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Course: **Personalisation for (public) media (INFOMPPM)** **Individual Assignment**

Contents

1 Introduction

Constant consumption and the creation of new content are fundamental pillars of the world we live in. For example, every minute, 500 hours of content are uploaded to YouTube (*YouTube for Press*, 2022). By this flood of content, an unguided exploration is not feasible. Recommendation systems (RS) are the guides that take the users by the hand by generating adequate recommendations to a collection of users (Melville & Sindhwani, 2010). Thus, RS are an integral part of all content-based websites and have also gained a foothold in the public sphere.

By maximising the screen time comparable to maximising the profit, the mission of many private organisations is satisfied. Whereas public organisations aim for different goals than maximising profit, for example, raising their population's common good.

In the VOD environment, it seems that public organisations follow the most vital private organisations regarding web interface design (shown in figure 1) and RS. The similarity regarding the RS is an assumption because the evaluation is not possible due to the restricted exchange of their methodologies. However, just because this organisation is the strongest in its field does not mean its approach is the best solution for everything. Again, we recall the difference in missions between private and public organisations, which justifies an alternative representation of the VOD web interface and embedded RS. These circumstances result in challenges but also in opportunities for the public sector.

So, where are the specific differences in the missions of the public and private sectors? The BBC, for instance, has painted on their banner that their mission is "Inform, Educate and Entertain" (Fields et al., 2018), whereas this represents the tip of the iceberg. Beneath those simple three words are

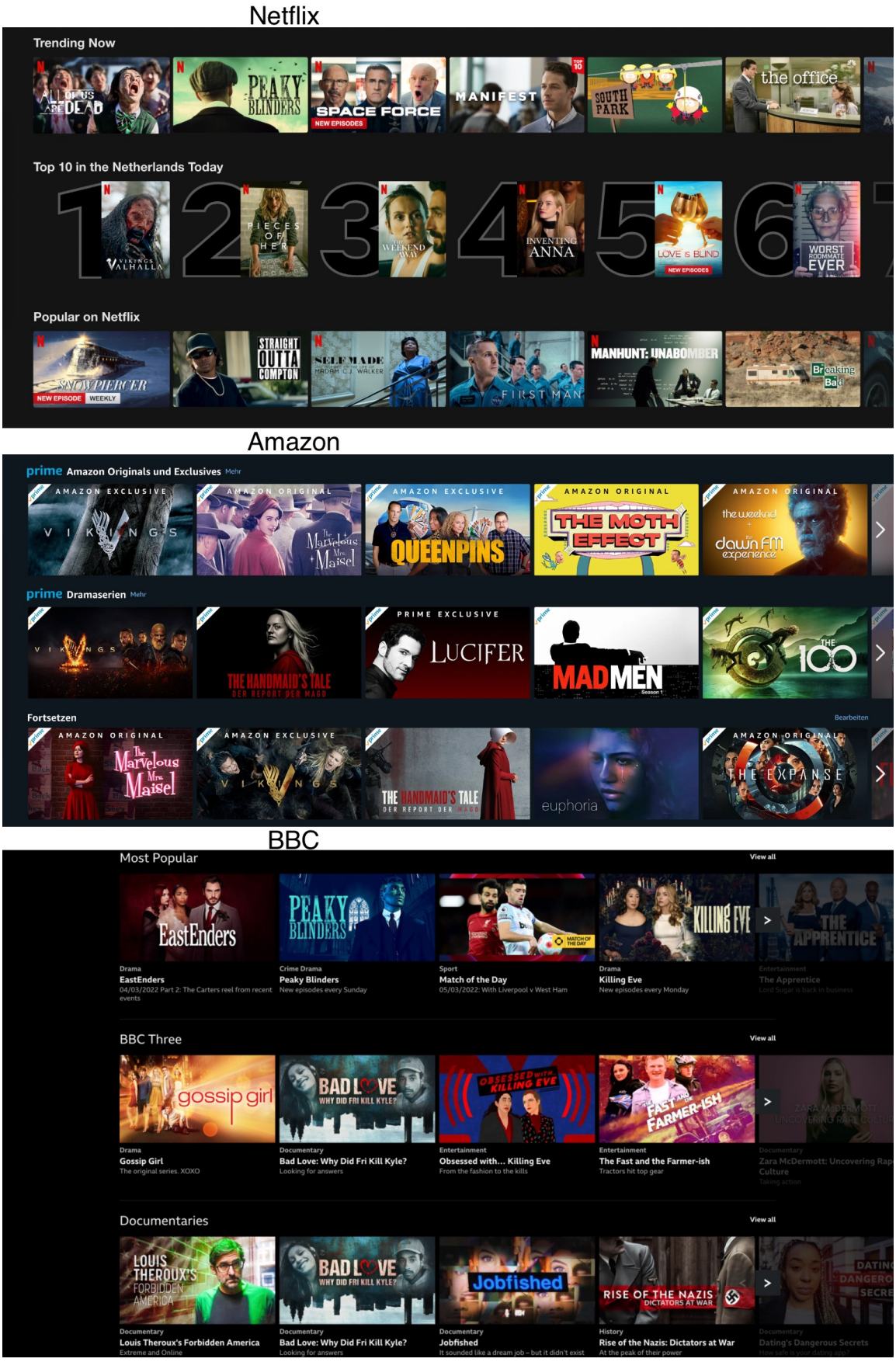

Figure 1: Direct comparison of the VOD webinterfaces of Netflix (top display), Amazon Prime Video (middle display) and BBC iPlayer (bottom display).

more noble and complex mission encapsulated such as conceiving, assessing and creating public values (Mazzucato et al., 2020). Diversity and inclusion are an example of such a public value (Sarpong, 2020). The public values the BBC wants to address are multilayered and broad. Friedman summarised a sample of human values, that can be aggregated to public values, Human Welfare, Ownership and Property, Privacy, Freedom from Bias, Universal Usability, Trust, Autonomy, Informed Consent, Accountability, Courtesy and Environmental Sustainability (Friedman et al., 2006, 2002). [1]

Within this symbiotic relationship between provider and consumer, the BBC is a direct stakeholder, with the role of a provider. In contrast, another direct stakeholder is the audience, with the role as the consumer. With limited resources, only a sample of the audience could be investigated in detail, international students. As international students are only a fraction of users, it must be noted that they are not a representative sample. However, this group should not be neglected and is valid to create a proof of work concept.

The mission of BBC is already stated by empowering their consumers' values, but where do international students see their priorities in their values, on which values should the BBC concentrate? By surveying[2] 15 international students I got a prioritisation of the values Privacy, Freedom from Bias, Diversity, Autonomy, Convenience and Transparency. Those values mainly were selected based on the assessed values in the User-Centric Evaluation Framework(Pu & Chen, 2011). Figure 2 visualises the survey's results as a bar chart.

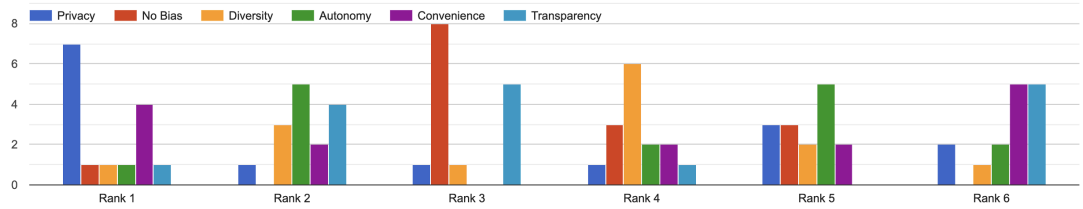

Figure 2: Displays the prioritisation for every value, that was included in the survey, on a ranking system from 1 to 6.

Two different personas were derived by analysing the results[3]. Persona one can be described as the 'Convenience Consumer', represented by the highest value Convenience, average values consisting of No Bias, Diversity and Autonomy and negligible values are Transparency and Privacy. Persona two can be described as the 'Cautious Consumer' represented with the highest values Privacy and Transparency, average values consisting of Autonomy and No Bias and negligible values are Convenience and Diversity.

For the public VOD provider, one approach would be to design the web interface with the underlying RS to attract both personas equally, without disregarding the space in between. It should be ensured that in the case of 'Convenience Consumers', the use of the web interface is intuitive and convenient, whereas the 'Cautious Consumers' should be provided by a transparent and privacy-oriented web interface, whereby both have possibilities to interact.

This assignment's goal is the creation of a mid-fidelity prototype of a web interface with an embedded RS that tackles the equal consideration of both personas that represent the audience. The public

[1] Those values might have different interpretations concerning the point of view. Thus Friedman's definitions are stated in the 7 glossary .

[2] The survey questions can be found in the appendix A and are on purpose with little guidance and without direct comparison between values to avoid black painting and to provide the greatest possible leeway.

[3] The Jaro Winkler(*Jaro and Jaro-Winkler similarity*, n.d.) Distance was applied to evaluate personas from the survey's result. Every result's entry represented a participant by their prioritised values. To apply the Jaro Winkler distance on the resulted data, they first had to be transformed. The transformation consisted of substituting every value with a numerical number (e.g. Privacy -> 1) and concatenating them to a string (e.g. '1 3 5 2 6 4'). Then the difference of those strings was calculated where for example, a string like '1 2 3 4 5 6' was similar to '1 4 3 2 5 6'. Assuming people with a very similar string representation can be summarised to one persona. Some participants were excluded because their preferences were standalone and too insignificant to aggregate a persona based on them.

broadcaster for whom this prototype is exemplary designed is the BBC, whereby also scraped data from their VOD web interface is used.

2 Literature review

Implementing public values in a software product is challenging due to the wide spectrum of how they can be interpreted. Therefore, the values of Privacy, Freedom from Bias, Diversity, Autonomy, Convenience and Transparency are narrowed to understand how they influence and might be measured.

Diversity is an indication of how diverse the recommended content is. It was shown that recommender systems lose their attraction when their content lacks Diversity, thus leading to disappointment which might be the cause for users to leave (Jones & Pu, 2007). For operationalisation reasons, suggestions say, to see the list of recommendations as an entity (Ziegler et al., 2005), which can be understood as a diversity ratio of all the recommendations and by measuring such the Diversity can be reasoned.

Transparency represents how understandable the inner logic of a system works. With numerous possibilities existing to emphasise Transparency, it is a tightrope walk between good and evil, or better in this context, between too much and too little. The benefit of good Transparency is the increase of trust and attitude, which are stated as essential factors for are recommender system (Pu & Chen, 2011) as researchers found a high correlation between a good explanation interface and the users' trust and satisfaction (Medhurst & Sinha, 2002; Tintarev & Masthoff, 2007). Transparency's impact can be measured by monitoring the change of the interaction with the web interface under the assumption that by understanding the mechanics, the user's behaviour adapts.

Freedom of Bias is a challenge that is yet not solved is probably never solved due to human nature. Nevertheless, including additional information about already explored biases of specific content might mitigate the bias and increase the Transparency, thus might increase the user's trust and satisfaction. By hypothetical having a robust metric on bias could make this aspect operationalisable.

Convenience is understandable as the user's perceived ease of use, also referred to as perceived cognitive effort (Jones & Pu, 2007). To narrow it down, it means how easily the users interact with the interface to find their relevant content, inform, teach, and entertain themselves. Measurable by the conversion percentage, whereby conversion stands for consuming a video.

Autonomy, **Privacy** and **Transparency** are intertwined with each other. The user feels empowered and has an improved overall user experience when they have the feeling of impact on the embedded mechanisms, such as modifying preferences to tweak the recommender system (Pu & Chen, 2011). Autonomy can only be properly applied by understanding how something works, therefore, intertwined with Transparency. Privacy is the issue that might prevent a recommender system from finding the most relevant solutions due to the lack of users' information. Nevertheless, giving the user the power to adjust their privacy level (Autonomy, Privacy) and understand why, how, and what their data is used (Transparency) should also increase the user's perception of being empowered and thus their satisfaction. Measurable by surveying users and also by monitoring their use of such functions.

3 Methodology

Since only content-based methodologies are applied within this assignment, **Privacy** is not machined with the depth that actually befits its value because no user data is collected. Thus no direct privacy issues arise. Before all content-based methodologies were applied, every item's synopses were pre-processed by lemmatisation, removing stop words, lower casing and filtering for parts of speech (adjectives, nouns, proper nouns (e.g. Germany, God, Alice) and verbs).

Convenience was addressed by recommending similar content once based on the selected item and once based on the history of watched content. This task was achieved by converting the synopses of every item into a vector by applying BERT (Devlin et al., 2018). BERT understands the context of the

synopses and represents them as a vector, which allows calculating the similarity of items by evaluating the cosine similarity (Metcalf & Casey, 2016). Cosine similarity examines the similarity based on the angle between items' vector presentation. The basic understanding can be taken from the figure 3.

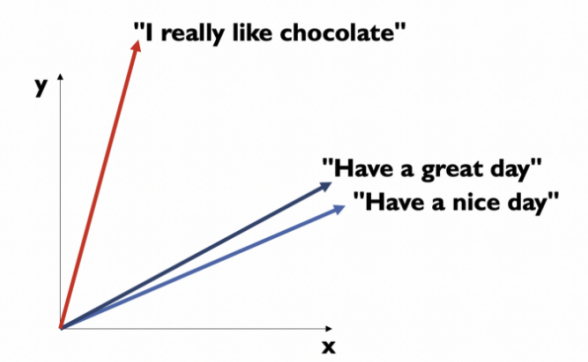

Figure 3: Sketch of the functionality principle of cosine similarity, from (Paialunga, 2016).

In order to improve **Diversity**, an additional list of recommendations is added that recommend not the most similar items but are within an artificial cluster based on the current item. This should broaden the horizon by suggesting more diverse content that is still a recommendation instead of a wild guess like a random suggestion. Those artificial clusters are aggregated by applying TF-IDF (Qaiser & Ali, 2018) and K-mean clustering (Jin & Han, 2010). TF-IDF examines the relevance of words to documents. In our case, synopses of items represent documents. K-Mean clusters items based on their coherent relevancy represented as a TF-IDF matrix.

Freedom of Bias is not addressed within the methodology due to the lack of data that allows mitigation.

To additionally emphasise **Convenience** a genre filter was implemented that allows the user to filter for a specific genre and still uses the most similar item based on the cosine similarity approach.

To emphasise **Autonomy** a complex web interface side was added that has a structured table that allows the user to browse, filter and group-by every single available item without getting a narrower view by the RS. This web interface side is additionally an advantage when it comes to **Transparency**. It is beneficial to understand the RS when the scope of possible recommendations can be explored.

4 Interface design

The interface was designed to emphasise both personas' Convenience Consumer' and 'Cautious Consumers' that were derived from the survey. It includes in total three different web interface views' Casual Exploring', 'Unveiled Exploration' and 'History' and a sidebar to interact with the website.

Convenience, **Diversity** and **Autonomy** were the highest values for the 'Convenience Consumer'. Concluding the experiences has to be easy and as little distraction as possible from the essential. Therefore, the initial view of the mid-fidelity prototype provides most of the features out of the box, spotlighting the easy consumption of content and providing all possible recommendations, as is displayed in figure 4.

Privacy, **Transparency** and **Autonomy** were the highest values for the 'Cautious Consumers'. Thus, the experience is not mainly tuned to find the most appealing content but rather to inform and control what is happening on the website. Therefore, many modes were added to the sidebar (shown figure 6) that allows the user to be in control of many embedded mechanisms:

- **Genre**: Enables a recommendation list that is based on the selected content but filtered by a genre.

- **Privacy Mode**: In this prototype, the functionality is limited due to the lag of user data collection and processing. It toggles if viewed content is appended to the history and if the history recommendation is shown. The idea behind this mode is to erase all modules from the website that might be in conflict with any privacy issue to show the user where their data is used.
- **Diversity Mode**: Enables an additional recommendation list based on the selected item. The big difference from the normal recommendations is that the recommendation is broader but still concerns the selected item. The idea behind this mode is to give the user the possibility to broaden their horizon. Additional features might be recommendation lists based on selected topics the public broadcaster cares about, political relevant topics or content about minorities so that they have a stage for any reason.
- **Transparency Mode**: Toggles if an infobox is shown by activating specific elements to get a better insight into what is happening. The idea behind this mode is to extend its range of infoboxes to explain even the embedded mechanisms. A possibility would be to add different intensity levels ranging from little information to verbose explanations to reach out to every user.

An additional feature for 'Cautious Consumers' is the unveiled exploration (shown figure 7). The idea behind this view is to give the user the control to explore every item from the database without any recommendation based directions. With features ranging from sort by column to applying various filters and group-by attributes, this might be the highest level of **Autonomy** for people who understand how those mechanisms work.

For every user, the history view was added due to the interesting fact that most VOD provider do not support them but still emphasises **Autonomy**, **Transparency** and **Convenience**. This might be due to the reason that their content is sometimes temporarily available and therefore deleted and therefore not possible to display, for instance, due to law issues. Nevertheless, a placeholder could manage this if the former information is inaccessible.

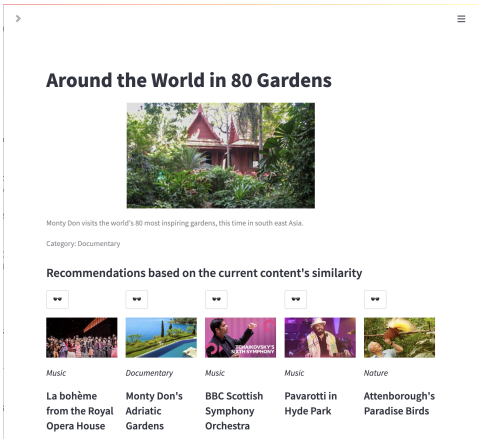

Figure 4: Initial view from the mid-fidelity prototype emphasising 'Convenience Consumer'.

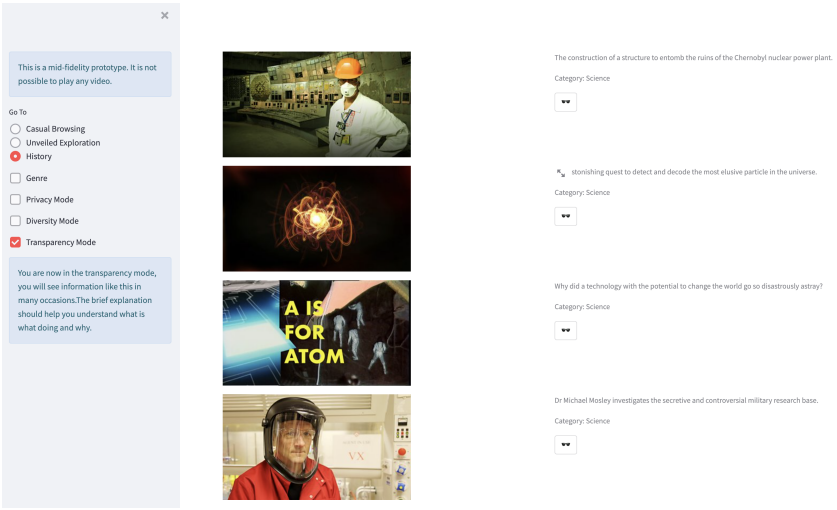

Figure 5: The history overview to enable the user to see what content is influencing his history recommendations.

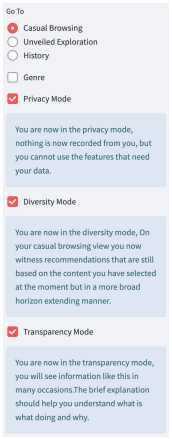

Figure 6: The sidebar of the website to give the user the possibility if interaction.

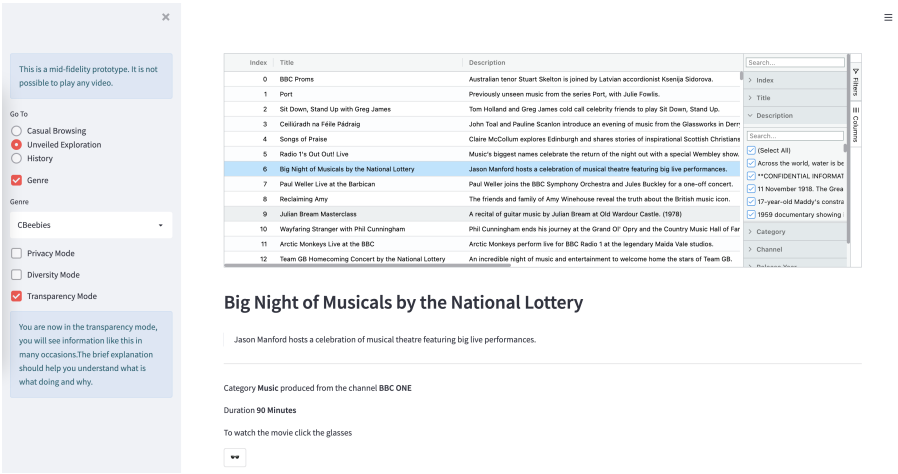

Figure 7: The Unveiled Exploration side that includes a table including every single item in the database with the functionality to filter, sort and group by.

5 Conclusion

BBC has much sensible work to do, to equally satisfy every user and to emphasise all public values. Even though the concentration was only on two Personas and a total of 6 values in this assignment, the possibilities are uncountable, whereby 'Freedom of Bias' and 'Privacy' were not considered in-depth due to the lack of data, and sometimes contradictory. For instance, a 'Convenience Consumer' might be distracted by possibilities like the 'Unveiled Exploration' due to fear of missing out (Przybylski et al., 2013).

A website that is convenient and at the same time complex enough to inform, educate and entertain might not be suitable for every person. The tastes of humankind, one country's population alone, seem to be too different from inventing one dish for all.

6 Discussion

There is one possibility that might solve the one dish for all problem. A possibility that comes to my mind is to reach out by providing different stages of a website, so to say, an evolutional website. An approach that I can imagine is having achievements based on a user, whereby every reached achievement unlocks a new feature or evolves the website towards a specific direction. Side note: This would add gamification, making the web interface more enjoyable.

An example of such an achievement for the 'Convenience Consumer' is binge-watching recommendations. Thus, the website evolves towards a more straightforward website with less distraction from 'unnecessary' interaction possibilities.

An example of such an achievement for the 'Cautious Consumer' is enabling 'Transparency Mode' 10 times or measuring the time spent reading such infoboxes, which would unlock a more verbose transparency mode to enable the user to dive into the thoughts and concepts of the website.

To elaborate on this idea, research has to be made towards the user acceptance of such and also the ethical issues that are associated with. Questions arise like: Do the users want to spend time on a website to unlock all possible features? Is discrimination possible based on evolved web interfaces? Is it conceivable that people say 'Show me your web interface and I will tell you who you are'?

Many questions arise. Nevertheless, it is an exciting area where a lot of a research has to be made, and hopefully, the future will reveal the answers or other possibilities.

7 Glossary

1. **Accountability** Refers to the properties that ensures that the actions of a person, people, or institution may be traced uniquely to the person, people, or institution (Friedman et al., 2006, 2002). 3

2. **Autonomy** Refers to people's ability to decide, plan, and act in ways that they believe will help them to achieve their goals (Friedman et al., 2006, 2002). 3

3. **BBC** British Broadcasting Corporation. 3, 4, 8

4. **Courtesy** Refers to treating people with politeness and consideration (Friedman et al., 2006, 2002). 3

5. **Environmental Sustainability** Refers to sustaining ecosystems such that they meet the needs of the present without compromising future generations (Friedman et al., 2006, 2002). 3

6. **Freedom from Bias** Refers to systematic unfairness perpetrated on individuals or groups, including pre-existing social bias, technical bias, and emergent social bias (Friedman et al., 2006, 2002). 3

7. **Human Welfare** Refers to people's physical, material, and psychological well-being (Friedman et al., 2006, 2002). 3

8. **Informed Consent** Refers to garnering people's agreement, encompassing criteria of disclosure and comprehension (for "informed") and voluntariness, competence, and agreement (for "consent") (Friedman et al., 2006, 2002). 3

9. **Ownership and Property** Refers to a right to possess an object (or information), use it, manage it, derive income from it, and bequeath it (Friedman et al., 2006, 2002). 3

10. **Privacy** Refers to a claim, an entitlement, or a right of an individual to determine what information about himself or herself can be communicated to others (Friedman et al., 2006, 2002). 3

11. **RS** A recommendation system (RS) aims to predict if an item would be useful to a user based on given information (Fayyaz et al., 2020). 1, 3, 5

12. **Trust** Refers to expectations that exist between people who can experience good will, extend good will toward others, feel vulnerable, and experience betrayal (Friedman et al., 2006, 2002). 3

13. **Universal Usability** Refers to making all people successful users of information technology (Friedman et al., 2006, 2002). 3

14. **VOD** Video-on-Demand. 1–4, 6

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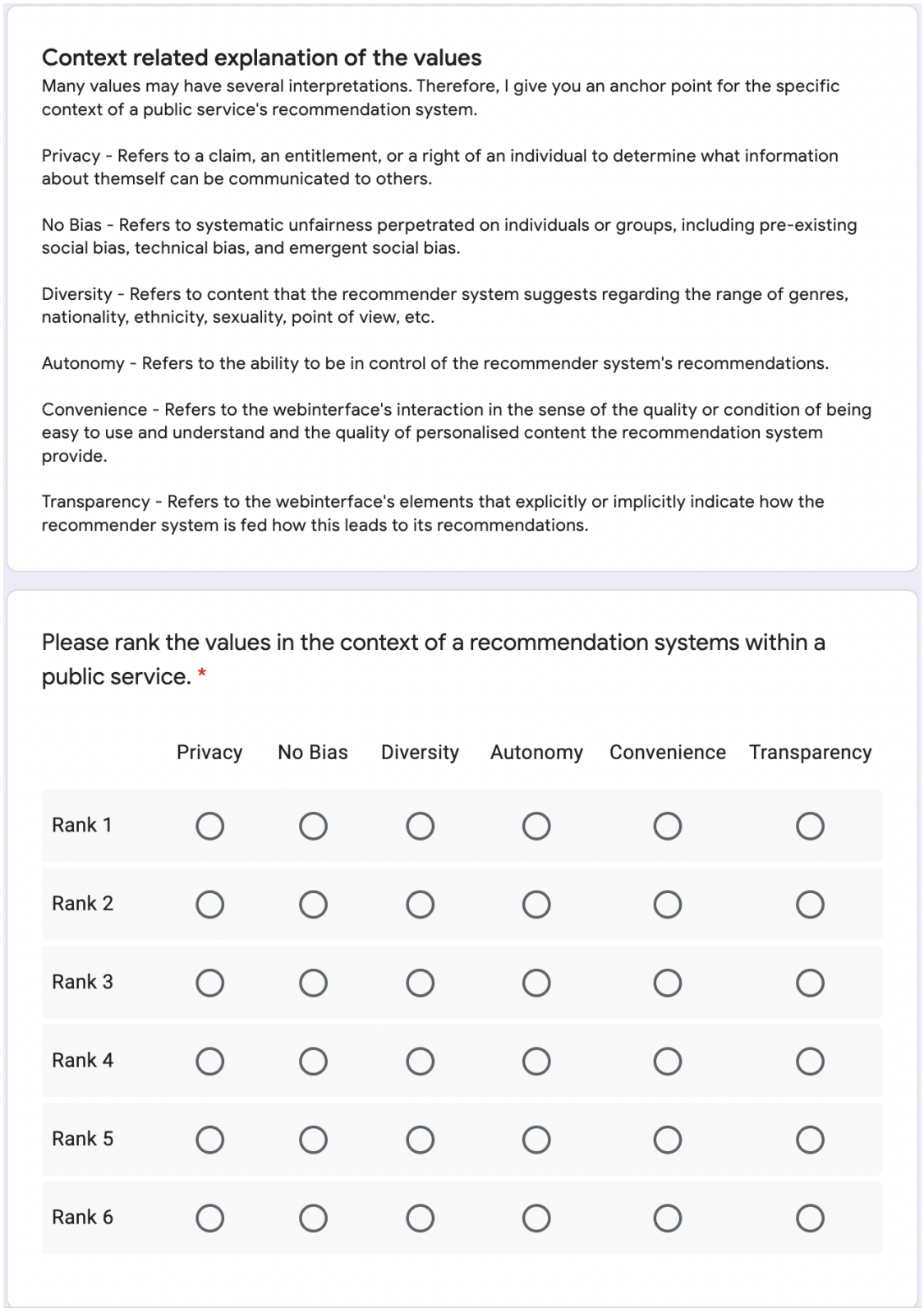
A Survey



Context related explanation of the values

Many values may have several interpretations. Therefore, I give you an anchor point for the specific context of a public service's recommendation system.

Privacy - Refers to a claim, an entitlement, or a right of an individual to determine what information about themself can be communicated to others.

No Bias - Refers to systematic unfairness perpetrated on individuals or groups, including pre-existing social bias, technical bias, and emergent social bias.

Diversity - Refers to content that the recommender system suggests regarding the range of genres, nationality, ethnicity, sexuality, point of view, etc.

Autonomy - Refers to the ability to be in control of the recommender system's recommendations.

Convenience - Refers to the webinterface's interaction in the sense of the quality or condition of being easy to use and understand and the quality of personalised content the recommendation system provide.

Transparency - Refers to the webinterface's elements that explicitly or implicitly indicate how the recommender system is fed how this leads to its recommendations.

Please rank the values in the context of a recommendation systems within a public service. *

	Privacy	No Bias	Diversity	Autonomy	Convenience	Transparency
Rank 1	○	○	○	○	○	○
Rank 2	○	○	○	○	○	○
Rank 3	○	○	○	○	○	○
Rank 4	○	○	○	○	○	○
Rank 5	○	○	○	○	○	○
Rank 6	○	○	○	○	○	○

Figure 8: The survey the international student participants had to answer.