

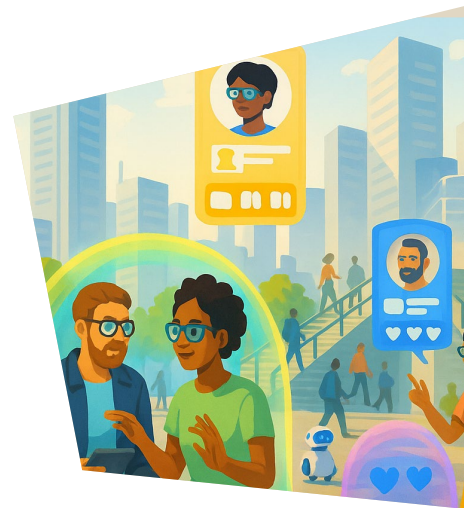
Towards Societally Beneficial Personalized Realities: A Conceptual Foundation for Responsible Ubiquitous Personalization Systems

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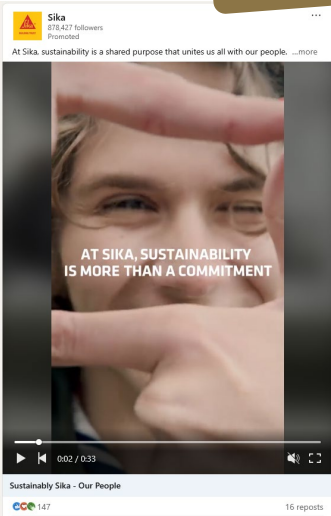
♦ *University of St.Gallen, Switzerland*

△ *HOCH Health Ostschweiz, Switzerland*



We find personalized services mostly on the Web...

Ads



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Leo and Lilo Small Christmas greeting, gift set with 6 hand creams, natural cosmetics, made in Germany
★★★★★ 1,476
€18.40 (€153.33/l)
Get it as soon as Tuesday, Dec 20



Kneipp shower gift pack - shower happiness, 3 x 75 ml
★★★★★ 2,756
#1 Best Seller in Beauty
€3.42 (€15.20/l)



Rainbow Socks, Unisex Funny Hamburger Socks, Box with 2 Pairs
★★★★★ 9,226
€16.80 (€8.40/stück)
Get it as soon as Tuesday, Dec 20

Shopping



SUGGESTED FOR YOU



PIERROT LE FOU
JEAN-LUC GODARD FRANCE 1965

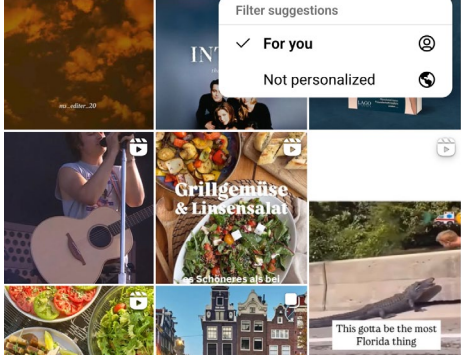


THE SACRIFICE
ANDREI TARKOVSKY SWEDEN 1986

Streaming



Social Media



Filter suggestions

✓ For you

Not personalized

Grillgemüse & Linsensalat

This gotta be the most Florida thing

...but personalization increasingly also affects physical reality

Web



personalized content

Ubiquitous Computing

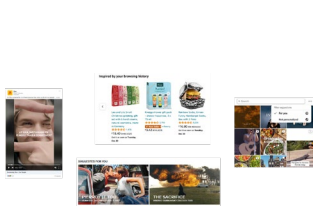


personalized interaction with things

Mixed Reality



personalized mediation

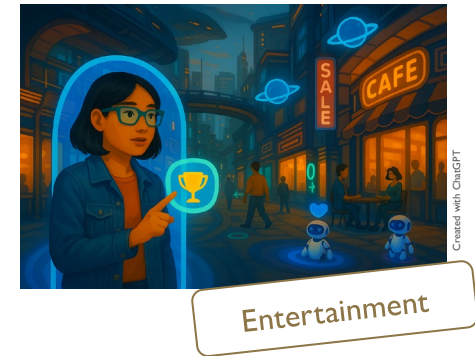
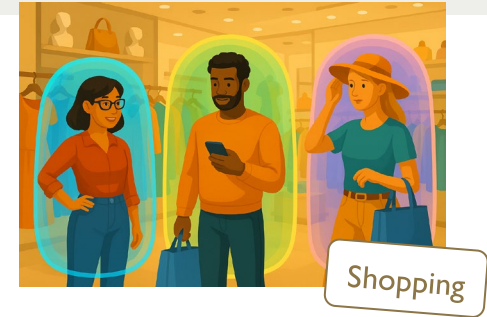


Project Aria, Meta

This creates **Personalized Realities (PR)**

PR describes a physical, virtual, or mixed reality

- that has been modified in response to *personal user data*
- and may be perceived by *one or multiple users*
- through *any sensory modality*. [1]



What could possibly go wrong?

Perceptual
Filter Bubbles

[1, 2]

Manipulation

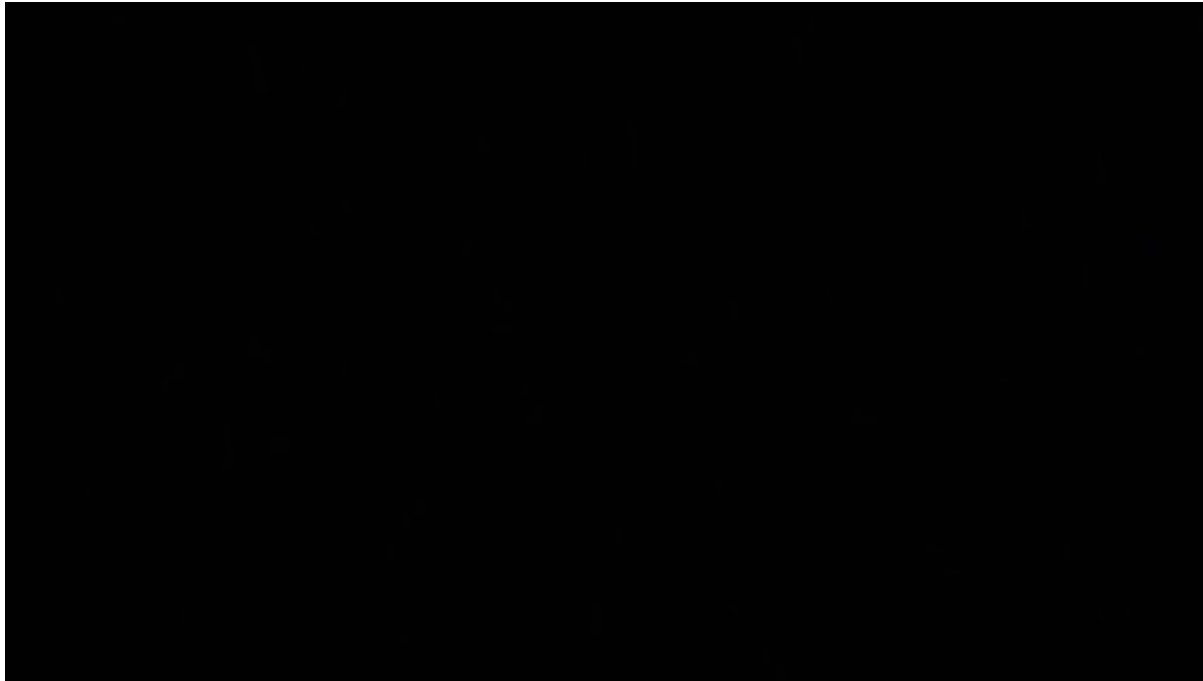
[4]

Deception

[5]

Isolated Realities

[3]



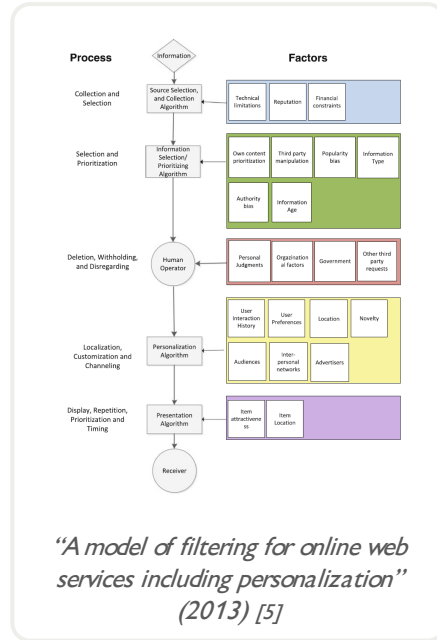
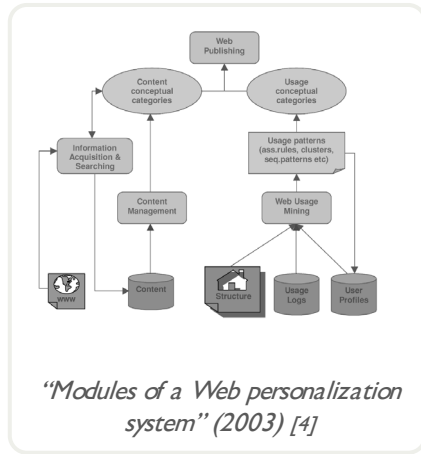
HYPER REALITY (2016)

Keiichi Matsuda (<https://www.youtube.com/watch?v=YJg02ivYzSs>)

Previous conceptual models are not suitable for ubiquitous personalization systems anymore

Conceptual models

provide a high-level abstraction of complex systems [1,2,3]



Shortcomings of existing personalization models



Stakeholder Conflation



Virtual-Only Focus



Disregard of Delivery Medium /
Assumption of Homogeneous
Delivery Media



Limitation to
Virtual Data Sources



Missing Feedback-Loop

Our contribution to mitigate dystopian PR

We provide a systematic description of
Ubiquitous Personalization (UP)
and...



...show how it extends traditional personalization research to physical reality



...enabled by technologies like Mixed Reality and Ubiquitous Computing

Our conceptual model for
Responsible Ubiquitous Personalization Systems (RUPS)...



... describes personalization systems in any environment



... and guides the analysis, and design of *responsible* personalization systems.



Our research provides a framework for the development of
Personalized Realities that are beneficial for individuals and society.

What is Personalization?

The term is commonly used when referring to

- the processing of *personal data* by a system as input,
- the adaptation of the system's functioning in response to *personal data*, or
- the personalized content that such a system outputs. cf. [1-6]

Personal Data is

“[...] *any information relating to an identified or identifiable natural person* [...] who can be identified, directly or indirectly, [...]” (GDPR, Article 4)

Personalization

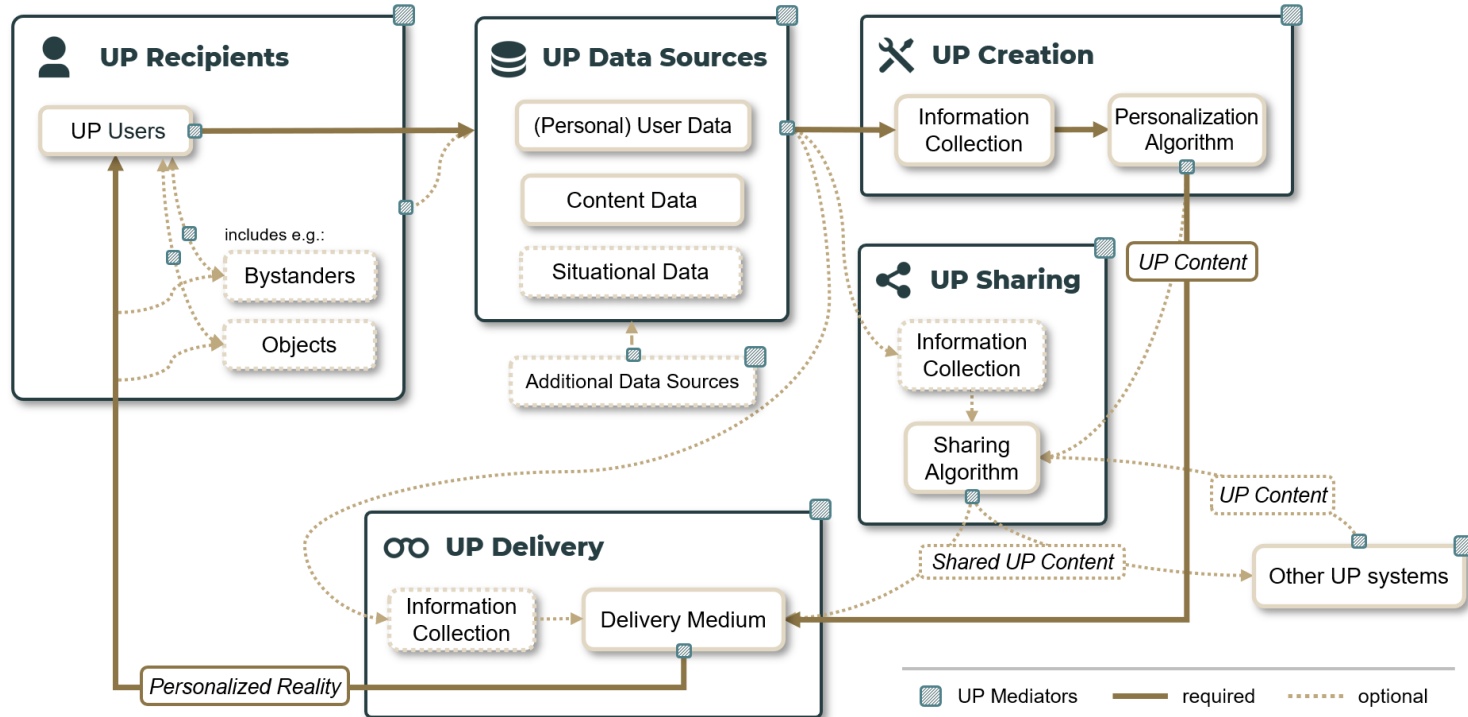
- a *system-initiated* or *-controlled* adaptation [2,3,4]
- i.e. a system is *adaptive* [7]



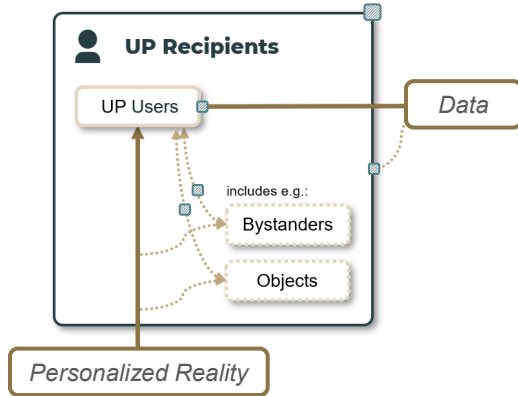
Customization

- a *user-initiated* or *-controlled* adaptation [2,3,4]
- i.e. a system is *adaptable* [7]

A model for Responsible Ubiquitous Personalization Systems (RUPS)



UP Recipients



UP Users

= Intended recipients of PR



Bystanders, Devices, Objects,...

= Unintended recipients of PR

- Information asymmetries
- (Harmful) Implications on bystanders should be avoided
- Data privacy of bystanders should be respected

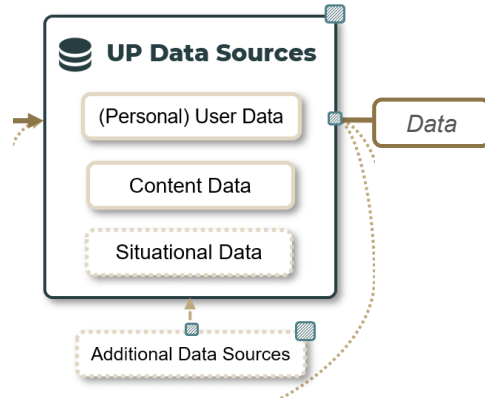


Recipients who perceive the PR and from whom data is sourced for creating the PR.



The RUPS models shows PR as a phenomenon that has implications beyond the intended recipients.

UP Data Sources



Historic, current, and predicted data about the users themselves (personal data), and the content that is to be personalized.



The RUPS model makes the data collection in personalization systems more explicit.

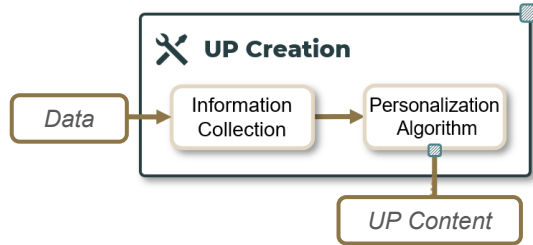


Data Collection in physical reality

- is less socially accepted [1]
- is more expensive (hardware!)
- is potentially much more comprehensive than on the Web

→ Fine-grained mechanisms for capturing consent are needed to guarantee data privacy in PR for users and bystanders.

UP Creation



UP creators have the powerful possibility to “determine how users experience the world, how they conceive of themselves, and how they regard others” [1, p.99], and hence may influence people’s perceptual and conceptual worldview [2].



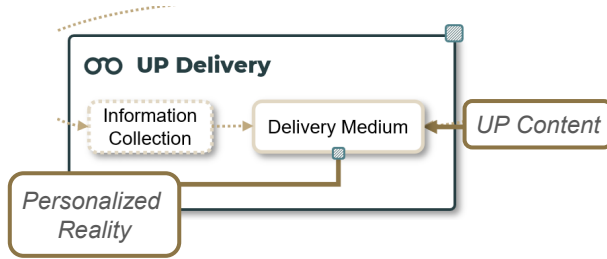
The creation of UP Content by creators based on (minimally) personal data and content data using a Personalization Algorithm.



The RUPS model highlights the Personalization Algorithm as a powerful Reality Filtering tool.

→ UP creators have a much greater and more direct influence on people’s lives than on the Web

UP Delivery



The scope extension of UP

- many more devices can show personalized content or behave in a personalized way
- each delivery device poses its own set of issues (e.g., deceptive design, data privacy, impact on bystanders,...)



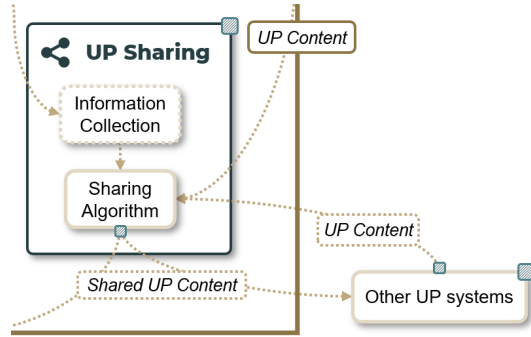
Through UP Delivery, aspects of UP Users' original reality are personalized (e.g., by augmenting, diminishing, or mediating content).



The RUPS model highlights the expanded Personalization possibilities through the scope extension of delivery devices.



UP Sharing



The explicit sharing of UP Content between UP users across UP systems.

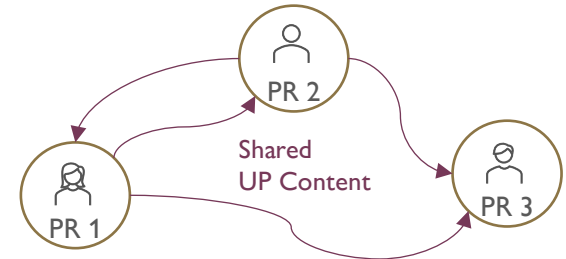


The RUPS model provides a method to potentially mitigate isolated perceptions of reality, while keeping the benefits of individual PR.



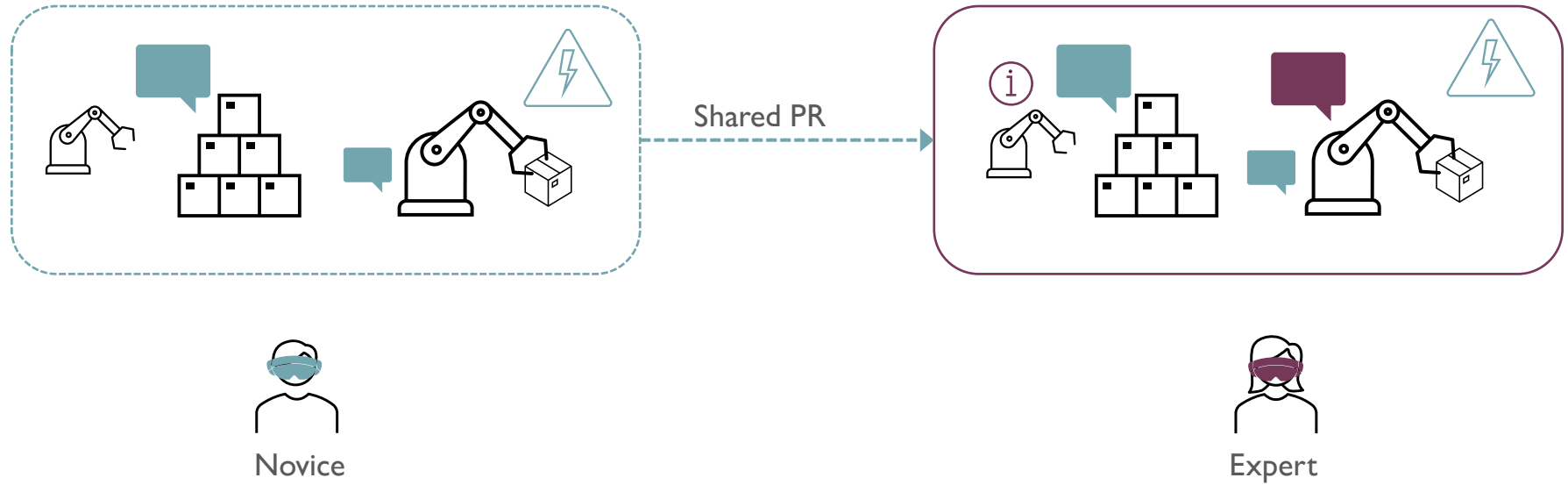
Mitigating fragmented realities

- PR filters the common ground-truth (i.e. physical reality)
- Transparent controls may enable people to share personalized content with others
- This may mitigate isolated perceptions of realities and be societally beneficial



UP Sharing: Uni-Directional Exchange

 
Personalized
MR Content



Literature Validation



N=16 existing personalization systems from literature



Mapping each system to the components of the RUPS model



Mapping table (excerpt):

...	UP Data Sources		UP Creation		UP Sharing		UP Delivery		UP Mediators
	Content Data	Additional Data Sources	IC	Personalization Algorithm	IC	Sharing Algorithm	IC	Delivery Medium	
[37]	Smartphone application interface	Compendium of Physical Activities	-	Physical activity and tip recommendation	-	-	-	Smartphone	-
[53]	Physical skiing map	-	-	AR overlay on physical map	-	Followers see primary user's AR content overlayed on a physical map	-	Head-mounted mobile phone	-
[71]	Workout recommendations	-	-	Personalized Workout Interpretation and Smart Workout Assessment	-	-	-	-	-

...



The RUPS model fully describes each system, especially with regards to



Completeness



Modular system design

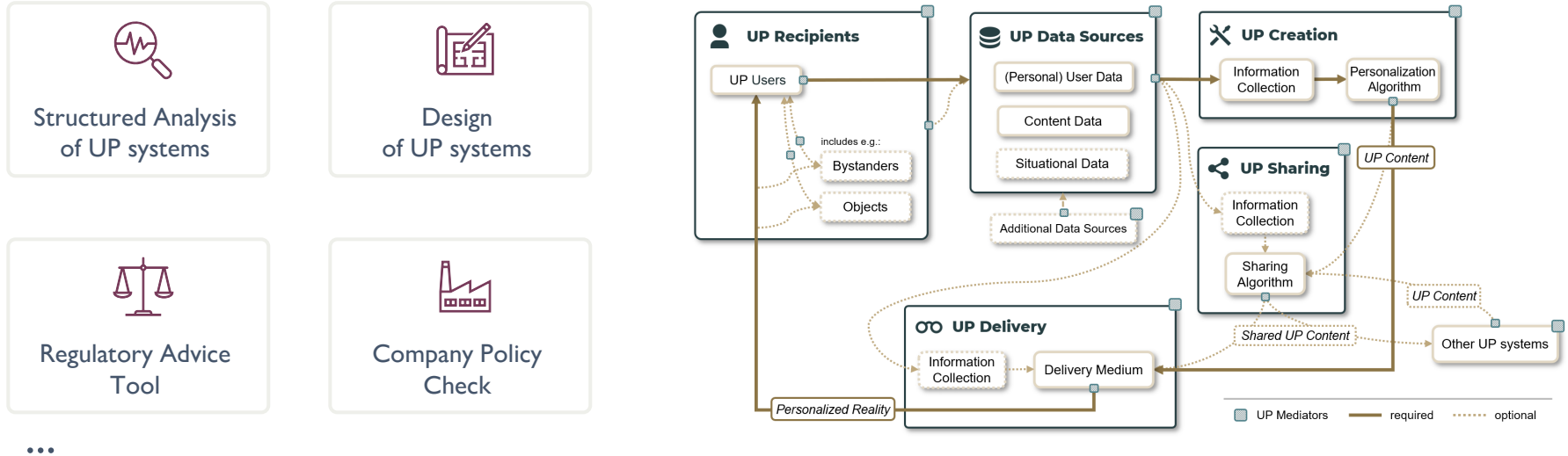


Mapping Gaps



Extension possibilities

How to use the RUPS Model



Thank you!

Questions?

Towards Societally Beneficial Personalized Realities: A Conceptual Foundation for Responsible Ubiquitous Personalization Systems

- We proposed a conceptual model for *Responsible Ubiquitous Personalization Systems (RUPS)*.
A responsible implementation of these systems ensures that *Personalized Realities* are beneficial for individuals and society.



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Read the
paper



<https://doi.org/10.1145/3715336.3735709>

