



(Picture: Target)

# Adoption of Mobile Augmented Reality Applications

Salo M., Olsson T., Makkonen M., Frank L.

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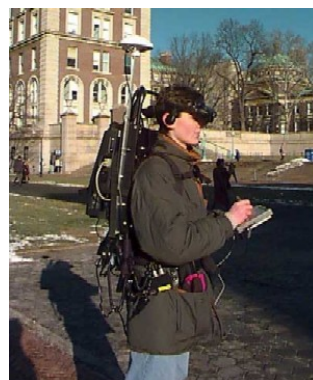


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## Introduction

*Mobile augmented reality (AR) applications are enabling digital content to be connected with the user's real world contexts in real-time*

- Technical pilots for over 20 years
- End-user applications relatively recently
- Term 'Augmented Reality' introduced in 1992: AR system for aircraft manufacturing (Caudell & Mizell 1992)

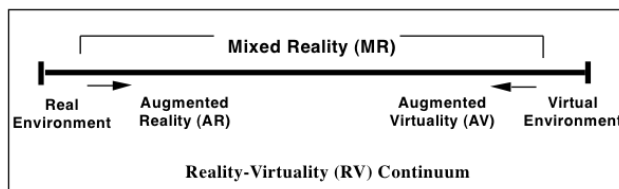


## Mobile Phone as an Enabler



## Augmented vs. Mixed Reality

- Similar elements with 'augmented reality' and 'Internet of Things' (IoT)
  - Most earlier research on IoT concentrates on machine-to-machine interaction, not social platform (*Boussard & Thebault 2010*)
  - The user base for augmented reality applications is expected to explode (*Wither et al. 2009*)

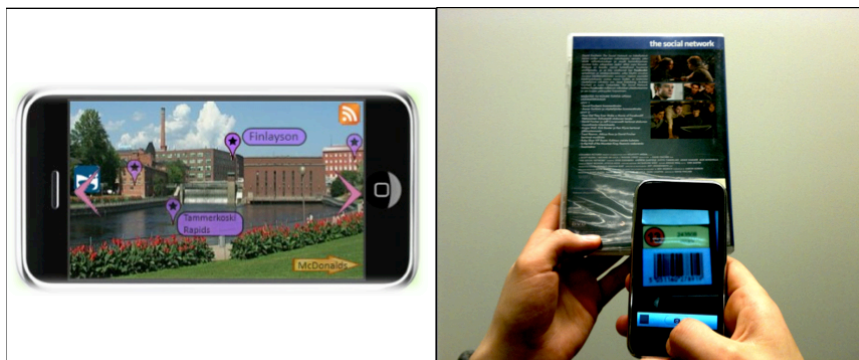


(*Milgram et al. 1994*)

## Mobile Augmented Reality Apps

- Users are able to acquire digital information via barcodes, visual tags, sensors or image recognition
  - Masses of consumers have the necessities (smart phone)
- Several applications available on appstores
  - E.g. *Layar* and *Wikitude* with over 1 million installations
- The role of the user: receiving content → content creation
  - The latter area is novel
  - Different from writing reviews on web sites (real-time & context-related)

## Types of Mobile AR Apps: Points of Interest vs. Object Recognition



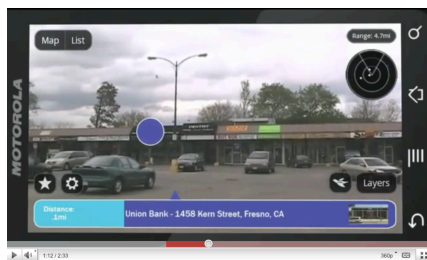
## Google Goggles



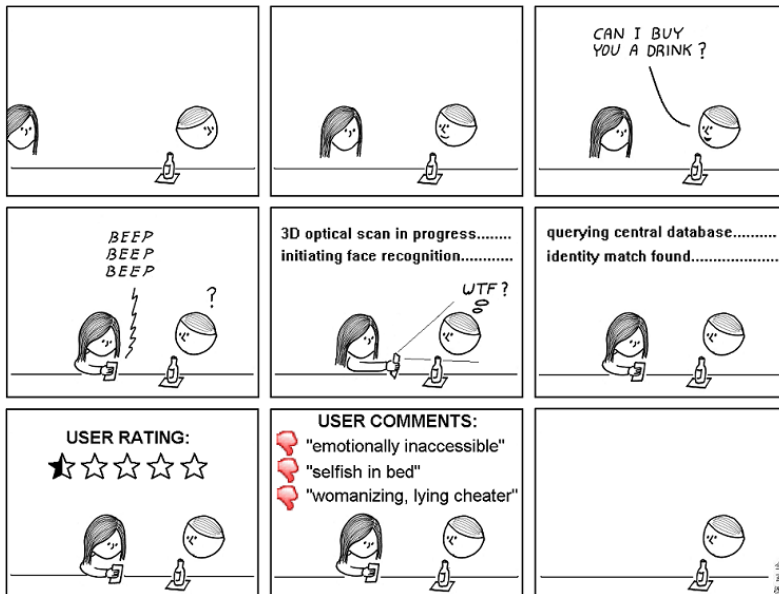
## Layar & Wikitude

*Layar*

*Wikitude Drive*



# TAT Augmented ID (Demo)



\* PAT. PEND.

Abstruse Goose

“Anyone pointing a device in my direction to try to identify me better be prepared for either a **law suit**, or a **punch in the face.**”

*(Anonymous comment)*

Lähde: <http://slidesha.re/cNibu>

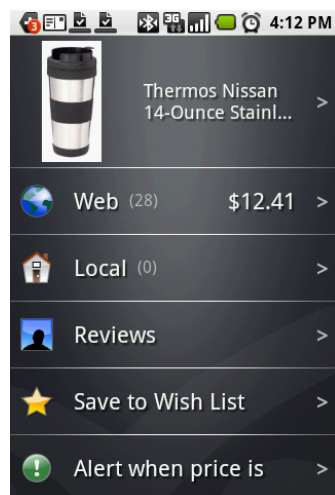
## ShopSavvy



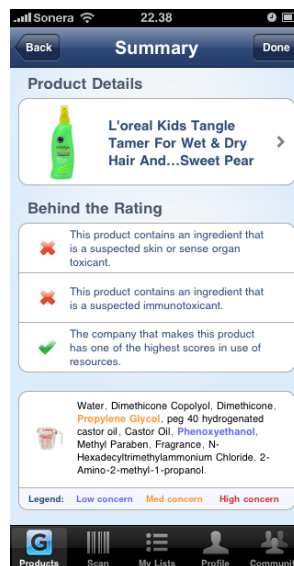
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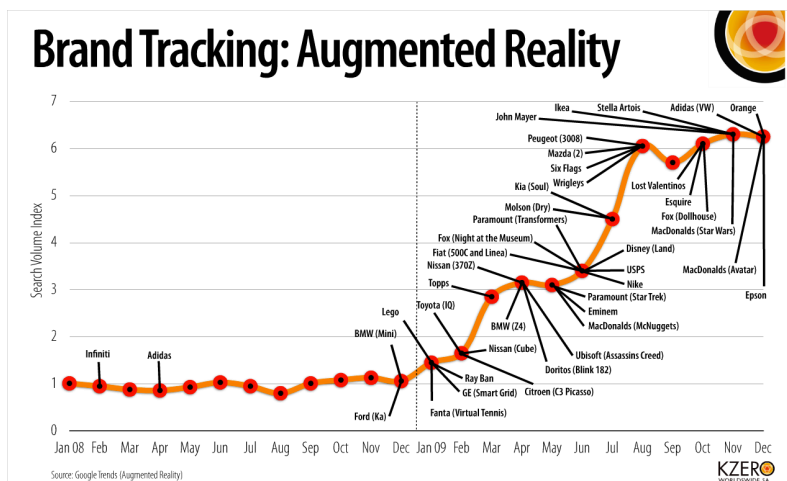


# GoodGuide



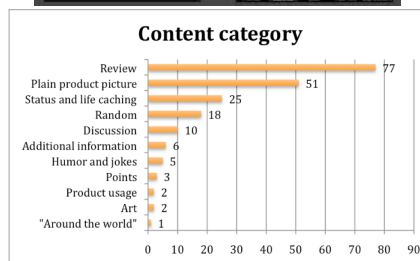
# Marker Based AR Searches

The use of augmented reality by brands and companies



## Stickybits

- Attaching information to barcodes
- 200 user-generated content pieces (publicly available) were analyzed (Salo 2011)
  - Real world data from 95 Stickybits users (no other suitable applications available)



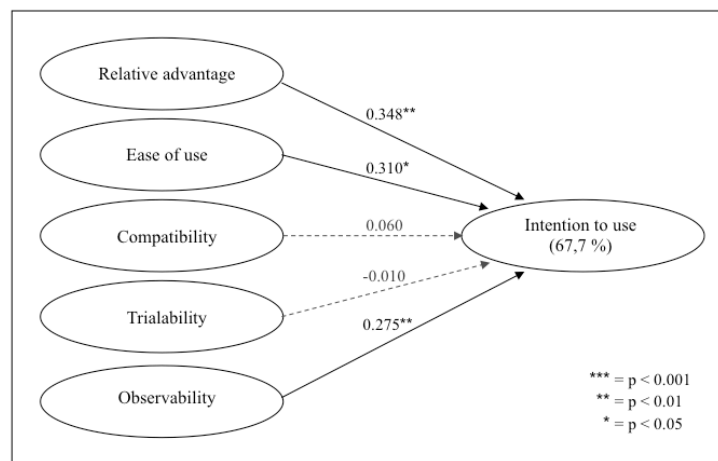
## Adoption of Mobile AR Applications

- Diffusion of innovations theory is applied to find out which factors affect the intention to use mobile AR applications
- Previous studies: (e.g. meta-analysis Tornatzky & Klein, 1982)
  - Relative advantage is the most essential factor
  - Ease of use and compatibility have been quite constant explaining factors
  - Trialability, observability, and other components vary

## Method

- Web-based questionnaire for AR users
  - Additionally to researchers major AR companies (e.g. Layar & Wikitude) spread the questionnaire link → thousands of contacts
  - Actual AR application experience was required
  - 90 completed global answers during spring 2011 (2208 visits), mean time 18 min
- Quantitative analysis SEM with PLS (SmartPLS 2.0 M3 software)
- Qualitative analysis using coding

## Quantitative Analysis Results



## Qualitative Analysis Results

### Strengths

- *Content (51 mentions)*
- *Features (39 mentions)*
- *Ease of use (29 mentions)*
- *Enjoyment (5 mentions)*

### Weaknesses

- *Content (40 mentions)*
- *Hardware and technology (35 mentions)*
- *Ease of use (23 mentions)*
- *Concept (9 mentions)*

## Qualitative Response Examples

- Strengths:
  - *“The main strengths would be showing relevant information on finding specific places. Like searching for restaurants or ATMs in foreign places.” (male, 25, Layar)*
  - *“Multifunctionality: [the application] acts as a translator, picture recognizer and text recognizer.” (male, 24, Google Goggles)*
- Weaknesses:
  - *“The content is either an artistic proof of concept or very commercially oriented. It still hasn't found the right sweet spot in between, somewhat similarly to the web 15 years ago.” (male, 30, Layar)*
  - *“[The application's] functions depend on the phone camera and it hardly works in dark.” (male, 23, Google Goggles)*
  - *“Usability and output is good but NEED for such app is at least for me very low.” (male, 24, Google Goggles)*

## Discussion

- Relative advantage, ease of use, and observability are significant determinants of intention to use mobile AR applications
  - Model based on diffusion of innovations theory explains a rather high amount (67.7%) of variance for behavioral intention
  - Qualitative analysis: Perceived strengths and weaknesses of AR applications are linked with the constructs of diffusion of innovations theory
- The unexplained part of intention to use AR applications might include social factors (subjective norms, social acceptance)
  - Signals about the unwillingness of users to hold mobile devices in front of their faces, especially outdoors or in public places