Human Values in Recommender Systems

Assignment 1: Value Sensitive Design in a recommender system for Allerhande

Lena Walcher – Student Number: 2818833

Introduction

With a growing volume of data, recommender systems have rushed to the aid of customers to overcome the information overload. However, when searching for literature including the words “value” and “recommender system” most resulting literature points at economic, monetary value added to businesses (Dias et al., 2008). The focus seems to lie on aspects like better marketing, ideal targeting and higher profits - but what about the person using it? Is it the customers’ or the businesses’ needs that are satisfied?

The information used to personalize the customers experience need to include human values as much as they include personal information. After all the customer is more than a target – it’s a person with human values. With ever more sophisticated techniques and personalized content the need for the inclusion of values is not just a curtesy, it is a responsibility. Not a responsibility of technology but of the people and shareholders designing it. This paper aims to analyze and suggest the implementation of human values in a recommender system used by the Dutch supermarket chain Allerhande (Albert Heijn).

Theoretical Framework

Human values were defined by Rokeach as “an enduring belief that a specific mode of conduct or end-state of existence is personally or socially preferable to an opposite or converse mode of conduct or end-state of existence” (Rokeach et al., 1973). They serve as standards in society and provide a frame of what is desirable in terms of human actions, behaviour and goals. Values help shape culture and societies worldwide and can be seen as a major difference to the animal world and a fundament of being human.

Recommender Systems (RS) can be defined as techniques and software tools that suggest items like a songs, online purchases, movies or books that are of use to a user. These suggestions are supposed to aid in decision making (Burke, 2007). The suggestion through RS therefore aims to make the user take action in a predictable and e.g. purchase the advertised apples at Albert Heijn because of what an algorithm predicts.

To include human values in the design of RS approaches have been taken by Friedmann et al. (2017) as Value sensitive design (VSD), by Iversen et al. (2012a) as Value-led participatory design (VPD) and as Value-centred design (VCD) by Cockton (2009). Friedmann et al. (2019) describe the approach of VSD as a tool that “*positions researchers, designers,*

engineers, policy makers, and anyone working at the intersection of technology and society to make insightful investigations into technological innovation in ways that foreground the well-being of human beings and the natural world" (p.8).

With the focus on Value Sensitive Algorithm Design by including Stakeholders values the approach by Zhu et al. (2018) should be mentioned as it incorporates stakeholders knowledge and feedback with the main goal to reduce bias in design choices which correlated to what Friedmann et al. (2017) includes as *technical investigations*.

Methods

For the purpose of this paper and the identification of stakeholders that are directly or indirectly affected by a RS the approach by Friedmann et al. (2013) will be used (Holbrook, 2014). An iterative approach is build as a tripartite framework of *conceptual, empirical* and *technical investigations* to define values from stakeholders that are directly or indirectly involved in the creation or the use of the RS. Conceptual investigations aim to theoretically conceptualize the values of stakeholders and their tensions. The empirical investigation attempts to understand the users values and opinions by empirical study for instance through questionnaires. The technical investigation analyses the properties of design within the recommender system to identify issues in technology as well as chances to implement important values in a recommender system, algorithm or general computational process.

This was done by starting with a *Stakeholder Analysis* including users as well as other stakeholders in the *conceptual investigation*. In the second part *Value Analysis* followed by *Value Tensions* investigated where tensions within individual users as well as between stakeholders are analysed (Friedmann et al., 2006). This is part of the *empirical investigation* which is done with a diverse team by taking different roles and perspectives into account. Lastly the *technical investigation* aims to analyse the existing and prospective values within technological properties of the recommender system and whether they support or hinder the identified values (Simon et al. 2020). *Value Scenarios* are used to identify effects of technological properties (Nathan et al., 2007). The scenarios are used to support systemic long term thinking in the development and deployment of technology. They are used to analyse the effect of technology on users and their values.

In this paper the HuValue tool is used to help identify human values (Kheirandish et. al, 2020). The tool is based on Value sensitive design, Value-led participatory design by Burke et al. (2007) and Value-centred design (Cockton, 2005). It includes 45 value words instead of the 13 initial values as defined by Friedmann and others (2006) that are clustered in nine categories to build a bridge between human values and their practical implementation in designing a recommender system. The value clusters are ranked by stakeholders on a Likert scale from “Extremely important” to “Not important”.

Results

Stakeholder Analysis

In a first step the various stakeholders that are affected by a recommender system of the supermarket chain Albert Heijn had to be identified. In order to get a variety of opinions a heterogenic team attempted to take different positions and viewpoints.

Figure 1: Stakeholder Analysis

Stakeholders affected by the RS can be divided into directly and indirectly involved. Figure 1 gives an overview over the most relevant stakeholders identified. The orange frame around some hexagons points to a big impact. The shareholders were added even though they are not part of the stakeholder analysis itself to show that the involvement through factors like higher profits. Whether their values are honorable or not, their impact on a RS is always existent.

Indirectly involved are: Society, Government, Food Industry, Competitors and Stores. Directly involved are: Investors, Consumer organizations like the Authority for Consumers and Markets (ACM), Shareholders, Employees of Albert Heijn including positions from retail workers all the way to Marketing and Supply Chain Management, Suppliers and lastly the customer and final user of the RS.

As the customer is the center of the RSs orbit, this paper focuses on the end-user and customer of Albert Heijn. Values are not the same for every stakeholder or end-user. This is why instead of considering customers as a single stakeholder, three user roles are taken into account.

Value Analysis

While Values like *Human Welfare* referring to peoples physical, material and psychological wellbeing, *Privacy* referring to a right of an individual to decide what information about the person can be communicated or *Informed Consent* referring to users agreement, disclosure and voluntariness can be identified for all customers, not all seem this obvious (Friedmann et al., 2006). The more personal a recommender system works, the more personal should the values included be.

To further analyze the values and then tensions between them in the following step, different personas will be used to illustrate some differences between individuals. The HuValue tool as can be seen on the right (Figure 2) will be used as an aid to identify values categorized into *basic beliefs*, *nature*, *self* and *society* (Kheirandish et al. ,2020). The nine categories and the most important of the total 45 values for each persona can be seen in Table 1 below.

Figure 2: HuValue tool

Three personas are considered to paint a diverse picture of what an end-user could look like.

A	student, just moved out of the parents' home, in a relationship (or not), social, living on a budget, unorganized, shared apartment, rides a bike
B	parent, small family, middle class, values high quality in foods, cares about nature and animals, busy, lives in suburbs, drives a minivan
C	retired person, upper class, single, cares about high quality, not busy but always seems to be, wealthy, the fancy car matters

The value clusters are ranked by a stakeholder or their perspective on a Likert scale from "Extremely important" to "Not important". The table below shows each category on the HuValue tool and a specific aspect for each persona by importance.

	A	**B**	**C**
Carefulness	Helpful	Kindness/Loyalty	Kindness
Respect for others	Friendship	Family security	True Friendship
Meaningfulness	Devout	Spiritual Life	Meaning in life
Ecology	Waste Avoidance	Environment	World of Beauty
Respect for oneself	Self Regulation	Self-Awareness	Self respect
Personal development	Independence	Independence	Choosing own goals
Pleasure	Enjoying life	Material Comfort	Pleasure
Status	Successful	Ambitious	Status
Justice	Freedom	National Security	Equality

Table 1: Values by persona organized with the HuValue tool

Value Tensions

The contrast in colors in columns like *Respect for others* in Table 1 illustrate tensions between the personas. While person A (the student) cares about their friends and persona B makes family and the families security a big priority, persona C does not care much about true friendship and enjoys retirement with little care about others. The categories of *Pleasure* and *Status* as well as *Ecology* influence a recommender system of a supermarket chain the most. While A and C don't mind spending money less careful or hesitant on luxury products whether that is alcoholic beverages or an expensive steak, persona B focuses more on a controlled way of spending money on needs instead of spontaneous pleasures which creates value tensions. *Ecology* creates an additional tension. While a B cares about a sustainable consumption, less waste and doesn't mind spending more money on organic animal products, A and C just want the biggest personal gain from their investment. Should a RS suggest products that are about

to go bad to reduce waste or should it present what makes the most profit? This is an example for an essential decision that needs to be made on the base of human values.

Stakeholder Generated Value Scenarios

Let's assume Albert Heijn uses collaborative filtering techniques in a demographic-based RS. Users are categorized based on demographic and user attributes. The recommendations are done by finding active, neighboring users and historic purchasing data on the base of demographic information. Now let's assume persona A, the student uses the Albert Heijn app and RS and purchases beer on Fridays as it is promoted as well as a variety of unhealthy foods. What if now other young adults with similar demographics, average money spent and living in the same area now get the same recommendations: beer, chips, toast and energy drinks but won't be exposed to the tomatoes on sale, the whole milk that is buy one get one free or the muesli that's new in the store? This might cause them to lean more towards the recommended, unhealthy choices that could have an impact on their wellbeing without them even noticing it.

To include *Human Welfare* as an essential value in a RS, groceries that are unhealthy like alcohol could be excluded from a being suggested to customers. The customer of course still has the choice to purchase them but they are not pushed to do so. Identified values like *Privacy* and *Informed Consent* can be included into a RS by making sure the algorithm is not just in agreement with the GDPA but also values the users privacy and consent by explicitly asking for consent, excluding personal data and informing the customer about underlying processes or giving the option to opt out of personalized recommendations. An additional decision to be made is whether ecologic values are implemented or not for instance to produce less waste on the cost of a loss in profit and recommending groceries that are about to go bad.

Presented examples for the implementation of human values in RS need to be taken into account for a variety of stakeholders and individuals and their values to assure that important collective goals, motivations, needs and interests are met (Zhu et al., 2018).

Discussion

As shown in this paper by briefly elaborating on the use of human values in technology with the example of a recommender system at Allehande, no one right implementation can be identified. However, this is exactly what the Value Sensitive Design approach is about: including a variety of human values in the intersection of technology and society. In order to catch the differences in stakeholders and their values the representation of the stakeholder is essential. A good RS should be build by a heterogenic group of people with many different backgrounds like ethicists, philosophers, social scientists and psychologists in addition to the technological knowledge needed. The RS itself should be easily understandable which

emphasizes the need to educate the general population as well as adapt similar to movements like XAI (Explainable Artificial Intelligence).

Value Sensitive Design is not just a way of protecting stakeholders and customers from stores like Allerhande but also a way of enhancing human wellbeing. By making good design choices one can aid in making healthy food choices. Of course the definition of what is “good” starts a whole new topic however, recommender systems seem to gain a more negative conjugation which they don’t need to have if human values are integrated in a smart and respectful manner.

References

Burke, R. (2007). Hybrid web recommender systems. *Lecture Notes in Computer Science (Including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics), 4321 LNCS*. https://doi.org/10.1007/978-3-540-72079-9_12

Cockton, G. (2005). A development framework for value-centred design. *Proceedings of CHI 2005 extended abstracts on human factors in computing systems* (pp. 1292–1295). Portland, OR: ACM.

Dias, M. B., Locher, D., Li, M., El-Deredy, W., & Lisboa, P. J. G. (2008). The value of personalised recommender systems to e-business: a case study. *RecSys'08: Proceedings of the 2008 ACM Conference on Recommender Systems*. https://doi.org/10.1145/1454008.1454054

Friedman, B., Kahn Jr., P. H., & Borning, A. (2006). Value Sensitive Design and Information Systems. *Human-Computer Interaction and Management Information Systems: Foundations*.

Friedman, B., & Hendry, D. G. (2019). *Value Sensitive Design: Shaping Technology with Moral Imagination*. The MIT Press. https://doi.org/10.7551/mitpress/7585.001.0001

Friedman, B., Hendry, D. G., & Borning, A. (2017). A survey of value sensitive design methods. *Foundations and Trends® in Human–Computer Interaction*, 11(2), 63–125.

Friedman, B., & Hendry, D. G. (2012). The envisioning cards: A toolkit for catalyzing humanistic and technical imaginations. *In Proceedings of the 2012 annual conference on human factors in computing systems* (pp. 1145–1148).

Holbrook, J. (2014). Early engagement and new technologies: opening up the laboratory. *Journal of Responsible Innovation*, *1*(2). https://doi.org/10.1080/23299460.2014.924240

Iversen, O. S., Halskov, K., & Leong, T. W. (2012). Values-led participatory design. *CoDesign*, *8*(2–3). https://doi.org/10.1080/15710882.2012.672575

Jannach D. & Jugovac M. (2019). Measuring the Business Value of Recommender Systems. ACM Trans. Manage. Inf. Syst. 10, 4, Article 16 (December 2019), 23 pages. DOI:https://doi.org/10.1145/3370082

Kheirandish, S., Funk, M., Wensveen, S., Verkerk, M., & Rauterberg, M. (2020). HuValue: a tool to support design students in considering human values in their design. *International Journal of Technology and Design Education*, *30*(5). https://doi.org/10.1007/s10798-019-09527-3

Nathan, L. P., Klasnja, P. V., & Friedman, B. (2007). Value scenarios: A technique for envisioning systemic effects of new technologies. *Conference on Human Factors in Computing Systems - Proceedings*. https://doi.org/10.1145/1240866.1241046

Simon, J., Wong, P. H., & Rieder, G. (2020). Algorithmic bias and the value sensitive design approach. *Internet Policy Review, 9*(4). https://doi.org/10.14763/2020.4.1534

Zhu, H., Yu, B., Halfaker, A., & Terveen, L. (2018). Value-sensitive algorithm design: Method, case study, and lessons. *Proceedings of the ACM on Human-Computer Interaction, 2*(CSCW). https://doi.org/10.1145/3274463