ABSTRACT
The growing inclusion of information and communication technologies in our everyday life sets the scene for the development of personalized public services. Their public character brings along challenges that have not necessarily been dealt with in commercial applications, especially in terms of optimizing for the common good which requires moving away from a purely personalized-oriented approach. In this paper, we claim that to address these challenges, we can learn from two best practices in the design of digital public services: participatory design and open data.

CCS CONCEPTS
• Information systems → Personalization; Recommender systems.

KEYWORDS
multi-stakeholder recommendation; open data; participatory design; personalization; public services

ACM Reference Format:

1 INTRODUCTION
The growing societal importance of algorithmic systems has spurred the discussion about the governance of these algorithms [11]. Emerging work in this field focuses on basic principles and values such as accountability, transparency and fairness [13]. This is especially true for algorithmic systems operating in the public domain, e.g. public service media, education, justice, social services, or the deployment of ICTs in public space (i.e. ‘the smart city’) [17].

While all digital services are required to respect basic legal rules of fair competition and consumer protection (e.g. GDPR), public services are expected to adhere to additional principles in order to serve the common good. This implies that they at times will deviate from individual or short-term preferences to safeguard public interest and long-term wellbeing. For example, city administrations may impose a social mix of pupils across primary schools, whereas individual parents may prefer to simply be able to select the school of their first choice.

As algorithmic recommender systems become pervasive in the public domain, personalized public services thus require valuesensitive design according to a set of explicit public values. This set of public values goes beyond accountability and transparency, and needs to reflect a more elaborate set of democratic principles [10]. It is widely accepted that the selection and operationalization of these values will differ according to the context in which they are deployed. In some cases, neutrality or integrity will be crucial; in others, social equity might be the overriding objective [5].

One of the areas where historically theorizing and experience on recommendations and editorial decisions in a public service context has been most extensive, is public service media. For instance, John Reith’s famous mission for the BBC to “Inform, Educate and Entertain” has also been suggested to apply to public service news recommenders [9]. In the case of public service media, we therefore suggest that a Reithian approach to public media recommender algorithms would imply a number of core values to be embedded in these systems, i.e. Trustworthiness and Pluralism (to inform the public without misinformation or one-sidedness), Diversity and Serendipity (to educate by displaying a diverse set of information, beyond only the most popular content), Engagement and Social Cohesion (to entertain in a way that the public sphere is strengthened).

In order to operationalize such public values, it has to be recognized that personalized public services represent a significant overlap with multi-stakeholder recommender systems, which aim to deal with so-called “system considerations” [1]. As public service operators will have to move away from a purely personalized-oriented approach to take into account the public interest and will have to deal with objectives that are often hard to formally quantify [7], they should not only focus on technical challenges associated with multi-stakeholder recommender systems, such as the modeling of multiple objectives [14] or the evaluation of multi-stakeholder systems [4], but also on a number of institutional arrangements.

In this paper, we argue that these institutional arrangements have been overlooked so far and we suggest some actions that aim to address them within the particular context of the public service domain. Building upon a number of projects related to public media and smart cities, we put forward two best practices: participatory design and open data.

2 PARTICIPATORY DESIGN
Due to their nonrivalrous character, the market for public services is unlike traditional markets. These services are often either provided through government development or by commercial parties who have been contracted by a public organization to develop and provide public services. In the latter case, the specifications laid out by the contracting government need to ensure that the public
interest is safeguarded and that the interests of the commercial party are aligned with that goal. This multi-stakeholder environment increases the complexity of service delivery versus a purely commercial scenario. Moreover, public services are characterized by a multitude of users who each have their own requirements for the service. Not only is there a great variety among citizens themselves, for example in terms of their needs or digital literacy, but there are also often a significant number of different roles amongst the service providers too.

In this sense, emerging work on multi-stakeholder recommendations could be of great value to the development of personalized digital public services. This framework builds upon the premise that recommender systems are in essence multi-sided platforms and is concerned with "the integration of multiple parties into the design of the recommender systems" [1]. It has been proposed to indeed deal with multi-sided considerations, such as fairness [7], by explicitly modeling the utility of different stakeholders.

This line of research is currently mainly concerned with the computational challenges that come along with this perspective, such as the modeling of multiple objectives [14] or the evaluation of multi-stakeholder systems [4]. However, when it comes to the design of these systems, there is little empirical work demonstrating how multiple stakeholders are actually involved in the process and how the public interest could thus be articulated [1]. Yet, evidence from multi-stakeholder design projects suggests that the state-of-the-art is to engage in participatory practices [3]. As a co-creative methodology among the different parties involved, participatory design is centered around the principles of equalizing power and democratic practices [15]. On the one hand, this will allow identifying possibly conflicting or incompatible objectives of multiple stakeholders and means to remedy them. On the other hand, participatory design is known as a value-centered design approach and is therefore often used in the public sector [15].

Participatory design methods should thus become an integral part of the design phase of the recommender system. However, this brings along a multitude of questions such as how to identify different stakeholders; who must be able to participate; to what extent should each be involved; what are the best ways to facilitate the participatory design; how do we keep the balance between top-down and bottom-up approaches? While there is a vast amount of former work on participatory design methods that might inform these questions at hand, there is still a need to align these design practices with the development of recommender systems and adapt them to this specific context.

Furthermore, we believe that contemporary participatory design practices should also benefit from the opportunity to incorporate actual user feedback through their usage of the system. In this way, public service algorithms should be deployed and tested in a large-scale experimental setting, and the usage data might not only serve the evaluation of a number of short-term metrics, but also be considered as an important form of indirect participation to inform the system design in an iterative way.

This kind of co-creative approach is known as a living lab: "the involvement of multiple stakeholders, including users, in the exploration, co-creation and evaluation of (usually ICT-related) innovations within a realistic setting" [3]. This design method is commonly used in innovation research on digital products and services and is particularly suited to consider these institutional arrangements that arise from humans and machines being embedded in social contexts. The method has therefore been applied in innovation projects related to digital public services (e.g. in cities [6] or public service media, such as the Content Personalisation Network 1). However, there is still a lack of a sound methodological approach to apply this kind of methodology in the design of recommender systems and therefore these practices are considered to be rather ad hoc implementations. We believe the design of recommender systems would benefit from a consistent design approach to include these large-scale experimental settings, especially in complex socio-technical environments.

3 OPEN DATA

Although sparse-data environments are not new to the field of personalization [2], it should be considered that in the context of public service design this problem might become even more pressing. Given its role as a trusted party, from which citizens expect a degree of transparency, the (non-personal) data on which recommendations are based, could be expected to be public and very well described as well. While data has always been used in policy making to some extent, the sheer amount of data that is becoming available today, as well as the combination of data from different sources and domains, can provide new types of tools and insights.

In order to fully unlock the potential of this data, however, it needs to be more easily available and better described than today. This is where open data comes in. The idea is that governments currently own (but do not use) information related to divergent aspects of public life, but that this data is neither publicly available, nor easily interpretable. This has sparked a movement to encourage the opening of data sets in a structured and machine-readable way, under the ‘open data’ moniker, which has gained significant traction across local and national governments. Open data can be used for any goal at no cost, with the only (potential) exceptions being that re-users mention the source of the data or do not in any way prevent the data from being shared further on.

The idea here has been twofold: public organizations open up all kinds of data related to their operations, with the goal of (1) having external developers create new services and applications (‘apps’) based on this data, and (2) increasing transparency, accountability and civic engagement [8]. In principle, this can mean a cost reduction for the public organizations that open data, as they do not necessarily need to build and maintain their own services and apps, an activity that is generally accepted as being highly cost-intensive [16] and at the same time, governments can be more easily held accountable for the decisions they make.

In practice, however, and particularly in the case of recommender systems, a number of challenges remain and ‘merely’ opening up data has not always proven equally successful [12]. Opening up data already entails significant challenges to governments and public organizations before any data leaves the organization (e.g. setting up internal processes to safeguard internal data hygiene and quality control or implementing new or updating existing database systems). Relevant data can also be managed by different government

1https://www.projectcpn.eu
organizations or levels of governance, and some data applicable to the public may be under the control of private players that are less inclined to open it. This links back to the challenge of multi-stakeholder networks and participation discussed in the first part of this paper. We identify four key challenges at play when opening data in this context:

- Data hygiene in the organization: In some cases, digitization still is a significant challenge, but how can we generate awareness to the level of key individual public servants that work with data? How do we change working with data into an operational process that leads to good open data?
- IoT and open data: In the hype surrounding the Smart City concept a lot is made of the data generated by sensors and other IoT devices, but how do we publish data from these sensors in a proper way, dealing with the real-time aspect, the sheer volume of the data, archiving of data and so on?
- Centralize vs decentralize: As a principle, open data lends itself quite well to decentralized publishing and the technical solutions are available, but how do we turn these into processes that work? This requires agreement on the roles of different levels of government.
- Government and the market: where does the role of government end? When do private actors come into play? This is particularly relevant in the field of open data as well.

To overcome these challenges, it is necessary to create a common understanding between the actors in the network on the common goals and ambition. In the case of open data, there are a few examples of charters or strategies, aligning such ambitions. The city of Eindhoven for example, puts forward a clear vision for its partners, gathering data in the public space. The Smart Flanders Open Data Charter aligns the open data ambition of thirteen cities and the government of Flanders (Belgium), and its 20 principles were co-created in a participatory way.

It is generally agreed that data availability and data quality are key in designing performant recommender systems [2]. When considering these systems in a public context, this data challenge becomes even more layered and complex. Providing an answer to the questions laid out here will be critical in the design of such systems going forward.

4 CONCLUSION

We claim that the development of personalized digital public services should sufficiently take into account the institutional challenges that arise from the particular context of the public domain. More specifically, we suggested two practices that aim to deal with the complexity of the multi-stakeholder environment and safeguard the public interest. Firstly, a participatory design approach to be able to go beyond a traditional personal preferences approach and thereby fulfill the public objectives. Secondly, open data and proper metadata as a key enabler of all kinds of applications with a public interest as their goal. Future work should take into account these actions to ensure the development of sustainable digital public recommender systems.

REFERENCES