The Art of Spending and Recommendations in Personal Finance

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Abstract Happiness is one of the most important aspects of human lives, yet the literature on emotional well-being indicates that people often fail to correctly anticipate the hedonic consequences of future events. As a result, individuals end up being not as happy as they thought they would be. This phenomenon also applies to the domain of personal finance where people make bad decisions about purchases. In this paper, we identified a new opportunity for the research on recommender systems in personal finance and through analysis demonstrated that intelligent recommenders can help to minimize errors in affective forecasts and enhance happiness of people in the domain of consumption. Furthermore, we reviewed problems associated with design of such recommenders and proposed approaches to overcome them.

1 INTRODUCTION

One of the most fundamental instincts that people have is to be happy and to live a good life. There are many criteria for defining a good life but an important point is that an evaluation of one's life is a subjective process. Positive psychology defines a happy life more formally using the notion of "subjective well-being" (SWB). SWB refers to how people evaluate their lives in terms of both affective and cognitive aspects. There are several components of SWB such as a general life satisfaction, satisfaction with important domains (e.g., relationships with loving others), and positive affect (experiencing pleasant moods and emotions) [1]. Improvements in any component of SWB can help to increase a person's happiness. It seems that nowadays ordinary people tend to grant increasing importance to SWB. This is especially true in developed countries where basic material needs of people are satisfied and they are progressing towards the post-materialistic phase of self-fulfillment [2].

Often people are looking for earning more money in the quest for having a happy life. There is a common belief that more income has a positive impact on well-being and can make people feel happier. Therefore, a desire for higher income is a common motive among many people at all income levels [3]. On the other hand, research on income and SWB showed that among the non-poor the relationship between money and happiness is surprisingly weak. Although money seems to be able to buy happiness, it buys much less than what most people think. Data showing a weak correlation between SWB and income presents a puzzle [3]. Absence of a strong relationship is intriguing because as Dunn, et al. [4] argued "money allows people to live longer and healthier lives, to buffer themselves against worry and harm, to have leisure time to spend with friends and family, and to control the nature of their daily activities – all of which are sources of happiness". Moreover, people with high income have better nutrition, more free time, and more meaningful labor. The contradiction between potential possibilities for improving well-being offered by money and the lack of a strong link between SWB and income seems to be partly explained by the fact that people often are not particularly happy with their purchases.

When individuals make a decision to buy something, they usually try to make predictions about the hedonic value or consequences of this purchase in the future. The process of foreseeing the future with respect to affective states is called affective forecasting and, according to the review provided by Wilson and Gilbert [5], people are often wrong in their forecasts. They discovered several sources of biases that cause errors in affective forecasting. Any of them could lead to inaccurate predictions and the situation where a wealthy person is not much happier than anyone else. Overall, it seems that in most of the cases people are neither good in affective forecasting nor are aware of characteristics indicating purchases that will potentially make them happier, and for this reason, do not use the opportunities for better SWB provided by wealth.

We suggest that people can potentially benefit from a recommender system with abilities to improve their affective forecasts and to offer intelligent guidance about spending. Many psychological biases that disturb affective forecasts of individuals are known to behavioral scientists and documented in the literature. For this reason, we argue that design of such a recommender system should be feasible taking into account excellent progress in the area of recommender systems that we saw from the early 1990s.

To the best of our knowledge, current research in recommender systems has not yet approached the problem of forecasting enjoyment and satisfaction in the domain of personal finance. We are still to see if technology can help people become happier with their purchasing decisions and improve SWB by recommending clever choices. It is however not clear how to approach design of such technology. What are the challenges and possible solutions?

The novel contribution of this paper is related to meta-analysis of the literature in behavioral sciences related to SWB and demonstration of how developments in this area enable design of new recommender systems for personal finance. We aim not just to identify new opportunities but also foresee and analyze major difficulties associated with designing a recommender system for application in personal finance that helps to optimize spending in terms of savings and SWB. Our analysis will be complemented with discussion of approaches towards overcoming these difficulties and further implications. We hope that it will help to initiate discussion and provoke thoughts on new research directions in the areas of personal finance and recommender systems.

2 SUBJECTIVE WELL-BEING

A brief review of the literature on consumption and happiness is necessary to demonstrate the current state of affairs in this area. The

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review will help to understand what are the current developments in social sciences and what input they can provide in design of recommender systems for personal finance.

We first propose to look at how psychologists approach measurement of SWB. Data on SWB usually consists of self-reports that reflect what people say about themselves when asked a particular set of questions [6]. There are a number of well-known surveys on happiness that are regularly conducted in several countries. They include British Household Panel Survey, European Social Survey, German Socio-Economic Panel, and the World Values Survey. Many researchers apply data from these panels in their work. An alternative to using data or question formulations from the widely recognized surveys is independent collection of data. This alternative often needs to be exploited when new hypotheses cannot be confirmed or rejected using existing data sets. It is not surprising that research on happiness is almost exclusively based on data collected with questionnaires. It seems that currently there is no better way of finding out how much individuals enjoy their lives than asking them questions.

Is it possible to sustainably increase SWB or this pursuit is futile? This is a point of debate between psychologists. Historically, it was considered that every person has a genetically determined set point for happiness and people tend to fluctuate around their baselines during lives [7]. Also, there is a concept of hedonic treadmill [8] that implies temporality of any gains in SWB. The argument behind this concept is that individuals always adapt to new situations or circumstances and their effect quickly diminishes. However, there is some recent evidence that SWB can be sustainably enhanced by practicing *intentional activities* [9]. Intentional activities are any actions in which people choose to engage. Not every activity suits to every individual. People have different psychological profiles and different strategies of intentional activities need to be applied. Examples of intentional activities include committing acts of kindness and practicing grateful thinking. These findings are important in the context of recommender systems because they indicate that cognitive or behavior interventions suggested by intelligent technological systems may lead to sustainable changes in well-being.

One of the findings from consumer psychology that we have already mentioned earlier is that high income is not always a recipe for a happy life [4]. More does not mean better and an individual need to be able to make right choices in the quest for happiness [10]. There are advocates of low-consumption lifestyles whose points of view are supported by outcomes of this research [3]. They argue that after a certain threshold increase in consumption does not make much sense and people ought to focus on different goals or values. However, it is not clear if low-consumption lifestyles will become mainstream.

Research in behavioral science demonstrated that people often make mistakes in forecasts about their own emotional states in the future [11]. There is a number of known prediction biases such as durability bias or impact bias [12]. Due to the biases, individuals tend to anticipate different duration and intensity of emotional feelings. As a result of such forecasting mistakes people sometimes put too much effort in pursuing goals that will not make them happy. From our point of view, biases in affective forecasting seem to be particularly suitable for being corrected by recommendations from intelligent systems for managing personal finance.

The last piece of research from behavior sciences that we are going to consider in this brief review is related to types of purchases and hedonic return. It was demonstrated that material and experiential purchases lead to different profiles of satisfactions [13]. Consumers seem to consistently derive greater happiness from buying experiences than from tangible or material goods. This is another example of knowledge about SWB that is widespread between academics but not commonly applied in the real life.

From our analysis it is evident that science has accumulated some interesting findings about SWB generally and specifically with application to the consumption domain. We argue that now may be a good time to start exploiting this knowledge and attempt to design recommender systems that help to identify gratifying purchases.

3 RECOMMENDER SYSTEMS

Next, let us have a look at the state of the art recommendation systems in personal finance. The number of services providing intelligent recommendations has significantly increased during the last decade. The research on improvement of recommendation algorithms is being actively expanded [14]. Also, academics began inquiry into user experience with recommenders [15] by addressing the issues related to transparency of recommendations and trust of users to the system.

The majority of recommender systems reported in the literature work for a specific category of goods or services. For instance, they can support users in choosing a movie or a book. There are also cross-domain recommenders that enable support of personal decision making across different categories of goods [16], [17]. The research in the area of cross-domain recommenders seems to be the most relevant for the task of building a recommender for shaping spending in terms of SWB because decisions about the best purchases in terms of satisfaction and enjoyment usually require comparing alternatives from different domains. Recommender systems are usually deployed on the side of a company that is offering goods or services (e.g., on an e-commerce website) with the main motivation to increase sales. However, in the case of recommendations with regard to happiness and satisfaction, it seems to be more appropriate if a recommender system is run on devices belonging to an individual who receives the recommendations. Since we talk about a recommender system for personal finance, it will be best if a personal finance manager and a recommender engine are integrated in a single application. The main advantage of the integration is that the recommender system will receive data regarding consumption in real-time. So, it is necessary to review what are the latest advances in the area of personal finance.

Nowadays, we witness how the modern technology is changing the way people manage their personal finance. Ubiquitous computing has triggered an appearance of personal informatics systems that support people in collecting and reflecting data on their finance [18]. Such tools enable individuals to aggregate financial information, track transactions, create budgets, and set up goals [19]. One of the examples of a digital system for managing personal finance is Mint.com. Users of modern tools for managing personal finance benefit from precise information about their money and convenient interfaces for collecting this data [20]. These instruments help to optimize spending in the dimension of wealth. This approach for managing money is clear and well-established. However, it does not take into consideration the dimension of pleasure or happiness with regard to how the money is or should be spent.

4 PROBLEMS

Based on the review of modern systems for managing personal finance and a variety of recommender systems for different domains it is evident that there is no solution that would enable people to budget their spending in accordance with overall enjoyment of consumption. However, our analysis of the literature about SWB indicates that the latest finding enable design of such recommender systems. Now, let us analyze what are the challenges in development of recommender systems for personal finance that take into account enjoyment of consumption and identify potential opportunities to overcome them. We will not attempt to present an exhaustive list of problems but rather mention the most challenging and interesting ones.

4.1 Happiness and Consumption

All recommender systems operate based on underlying models that enable them to forecast what items a person is likely to enjoy or be interested in. If one is to approach the problem of designing an intelligent recommender system that guides users towards smarter and more enjoyable purchasing decisions, it is necessary to know how individual purchases contribute to the overall happiness in the domain of consumption. In other words, one needs a model describing relationships between spending and happiness. The problem of obtaining such a model probably needs to be tackled by academics from behavioral sciences or human-computer interaction because it requires conduction of user studies expanding our knowledge about SWB and consumption.

4.2 Measurement of Enjoyment

Another challenge in building recommender systems for allocation of personal finance is understanding how happy a user is with a particular purchase. An ability to quickly receive this information is crucial for performance of the recommender because it enables to identify inaccurate forecasts and build a knowledge graph for generation of next forecasts. The most straightforward approach towards measuring how happy a user is with a particular purchase is asking them questions. It is very similar to what researchers of happiness have been doing so far. However, when it comes to recommender systems used in a real life, asking questions about purchases is associated with certain difficulties. First, they are likely going to be intrusive and users may feel annoyed by the questions. Second, it is necessary to understand the context and know when is the best time to ask a question. For example, consumption of certain categories of goods (e.g., tickets for holidays) is delayed until some time in the future or can be continuous over a period of time. In such cases, the system will need to forecast when is the optimal time for measuring enjoyment of a purchase.

4.3 Meaningful Advice

The importance of capability to provide meaningful and persuasive feedback cannot be overestimated in the domain of recommender systems. Even a very accurate recommendation generated by a system can be of low value for a user if it is not communicated or presented in a way that encourages the user to trust the recommender. This also applies to recommender systems that attempt to understand emotional experiences associated with purchases and provide an advice about spending in terms of its affective value. Perhaps, the aspect of designing a trustworthy user interface is even more significant when it comes to emotional experiences because people will not believe that a machine is able to understand their feelings and recommend purchases that will make them feel better. For this reason, a major challenge for a recommender system is not just forecast items that are likely to enhance SWB of users but also to intelligently present the recommendation. Since the recommendations are related to the area of personal finance, it is interesting to explore possibilities of integrating feedback into modern payment interfaces. For instance, a recommender system might communicate a warning that a potential purchase is going to be a waste of money by providing subtle feedback when a user is considering committing a transaction. The users might not trust it from the first time but, if the warning turned out to be correct, they are likely to pay more attention in the future.

5 METHODS AND APPROACHES

It is proposed to approach the *first* problem outlined above (4.2) through a number of quantitative experiments with individuals. The goal of these experiments will be to see how their happiness in the domain of consumption is related to past emotional experience with certain things and services that they purchased. The experiments will require collection of data about psychological backgrounds of participants that will help to see how personality traits influence consumption and SWB. Next, it will be necessary to record experiences of the individuals using either self-reports or techniques of affective computing [21]. The latter approach can potentially enable researchers to obtain objective data about emotional states as opposed to subjective data from questionnaires.

The techniques of affective computing [22] can also be valuable for approaching the *second* problem that we outlined. Indeed, if a recommender system can receive real-time feedback about enjoyment of consumption using recordings of physiological signals that indicate specific emotional states, it will be an efficient solution to the measurement problem. In this case, there is no need to bother users with questions and the system can receive continuous feedback on enjoyment of a particular purchase. Although automatic analysis of affective data eliminates the necessity of using questionnaires, the problem of understanding the context knowing when to measure remains. One possible solution is to use additional environmental data such as location and agenda if users authorize the recommender system to access them.

The *third* problem that we considered in this paper is related to presentation of feedback from the recommender system. As we wrote earlier, it is likely that users will not have confidence in the recommendations provided by the system because they will concern very sensitive aspects such as feelings and SWB. People strongly prefer basing affective predictions on their own mental simulations of future events or purchases rather than relying on previous experiences of other people. Even worse if forecasts of enjoyment need to be based on feedback from a machine. However, since information about how much complete strangers enjoyed an experience could help significantly improve forecasts, it is necessary to use and present it in a persuasive way. The research on recommender systems has already identified some clever ways of making recommendations look more trustworthy. For example, by presenting users how a system came to a particular conclusion or mentioning interests that two individuals have in common. The best way to approach this problem is to evaluate different ideas of

communicating recommendations in qualitative user studies that will shed light on possibilities for increasing credibility of the feedback.

6 IMPLICATIONS

Not just technology but also people themselves do not understand very well how things work in the realms of happiness and SWB. The implication from the analysis presented in the paper is that there are many areas for further investigation in the field of recommender systems for personal finance. Moreover, this work can hardly be done by people from one discipline. Ideally, a joint effort is required from researchers with backgrounds in behavioral science, computer science, recommender systems, and human computer interaction. Another implication is that research in engineering disciplines can potentially drive and contribute to the inquiry in behavioral sciences by developing systems for collection of data that will help to advance knowledge about SWB.

7 CONCLUSION

In this paper, we identified new opportunities for the research related to recommender systems in personal finance and analyzed the latest developments in the areas of SWB and recommender systems that are relevant to these opportunities. We argued that it is a good time to attempt design of recommenders that aim to optimize happiness in the domain of consumption. Following the analysis, important problems concerning development of such recommender systems were discussed. They included understanding of relationship between purchases and SWB, measurement of enjoyment, and credible presentation of recommendations. Then, possible solutions were suggested, and finally, we briefly outlined implications of our analysis. Being happy is one of the most important goals of people but unfortunately they often make inaccurate forecasts about hedonic value of events in the future and spend their money on things that do not make them happy. We demonstrated that advances in research on recommender systems have a potential to enhance SWB of individuals.

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REFERENCES

[1] E. Diener, "Subjective well-being. The science of happiness and a proposal for a national index.," *Am. Psychol.*, vol. 55, no. 1, pp. 34–43, 2000.

[2] R. Inglehart, *Culture Shift in Advanced Industrial Society.* Princeton University Press, 1989.

[3] A. Ahuvia, "If money doesn't make us happy, why do we act as if it does?," *J. Econ. Psychol.*, vol. 29, no. 4, pp. 491–507, 2008.

[4] E. W. Dunn, D. T. Gilbert, and T. D. Wilson, "If money doesn't make you happy, then you probably aren't spending it right," *J. Consum. Psychol.*, vol. 21, no. 2, pp. 115–125, 2011.

[5] T. D. Wilson and D. T. Gilbert, "Affective Forecasting," *Adv. Exp. Soc. Psychol.*, vol. 35, pp. 345–411, 2003.

[6] G. MacKerron, "Happiness economics from 35000 feet," *J. Econ. Surv.*, vol. 26, no. 4, pp. 705–735, Sep. 2012.

[7] D. Lykken and A. Tellegen, "Happiness is a Stochastic Phenomenon," *Psychol. Sci.*, vol. 7, no. 3, pp. 186–189, 1996.

[8] P. Brickman and D. Cambell, "Hedonic Relativism and Planning the Good Society," *Adaptation-level theory: A symposium.* pp. 287–302, 1971.

[9] S. Lyubomirsky, K. M. Sheldon, and D. Schkade, "Pursuing happiness: The architecture of sustainable change.," *Rev. Gen. Psychol.*, vol. 9, no. 2, pp. 111–131, 2005.

[10] C. K. Hsee, R. Hastie, and J. Chen, "Hedonomics: Bridging Decision Research With Happiness Research.," *Perspect. Psychol. Sci.*, vol. 3, no. 3, pp. 224–43, May 2008.

[11] D. Kahneman and J. Snell, "Predicting a changing taste: Do people know what they will like?," *J. Behav. Decis. Mak.*, vol. 5, no. 3, pp. 187–200, Jul. 1992.

[12] T. D. Wilson and D. T. Gilbert, "Affective Forecasting," *Adv. Exp. Soc. Psychol.*, vol. 35, pp. 345–411, 2003.

[13] L. Van Boven and T. Gilovich, "To Do or to Have? That Is the Question.," *J. Pers. Soc. Psychol.*, vol. 85, no. 6, pp. 1193–1202, 2003.

[14] Y. Shi, M. Larson, and A. Hanjalic, "Collaborative Filtering beyond the User-Item Matrix: A Survey of the State of the Art and Future Challenges," *ACM Comput. Surv.*, vol. 47, no. 1, pp. 1–45, May 2014.

[15] J. A. Konstan and J. Riedl, "Recommender systems: from algorithms to user experience," *User Model. User-adapt. Interact.*, vol. 22, no. 1–2, pp. 101–123, Mar. 2012.

[16] R. Chung, D. Sundaram, and A. Srinivasan, "Integrated personal recommender systems," in *Proceedings of the ninth international conference on Electronic commerce - ICEC '07*, 2007, pp. 65–74.

[17] A. Fano and S. W. Kurth, "Personal choice point: helping users visualize what it means to buy a BMW," in *Proceedings of the 8th international conference on Intelligent user interfaces - IUI '03*, 2003, pp. 46–52.

[18] I. Li, A. Dey, and J. Forlizzi, "Understanding My Data, Myself: Supporting Self-Reflection with Ubicomp Technologies," *Proc. 13th Int. Conf. Ubiquitous Comput.*, pp. 405–414, 2011.

[19] I. Li, A. Dey, and J. Forlizzi, "A stage-based model of personal informatics systems," *Proc. 28th Int. Conf. Hum. factors Comput. Syst. CHI 10*, p. 557, 2010.

[20] C. Lu, "Enhanced user experience in managing personal finance," in *Proceedings of the 14th international conference on Human-computer interaction: users and applications*, 2011, pp. 375–383.

[21] R. W. Picard, *Affective computing.* Boston, MA: MIT Press, 2000.

[22] L. Ivonin, H.-M. Chang, W. Chen, and M. Rauterberg, "Automatic recognition of the unconscious reactions from physiological signals," in *SouthCHI 2013, LNCS 7946*, A. Holzinger, M. Ziefle, M. Hitz, and M. Debevc, Eds. Berlin Heidelberg: Springer-Verlag, 2013, pp. 16–35.