Gamification, User Experience, and Sensors

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Den Norske Dataforening

NR researchers are doing research in statistical-mathematical modelling and in selected areas of information and communication technologies (ICT).

In ICT, we focus on research in the Quality of Experience (QoE), how to measure QoE, and how to design systems which are highly usable.

When using artefacts, sensors can measure the QoE from body reactions caused by emotions and engagement.

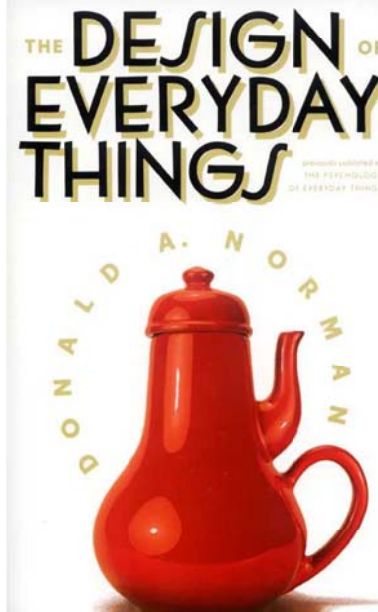We give an overview and show some practical examples.

If the experience is not good – the prosumer will go away and find another product or service …

Experience

We need research in:

- ► Metrics and methods for measuring experience
- ► Guidelines how to develop good experiences

A key component is engagement.

THE **DESIGN** OF **EVERYDAY THINGS**

DONALD A. NORMAN

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Gamification is...

- ► … applying game design-thinking to non-game applications to make them more fun and engaging.
- ► … infusion of game design techniques, game mechanics, and/or game style into anything
  (ref: Gamification Wiki)
- ► … the use of game design techniques and game mechanics to solve problems and engage audiences

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Quality of Experience (QoE)

is a subjective measure of a customer's experiences with a service or system.

► Usability

► User engagement

► Universal design

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User Experience – UX

… the way a person feels about using a product, system or service.

… highlights the experiential, affective, meaningful and valuable aspects of human-computer interaction and product ownership.

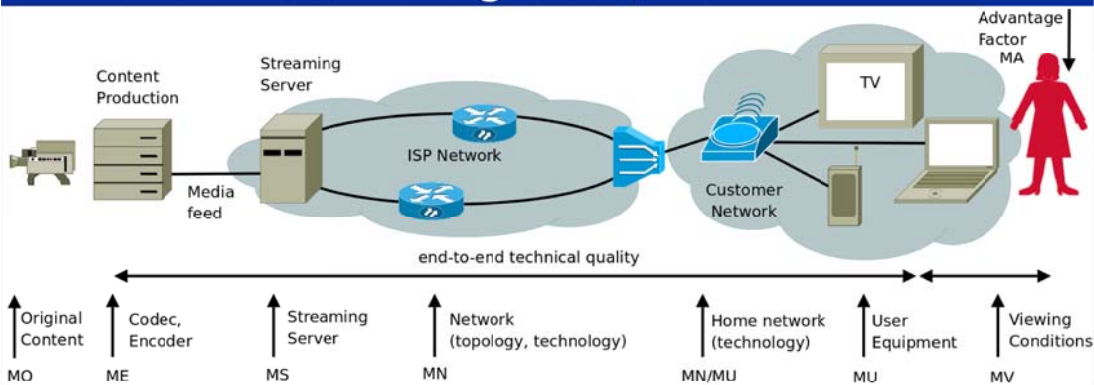… includes a person's perceptions of the practical aspects such as utility, ease of use and efficiency of the system.

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There are five ways to measure UX

- ► Subjective Assessment
  - ▪ Questionnaires, MOS, ...
- ► Objective Assessment
  - ▪ Measuring technical quality
- ► Estimation Models
  - ▪ Formula
- ► Physiological Responses
  - ▪ Sensors
- ► Hybrid Models
  - ▪ Mixture of the above

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Estimating QoE for Video-Streaming can be used for games, too

Content Production

Streaming Server

ISP Network

Media feed

Customer Network

TV

Advantage Factor MA

end-to-end technical quality

Original Content	Codec, Encoder	Streaming Server	Network (topology, technology)	Home network (technology)	User Equipment	Viewing Conditions
MO	ME	MS	MN	MN/MU	MU	MV

Quality estimation:

$$\tilde{Q} = Q_0 \cdot \prod_{i \in \{E, S, N, U, V, A\}} M_i$$

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APDEX can be used for QoE Assessment for Groups

F = 4T

0   T   F

Satisfied   Tolerating   Frustrated

- 1.00 T
- 0.94 T — E
- 0.85 T — G
- 0.70 T — F
- 0.50 T — P
- 0.00 T — U

$$APDEX_T = \frac{Satisfied\ count + \dfrac{Tolerating\ count}{2}}{Total\ samples}$$

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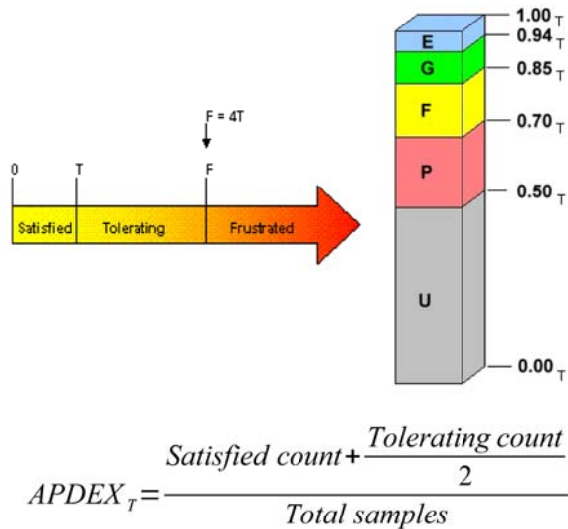
A Map of Game Experience (GX)

Design Principles vs. Models of UX

Assessment - Player Context
- Ethnography
- Cultural Debugging
- Playability Heuristics
- Interviews / Questionnaires
- Multiplayer Games Metrics

User Experience (UX)

Game Experience (GX)
- Playability
- Flow
- Immersion
- Frustration
- Enjoyment
- Presence
- Spatial Presence
- ...

Assessment - Individual UX
- Electromyography (muscles)
- Electrodermal (Skin)
- Electroencephalography (EEG)
- MRI, PET, NIR, ...
- Eye Tracking
- Person Modeling
- Game Metrics Behaviour Assessment
- Player Modeling
- Interviews / Questionnaires
- RITE

Playability
- System Quality - Technology
- Gameplay Quality - Player
- Social Quality - Community
- Intended vs. apparent character

Focus
- Emotion
- Affect
- Experience
- Pleasure
- Hedonic Qualities
- ...

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The UX Assessment must not be Intrusive and not Distract the User

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UX Assessment and Emotions ?

1. Skin temperature
measures the surface
temperature of the body

2. Galvanic Skin Response
measures skin imped-
ance which reflects water
content of the skin and the
constriction or dilation of
the vascular periphery

3. Heat Flux sensors
measures the rate at
which heat is dissipating
from the body

4. 2-axis Accelerometer
measures motion

These sensors, combined with our advanced
algorithms, calculate and report:

- Total energy expenditure
- Active energy expenditure
- Resting energy expenditure
- METS
- Total number of steps
- Physical activity duration (PAD)
- Sleep duration
- Lying down

UX Assessment and Emotions ?

quick.
comfortable.
active.

Source: gtec.at

complete compact
intendiX system with
active electrodes,
netbook and
wireless EEG amplifier

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UX Assessment with Eye tracking

Source: Tobii

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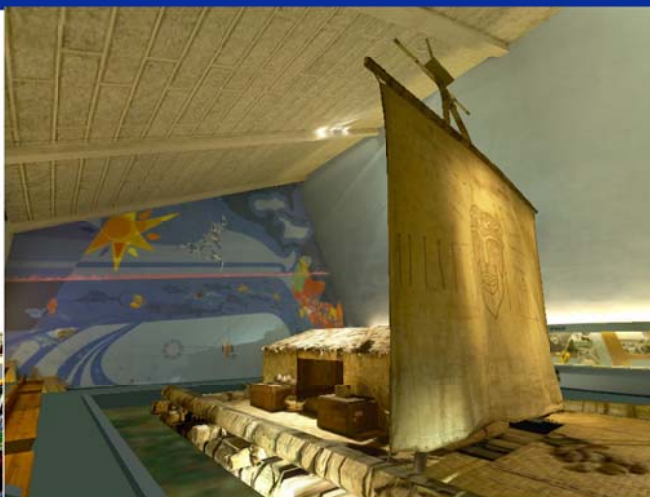
We show examples for using game technologies to create experience and engagement

Virtual Reality + Gaming

► Entertainment
► Architecture
► Museums
► Market Research

Example taken from VR project
with
Kon-Tiki Museum, Oslo

Live Demo

The Virtual shop helps to analyse user behaviour

Live Demo

Cultural heritage dissemination with games increases visitor interest

blender™ OPEN KINECT

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A horse saddle from the Vikings

VIDEO

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Evaluating Trust in Environments for Smart House, Smart Health, Smart Office, ...

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UE Assessment can be done in virtual environments

VIDEO

UTRUSTIT

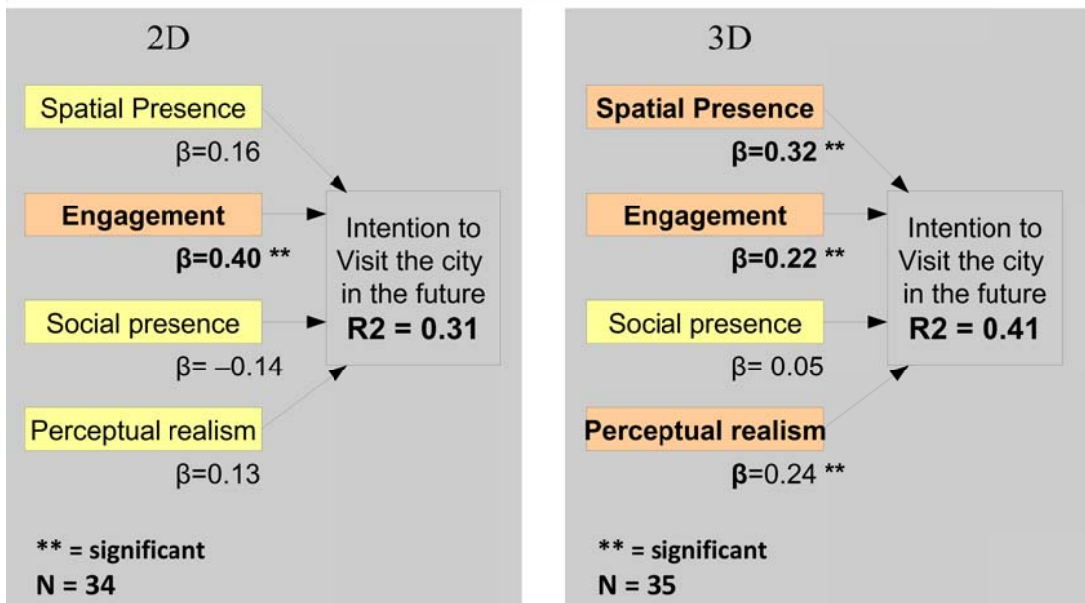# In tourist mode, the game PGR4 can be used to study Intention to Visit.

The game can be used to study tourism because the game is a good and detailed replication of the city. It took the game developers 18 months to create Las Vegas.

Las Vegas.

VIDEO

Videos in 3D mode result in higher Intention to Visit than Photos in 2D mode.

2D

- Spatial Presence β=0.16
- **Engagement β=0.40 ***
- Social presence β= –0.14
- Perceptual realism β=0.13

Intention to Visit the city in the future **R2 = 0.31**

** = significant
N = 34

3D

- **Spatial Presence β=0.32 ***
- **Engagement β=0.22 ***
- Social presence β= 0.05
- **Perceptual realism β=0.24 ***

Intention to Visit the city in the future **R2 = 0.41**

** = significant
N = 35

Conclusion

► Gaming technology can be used for a realistic and engaging experience

► Engagement the visitor is important

► Non-intrusive assessment using sensors that measure emotions needs to be further developed.

► More than a questionnaire !