affects the quality and eventually the acceptance of a Recommender System has been recently challenged since other factors that play also a significant role have emerged (Nanou et al., 2002; Knijnenburg et al., 2012). Such factors based on more user-centric characteristics including recommendation's presentation (i.e. Nanou et al. 2010), the needed effort in order to interact with Recommender System (i.e. Cremonesi et al., 2012), system's transparency or explain to end users how the systems works (i.e. Sinha and Swearingen, 2002; Pu et al., 2011), recommendation's novelty (i.e. Pu and Chen, 2011) and persuasion (i.e. Cremonesi et al., 2012). Studies also shown that the majority of the aforementioned factors also affect the persuasive ability of a recommendation defined as '*the attempt of changing people's attitudes or behaviours or both*' (Fogg, 1998). An important aspect of recommendation that

may influence its acceptance by a user is explanations (Herlocker, 2000; McSherry, 2005). Additionally, Tintarev and Masthoff (2011, 2012) specify that explanations have six main aims, one of whom is persuasion.

The aim of this study is to investigate if certain persuasive strategies (applied in the form of recommendation explanations) can affect user's adoption of recommendations. The rest of the paper is organized in five sections. The persuasive role of explanations is detailed in Section 2. We explain the importance of explanations in Recommender Systems as well as the role of persuasion. Our experiment is presented in Section 3, while in Section 4 the experimental results are discussed. In Section 5 we present the main conclusions of this research and proposals for future work.

2 The persuasive role of explanations

Explanations in Recommender Systems

An explanation can be considered as any type of additional information accompanying a system's output, having as ultimate goal to achieve certain objectives (Tintarev and Masthoff, 2011). One of the aims of explanations according to Tintarev and Masthoff (2011) is to persuade users to try or purchase the item that is recommended. In general, persuasion can lead a person to change his/her attitudes or adopt behaviours that lead to a better lifestyle (Guadagno and Cialdini, 2007). For instance, a smoker needs to be persuaded in order to quit smoking. According to Fogg (2003), there are two levels of analysis in the design and study of computers as persuasive technologies: *Macrosuasion* and *Microsuasion*. In *Macrosuasion* the whole unit of the product has as ultimate goal to persuade. For example websites, such as Amazon.com, are designed in order to persuade customers to consume goods. In *Microsuasion* the products do not have as ultimate goal to persuade but to increase productivity or user's loyalty (e.g. video games that they aim at entertaining not persuading).

Tintarev and Masthoff (2012) indicate that explanations have an important role on Recommender Systems since an explanation is a mean through which a consumer perceives the value of the recommended item so as to decide whether is close to his/her interests or not. In other words, this item description facilitates user's decision making. Explanations can operate like motivators and are being used by several systems such as MovieLens (Herlocker et al., 2000) and Social software items (Guy et al., 2009). However, there is no clear indication in extant literature about what type of explanations can actually lead to persuasion and at what extend. For example, transparency of recommendations (i.e. a description of how the recommendation has emerged) is associated with an increase of trust in recommendations (Herlocker, 2000) while still there is not enough empirical evidence that demonstrates what type of influence strategy could lead to persuasion (Halko and Kientz, 2010).

2.1 Persuasion

The first who talked about persuasion is Aristotle in Rhetoric, claiming that the elements that play important role on the procedure of persuasion is the ethos/character of the speaker, message's receiver pathos/emotions and logos/argument. Since then, other scholars have identified factors or principles that can lead to persuasion. For example, Fogg (2002) describes 42 persuasion strategies, Cialdini (2001) 6 Influence Principles (also known as Six Weapons of Influence), while there have been listed more than 160 influence tactics by Rhoads. In this experiment, we rely upon Cialdini's Influence Principles since they have been broadly used and verified (i.e. LeBourveau et al., 1988; Fogg, 2002; Guthrie, 2004). According to Cialdini (2001) if Influence Principles are implemented in a system then they increase its persuasive effect. These Influence Principles include: Reciprocity (humans have the tendency to return favours), Commitment (or consistency: people's tendency to be consistent with their first opinion), Social proof (people tend to do what others do), Scarcity (people are inclined to consider more valuable whatever is scarce), Liking (people are influenced more by persons they like) and Authority (people have a sense of duty or obligation to people who are in positions of authority). Cialdini (1987, 1993) suggested that when a compliance professional (e.g. salesperson) uses six specific psychological principles (Reciprocity, Commitment, Social proof, Scarcity, Liking and Authority) in his/her strategy then (s)he managed to influence more successfully the customer to consume a product/service/information. In the same vein, Kaptein (2012) suggests that applying the influence principles on text messages people get persuaded to reduce snacking consumption.

As indicated before, there is relatively limited research that evaluates persuasion in Recommender Systems and investigates the conditions under which Recommender Systems do have a persuasive effect (e.g. Cosley et al. 2003, Nguyen et al. 2007). In the extant literature, several studies are based on direct constructs in order to measure persuasion in the field of Recommender Systems, such as transparency (how a Recommender System works) (Nanou et al., 2010; Gretzel and Fesenmaier, 2006), trust towards a Recommender System (Nanou et al., 2010), Recommender System's credibility (Nanou et al., 2010; Ricci et al., 2011; Brinolans Petty, 2009), cognitive effort in order to acquire a recommendation (Gretzel and Fesenmaier, 2006; Cremonesi et al., 2012), recommendations' novelty (recommendations that user does not listen or see before) (Cremonesi et al., 2012), perceived accuracy of recommendations (Cremonesi et al., 2012) and recommendations' presentation (Nanou et al., 2010).

The aforementioned Principles provide a solid framework in order to investigate the persuasive power of explanations in recommender systems. In this study we utilize the above framework in order to develop persuasive explanations and experiment in order to investigate (a) if the applications of these strategies do lead in a change of users behaviour (in term of intention to use a recommendation) and (b) if the power of persuasion differentiates among of the strategies applied.

3 Methodology

The application domain of the study is the movie recommendation which is very popular in the field of Recommender Systems (Alspector et al., 1997; Good et al., 1999; Herlocker et al., 2002; Said et al., 2011; Kim and Oh Park, 2013; Jung, 2012).

The first step for the execution of the experiment was the design of persuasive explanations, following Kaptein's (2012) methodology. Thirty (30) textual explanations were created in total, i.e. five (5) for each Cialdini's Persuasion Principle. The content of each explanation was developed in order to comply with the main purpose of each Persuasion Principle. Then, 17 experts in the field of Information Systems and Marketing were invited in order to evaluate each explanation in terms of their compliance with the respective Persuasion Principle. Finally, the six (6) best-matching explanations (one for each strategy), were used in the experiment (Table 1).

Table 1. Best-matching Explanations on each Influence Strategy

Influence Strategy	Explanations
Reciprocity	A Facebook friend, who saw the movie that you suggested him/her in past, recommends you this movie
Scarcity	The recommended movie will be available to view from 15/1/2014 to 31/1/2014 on cinemas
Authority	The recommended movie won 3 Oscars!
Social Proof	The 87% of users in this survey rated the recommended movie with 4 or 5 stars!
Liking	Your Facebook friends like this movie
Commitment	Watch this movie and you may change your mind about this kind of movies

For the purpose of the experiment, a movie recommendation system was developed. At the first step of the experiment, participants evaluated (through 1-5 ratings) a set of 20 movies (Picture 1), in order to have an adequate number of ratings for each user to produce recommendations based on the collaborative filtering algorithm. For each movie the information presented included the movie's category, its plot, and the starring actors. If they had not already seen the movie, they chose the option 'I have not seen the movie and my intention to see it is:' on a dropdown box, otherwise they chose the second option which is 'I have seen this movie and my rating is:'. In both cases users inserted a rating, expressing their intention to see the movie (first option) or their actual evaluation for the movie they have seen (second option).

Picture 2. The first step of the experiment. For each movie the title, image and genre, a short description and participating actors are provided. In addition, a dropdown menu enables users to state whether they have seen or not the movie, in order to distinguish the ratings that express intention to see the movie from the ratings that express actual evaluation of a movie that the user has seen in the past.

The Shawshank Redemption (1994)



Genre(s): Crime, Drama

Actors: Tim Robbins, Morgan Freeman, Bob Gunton

Plot: Two imprisoned men bond over a number of years, finding solace and eventual redemption through acts of common decency.

Please rate the movie

I have not seen the movie and my intention to see it is: ▼

1 2 3 4 5
● ● ● ● ●

Inception (2010)



Genre(s): Action, Adventure, Mystery

Actors: Leonardo DiCaprio, Joseph Gordon-Levitt, Ellen Page

Plot: A skilled extractor is offered a chance to regain his old life as payment for a task considered to be impossible.

Please rate the movie

I have not seen the movie and my intention to see it is: ▼

I have not seen the movie and my intention to see it is:
I have seen this movie and my rating is:

At the second step, the Recommender System provided a “least matching” recommendation enriched with persuasive explanations. More specifically, a collaborative filtering algorithm was implemented and produced estimation of ratings for each of the items that the user has declared that he/she has not seen in the past. In order to ensure the proper selection of items to be recommended, the ratings estimated by the algorithm were cross-checked with the actual ratings that the user provided at the first step of the process (expressing actually his intention to see the specific movie). In order to be able to measure any differences in users’ intention to watch the movie stemming from the use of persuasive explanations, the users were recommended items with low ratings (i.e. low intention to watch the movie), i.e. “least matching” recommendations. This choice enable us to record “behaviour change” more easily since in computational terms it is much easier to identify changes in intentions from the lower to the higher levels of the 1-5 scale.

As mentioned above, the recommended movie was enriched with persuasive explanations, based on Cialdini’s Principles (the explanations from the first level

of the study) and was reassessed from participants in order to examine whether (and which) strategies influenced users in order to change their intention to watch the recommended movie or not. Each strategy was evaluated separately (through 1-5 rating). The difference between the initial rating at the first step and the rating on each strategy denotes the persuasive effect of every strategy.

4 Results

In total 148 users participated in the experiment. Participants were invited through posts or personal messages on social media. The analysis of data was held using the statistical software SPSS. First, we examined if users' behaviour changed by comparing the averaged value of the initial rating that users provided for the movie that was finally recommended to them with the average value of the ratings after the application of the influence strategies. The results demonstrate that on average there is statistically significant change in user's intention to watch the movie. In order to identify which strategies perform better in terms of persuasiveness, paired t-tests were used upon the differences between the initial rating and the one for each strategy. The results (Table 2) indicated that explanations based upon the strategies Authority and Social Proof have proven to be more effective compared to the other strategies.

Table 2. Paired t-test was used to examine significance, where 0.05 is set as the threshold for p-value to evaluate the significance and p-value lower than 0.001 indicates strong significance.

	Scarcity	Authority	Social Proof	Liking	Commitment
Reciprocity	0.173	<0.001	<0.001	0.002	0.001
Scarcity		<0.001	<0.001	<0.001	<0.001
Authority			0.116	<0.001	<0.001
Social Proof				<0.001	<0.001
Liking					0.353
Commitment					

5 Conclusions and Discussion

The ultimate role of a Recommender System is to provide items that match consumers' preferences and interests. A question that comes forth is what happens when a system recommends a product/service/information that the user does not like it at all, or in other words the recommendation algorithm has low accuracy. The present experiment reveals that even if a consumer has low intention to accept a recommendation, the application of an appropriate influence strategy in the form of explanation can significantly increase the adoption of the recommendation. More specifically, the Influence Principles of Authority and

Social Proof revealed as the most powerful principles. They increased participants' intention to consume a recommended item to a great extent even if this item is not of their interests. This is not surprising, since people have learned from their early life to follow rules, authority's suggestions and in general someone who is expert on a particular subject. Moreover, since we are sociable beings then is expected to be influenced from other people. If a mass of people has a particular behaviour then the unit is more likely to follow the mass in case it has not form an opinion about a particular situation, in our case has not seen the movie.

Certainly, the study presented in this paper has limitations. First, the sample size is rather small to derive conclusive results. Further extension of the experiment to a larger and more diverse group of user will provide additional validity support to the findings. Furthermore, the above results provide insights only for the movie recommendation domain, in which the recommended items (movies) present certain characteristics that are not applicable to other domains (e.g. other product categories).

In this study we focused on movies that users were actually not interested in. This served our purpose to safely measure differences in the users' intention to watch. However, users expect items similar to their interests to be proposed by a recommender system, and therefore the potential effect of such expectation must be controlled and measured. In our future research we plan to apply the same experimental process on items where users have expressed high levels of intention to use and compare the findings with the ones of the present study (on items with low intention to use).

We must also acknowledge that enhancing the influence of recommendations utilizing the influence principles should not violate the basic purpose of recommender systems, i.e. to support users in their decision making process and not act as marketing/promotional vehicles. As part of our future research we aim to measure the users perception on this type of explanations and examine the impact of the influence principles on the perceived effectiveness of the recommendations.

Acknowledgments. This research has been partially funded by the "Action I – Research Support Program – Athens University of Economics and Business", 2013-2015.

References

1. Alspector, J., Koicz, A., Karunanithi, N.: Feature-based and Clique-based User Models for Movie Selection: A Comparative Study. *User Modeling and User-Adapted Interaction*, 7, 279–304 (1997).

2. Bollen, D., Knijnenburg, B. P., Willemsen, M. C., Graus, M.: Understanding choice overload in recommender systems. Proceedings of the fourth ACM conference on Recommender systems, 63-70 (2010)
3. Briñol, P., Petty, R.E.: Persuasion: Insights from the Self-Validation Hypothesis. In Mark P. Zanna, editor: *Advances in Experimental Social Psychology*, Vol. 41, Burlington: Academic Press, pp. 69-118 (2009)
4. Cialdini, R. B.: Compliance principles of compliance professionals: Psychologists of necessity. In M. P. Zanna, J. M. Olson, & C. P. Herman (Eds.), *Social influence: The Ontario symposium* (Vol. 5, pp. 165- 184). Hillsdale, NJ: Lawrence Erlbaum (1987)
5. Cialdini, R. B.: *Influence: Science and practice* (3rd ed.). New York: HarperCollins (1993)
6. Cialdini RB. *Influence, Science and Practice*, Allyn & Bacon, Boston (2001)
7. Cremonesi, P., Garzotto F., Turrin, R.: Investigating the Persuasion Potential of Recommender Systems from a Quality Perspective: An Empirical Study. *ACM Trans. Interact. Intell. Syst.*, 2(2), 11:1–11:41 (2012)
8. Cosley, D., Lam, S.K., Albert, I., Konstan, J. A., Riedl, J.: Is seeing believing?: how recommender system interfaces affect users' opinions. Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, pp. 585-592 (2003)
9. Cremonesi, P., Garzotto F., Turrin, R.: Investigating the Persuasion Potential of Recommender Systems from a Quality Perspective: An Empirical Study. *ACM Trans. Interact. Intell. Syst.*, 2(2), 11:1–11:41 (2012)
10. Fogg, B.J.: Persuasive computers: Perspectives and research directions. In: Proceedings of the SIGCHI conference on Human factors in computing systems CHI '98 (1998)
11. Fogg, B. J. (2002) *Persuasive Technology: Using Computers to Change What We Think and Do*. Morgan Kaufmann.
12. Fogg, B. J., Cuellar, G., Danielson, D.: Motivating, influencing, and persuading users. *The human-computer interaction*, pp 133-147 (2002)
13. Good, N., Schafer, J. B., Konstan, J. A., Borchers, A., Sarwar, B., Herlocker, J., Riedl, J.: Combining Collaborative Filtering with Personal Agents for Better Recommendations. In Proceedings of AAAI (American Association for Artificial Intelligence), Orlando, Florida (1999)
14. Gretzel, U., Fesenmaier, D.R.: Persuasion in Recommender Systems. *International Journal of Electronic Commerce, International Journal of Electronic Commerce*, 11(2), 81-100 (2006)
15. Guadagno, R.E, Cialdini, R. B.: Persuade him by email, but see her in person: Online persuasion revisited. *Computers in Human Behavior*, 23, pp 999-1015 (2007)

16. Guthrie, C.: *Influence: Principles of Influence in Negotiation*. Marquette Law Review (2004)
17. Guy, I., Zwerdling, N., Carmel, D., Ronen, I., Uziel, E., Yogev, S., Ofek-Koifman, S.: Personalized recommendation of social software items based on social relations. *Proceedings of the third ACM conference on Recommender systems*, pp. 53-60 (2009)
18. Halko, S., Kientz, J.A.: Personality and persuasive technology: An exploratory study on health-promoting mobile applications. *Persuasive technology*, pp. 150–161 (2010)
19. Herlocker, J.L., Konstan, J.A., Riedl, J.: Explaining collaborative filtering recommendations. *CSCW 2000*: 241-250 (2000)
20. Herlocker, J., Konstan, J. A., Riedl, J.: An Empirical Analysis of Design Choices in Neighborhood-Based Collaborative Filtering Algorithms. *Information Retrieval*, 5 (4), 287-310 (2002)
21. Jung, J. J.: Attribute selection-based recommendation framework for short-head user group: An empirical study by MovieLens and IMDB. *Expert Systems with Applications*, 39(4), pp 4049–4054 (2012)
22. Kaptein, M., De Ruyter, B., Markopoulos, P., Aarts, E.: Adaptive persuasive systems: a study of tailored persuasive text messages to reduce snacking. *ACM Transactions on Interactive Intelligent Systems (TiiS)*, 2(2) (2012)
23. Kim, M., Oh Park, S. Group affinity based social trust model for an intelligent movie recommender system, *Multimed Tools Applications*, pp.505–516 (2013)
24. Knijnenburg, B.P., Willemsen, M. C., Gantner, Z., Soncu, H., Newell, C.: Explaining the user experience of recommender systems. *User Model User-Adap Inter*, pp. 441–504 (2012)
25. LeBourveau, C. A., Dwyer, F. B., Kernan, J. B.: Compliance strategies in direct response advertising. *Journal of Direct Marketing*, 2(3), pp. 25-34 (1988)
26. McSherry D.: Explanation in recommender systems. *Artificial Intelligence Review*, 179-197 (2005)
27. Nanou, T., Lekakos, G., Fouskas, K.: The effects of recommendations' presentation on persuasion and satisfaction in a movie recommender system). *Multimedia systems*, 16(4-5), 219–230 (2010)
28. Nguyen , H., Masthoff, J., Edwards, P.: Persuasive Effects of Embodied Conversational Agent Teams. *Human-Computer Interaction. HCI Intelligent Multimodal Interaction Environments*, 4552, pp 176-185 (2007)
29. Pu, P., Chen, L., Hu, R.: E-Commerce product recommendation agents: Use, Characteristics, and impact. *Proceedings of the fifth ACM conference on Recommender systems*, 157–164 (2011)

30. Pu, P., Chen, L., Hu, R.: Evaluating recommender systems from the user's perspective: survey of the state of the art. *User Modeling and User-Adapted Interaction*, 22(4-5), 317–355 (2012)
31. Rhoads, K. How many influence, persuasion, compliance tactics & strategies are there? <http://www.workingpsychology.com/numbertactics.html>.
32. Ricci, F., Rokach, L., Shapira, B.: Introduction to recommender systems handbook. *Recommender Systems Handbook*, Springer. (2011)
33. Said, A., Berkovsky, S., De Luca, E. W.: Challenge on Context-Aware Movie Recommendation: CAMRa2011. *Proceedings of the fifth ACM conference on Recommender systems*, pp. 385-386 (2011)
34. Sinha, R., Swearingen, K.: The role of transparency in recommender systems. *CHI'02 extended abstracts on Human factors in computing systems*. 830–831 (2002)
35. Tintarev, N., Masthoff J.: Designing and evaluating explanations for recommender systems. *Recommender Systems Handbook*, Springer, p. 479–510 (2011)
36. Tintarev, N., Masthoff J.: Evaluating the effectiveness of explanations. *User Model User-Adap Inter.* pp.399–439 (2012)
37. Xiao, B., Benbasat, I.: E-commerce product recommendation agents: use, characteristics, and impact. *Mis Quarterly*, 31(1), 137–209 (2007)