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Simon RICHIR - From Virtual Reality to Virtual Teleportation: Change How Users Experience Virtual Worlds. - 2014

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From Virtual Reality to Virtual Teleportation

Change How Users Experience Virtual Worlds

Simon Richir

Arts et Métiers ParisTech

Presence & innovation

Training & Research Team

ARTS ET METIERS ParisTech Laval

LAMPA (EA1427) - Resp. : Pr Simon RICHIR

Laval (France)

A small town in France…

LAVAL VIRTUAL

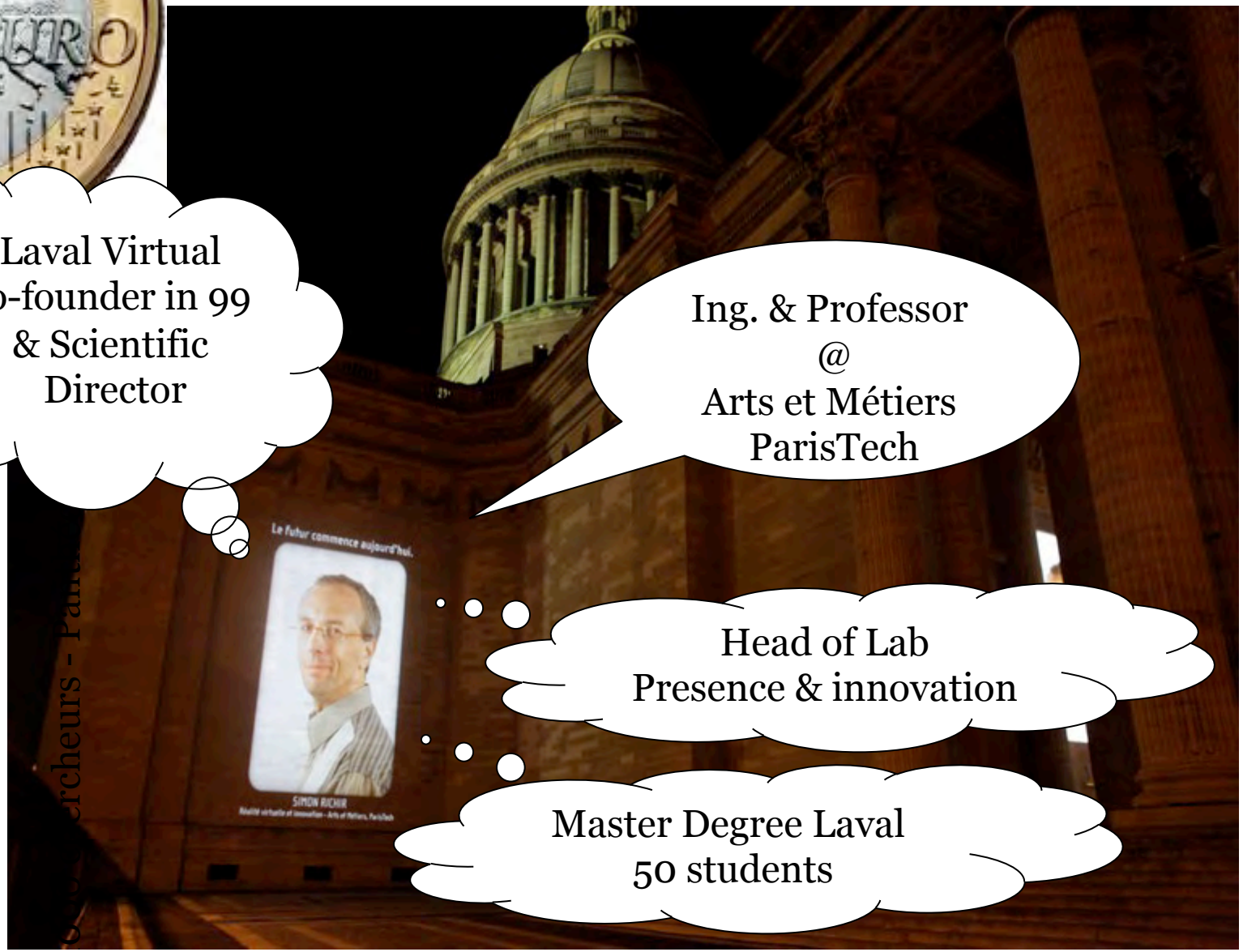
eon reality

Les illustrations utilisées sont un hommage aux talents d'Albert Uderzo et René Goscinny

Simon Richir

Supplier of ideas and talents

Simon Richir side stack: Co-creation and Virtual Reality



Laval Virtual co-founder in 99 & Scientific Director

Ing. & Professor @ Arts et Métiers ParisTech

Head of Lab Presence & innovation

Master Degree Laval 50 students

Simon Richir side face: Company Theatre & Shows

Pic Assiette
Theater for Companies

« Les Enfants de la Lune »
Children amateur circus - Clown

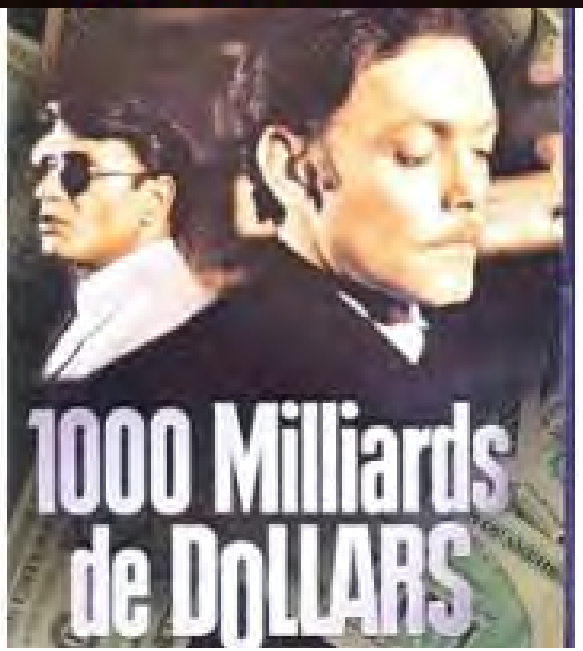
Organisor of
« Les Paris du Rire »

Author of 100+
theater sketches

Laval League of
improvisational theater

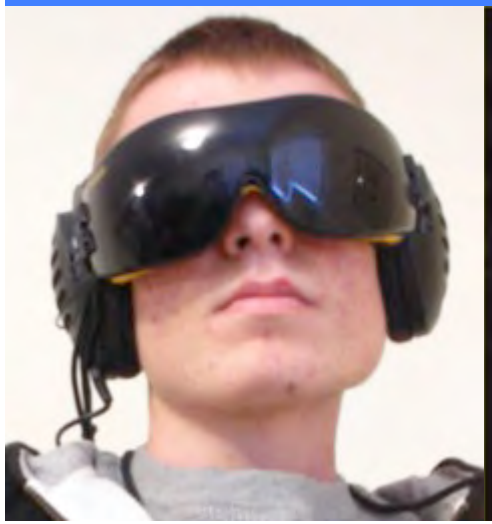
ARTS ET MÉTIERS ParisTech

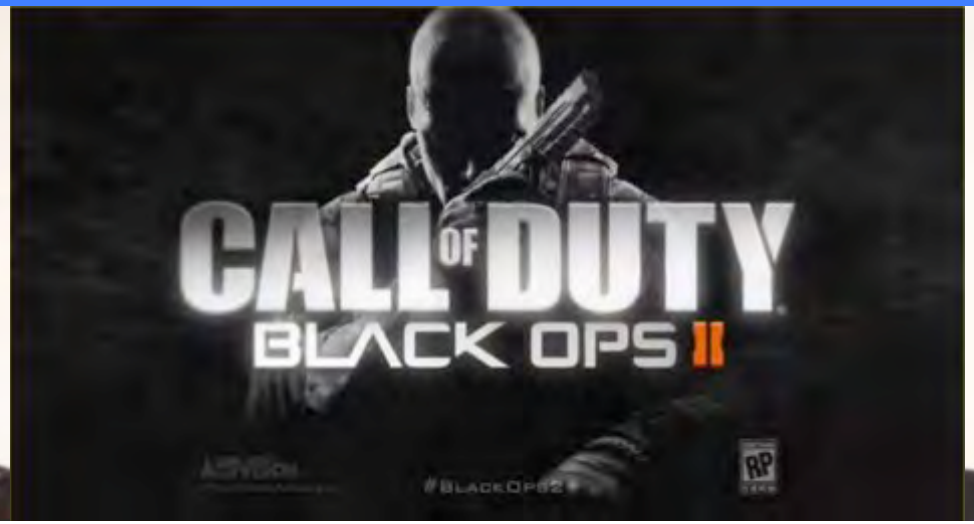
French filmmaker **Henri Verneuil** *(1920-2002)*



« Virtual Reality is the Cinema of the 21st Century »

Pr Bernard Taravel, Futuroscope & Laval Virtual co-founder





1999

Laval Virtual

François d'Aubert

Guy Le Bras

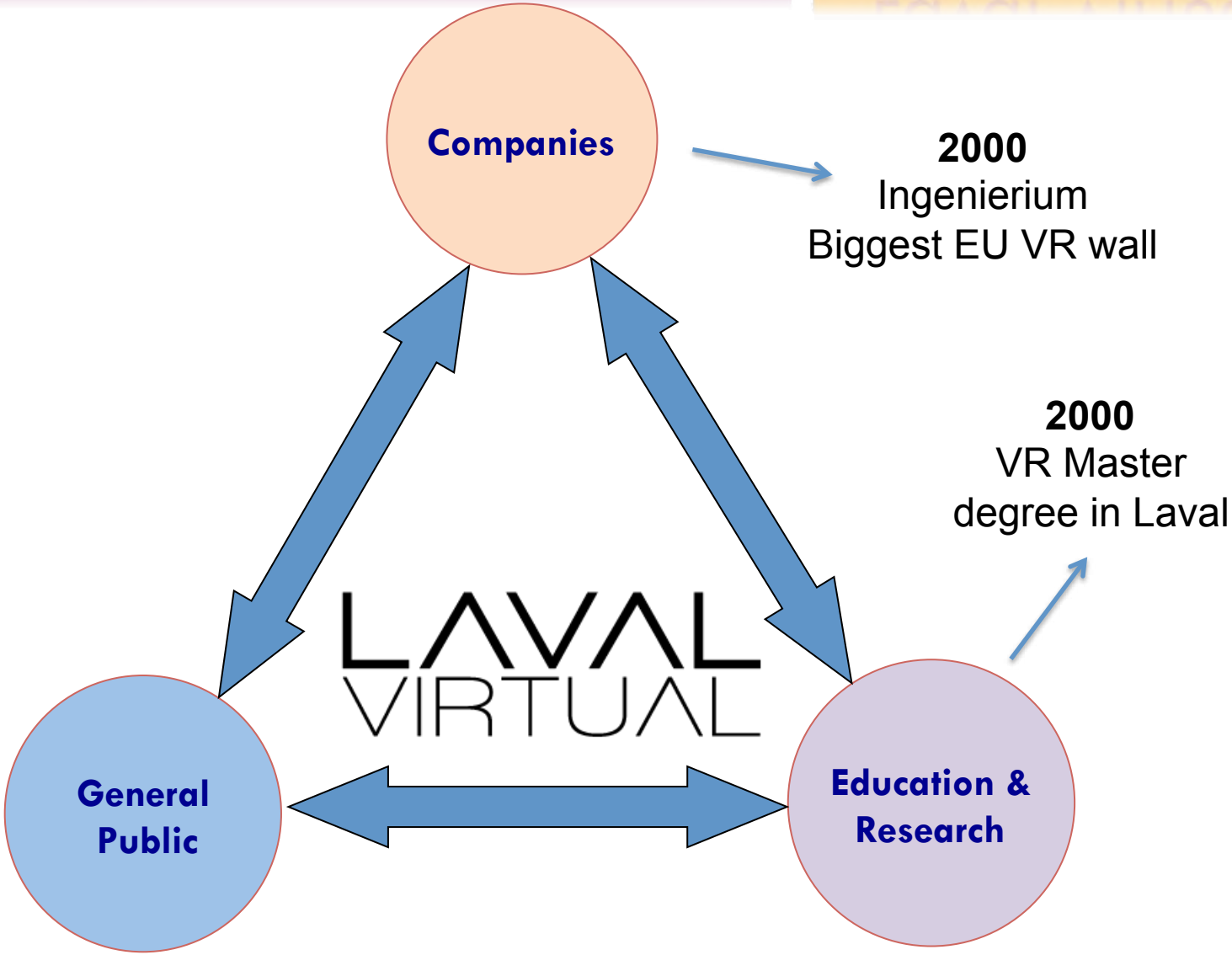
1999
Laval Virtual
co-founders

Bernard Taravel Simon Richir

Laval Virtual

- **International exhibition** (13 000 visitors)
- **ACM international Conference** (250 p.)
- **April 8-12, 2015**

The basic concept

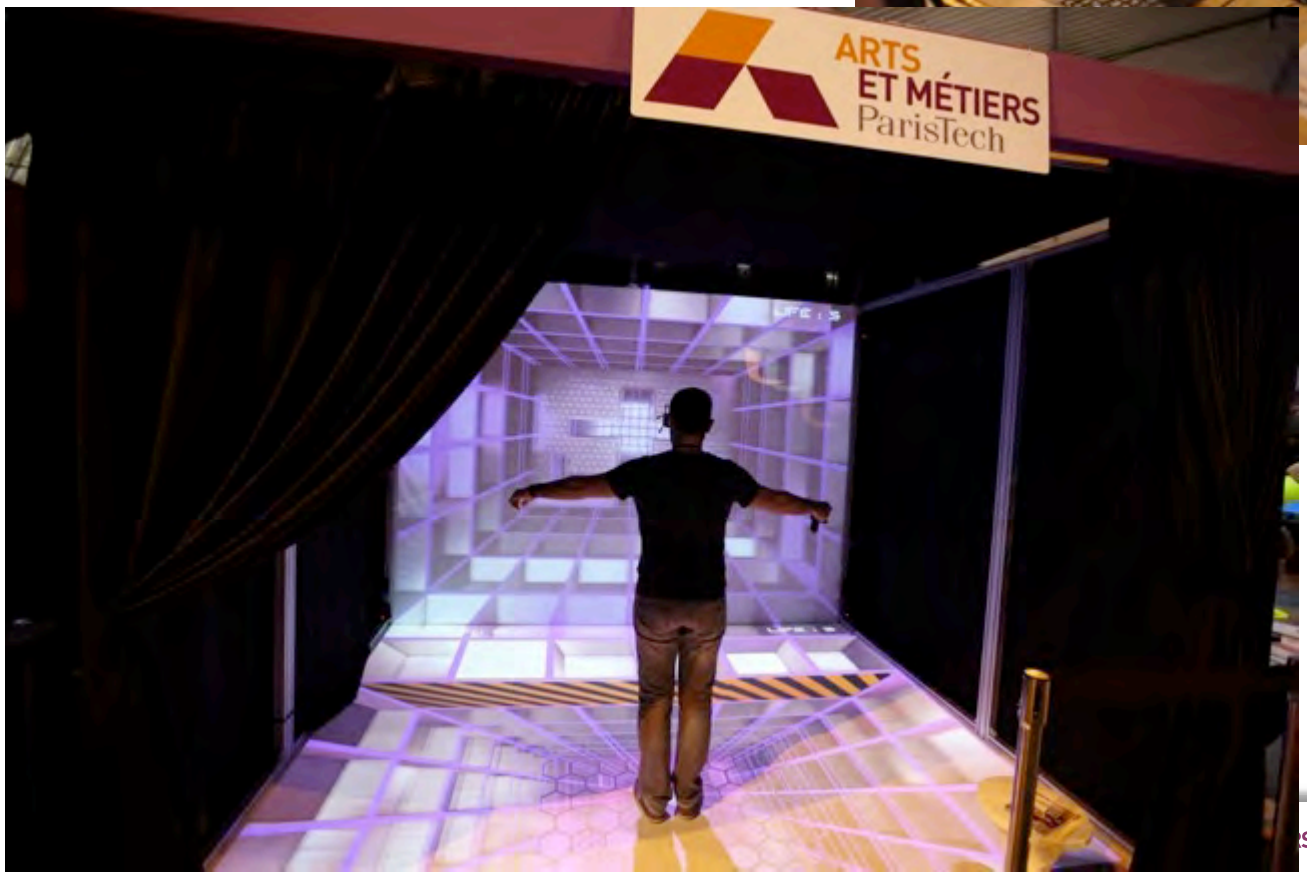


= *it was Futuroscope basic concept created by René Monory, Thierry Breton & Bernard Taravel*

Laval Virtual 2014

Laval Virtual Award
for AccesSim simulator

Laval Virtual 2014



Ensam
booth

Laval Virtual 2014

Master Recherche IVI

- **Response to the needs of local Companies**
- **40 to 50 students in Laval at the heart of P&i team (M1 + M2)**
- Educational **projects**
- Training of **projects manager** initiated to research

P&i Lab. equipment

Equipements partagés pilotés par CLARTE (www.clarte.asso.fr)

SAS3+ HDCAVE 3x3x4m **SASlab** : CAVE 2x2x3m **Salle collaborative, Workbench / Flatbench** 1m3, **Systèmes à retour d'effort** Phantom, Virtuose, INCA, **Logiciels** Ergowide3

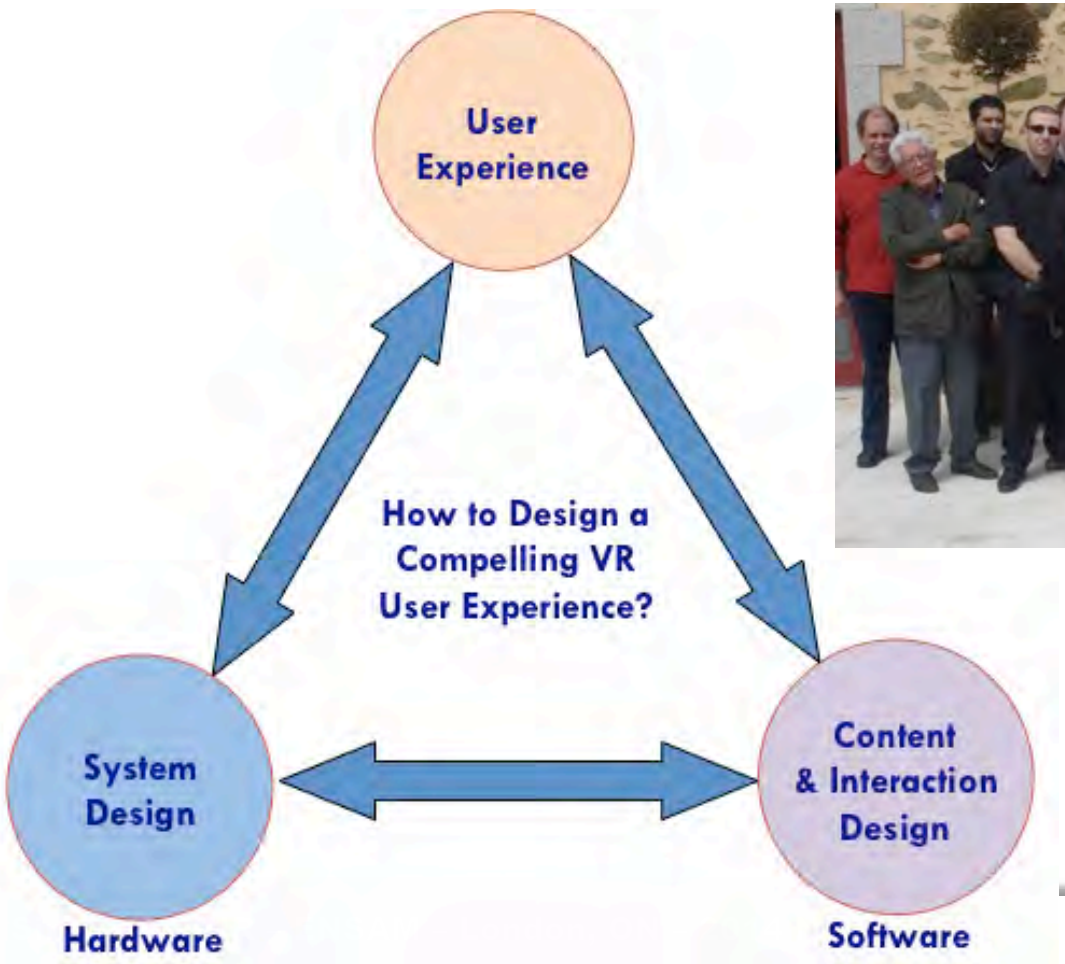
Equipements propres au laboratoire

Gants de données 5DT ; **Système de tracking** magnétique Pohlemus Patriot, **Système de tracking** optique Natura Point Optitrack (6 caméras TR « motion capture ») ; **Bras haptique** 6 ddl Sensable Omni et 3 ddl Novint Falcon ; **Caméra 3D** pour TR Microsoft Kinect et Mesa SR 4000 ; Tablettes iPad et Androïd ; Webcams HD, Kinects, Wiimotes, clés bluetooth

Videos : VR System we use

Experience Design Methodologies for Virtual & Augmented Reality

« my VX »



Partners

ARTS ET MÉTIERS ParisTech

LABORATOIRES (> 25)

ENTREPRISES (> 30)

SANTE (> 15)

ECOLES & UNIVERSITES (>10)

POLES (6)

RESEAUX (# 10)

FINANCEURS (# 8)

I'm going to introduce you 4 projects

- An achieved project, AccesSim
- A current project, 3DLive

- *(Advertisement…) What Mark said about VR…*

- A new project with Eon Reality
- A future project, Urbi & Orbi

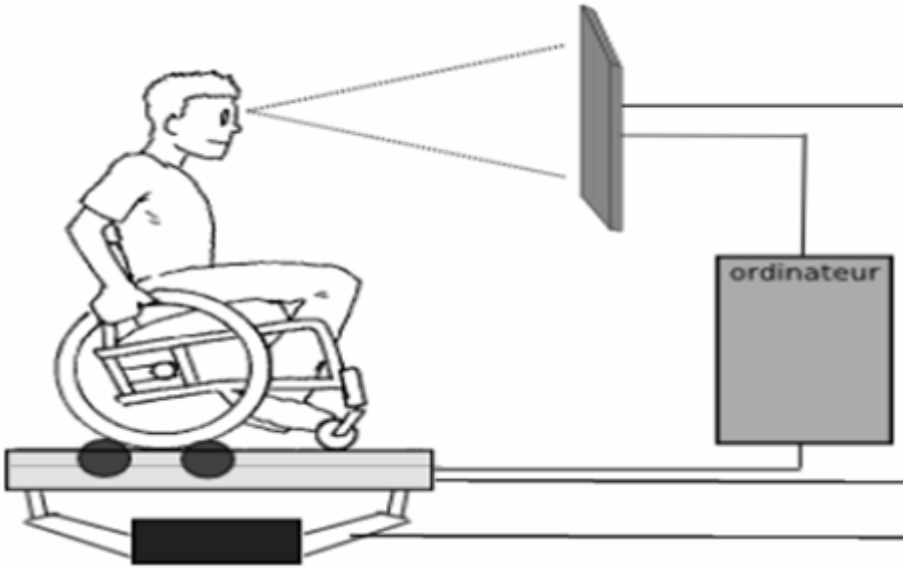
And then let's discuss together!

Example of an achieved project

ACCESSIM

Funded by Paris County

Wheelchair Simulator to Evaluate Building Accessibility for Disabled People



Patent: brevet deposé à l'Institut National de la Propriété Industrielle le 8 juillet 2009. Numéro de dépôt 09 54740.

Project objectives

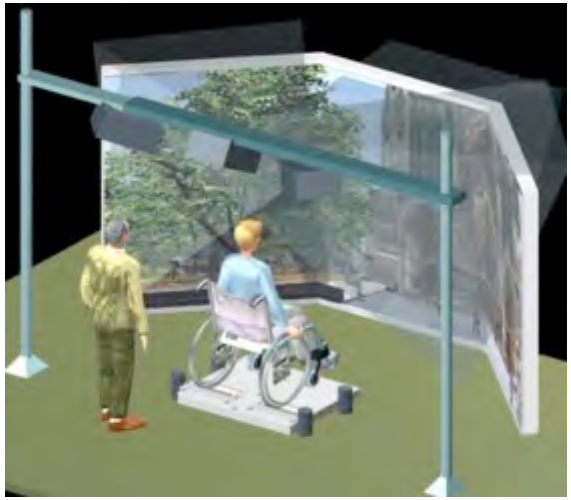
- Proposer un Simulateur de fauteuil roulant utilisant les technologies de la Réalité Virtuelle pour :

  - former et sensibiliser les architectes, les décideurs urbains et le grand public à la circulation en fauteuil roulant (normes de la circulaire n° DGUHC 2007-53),

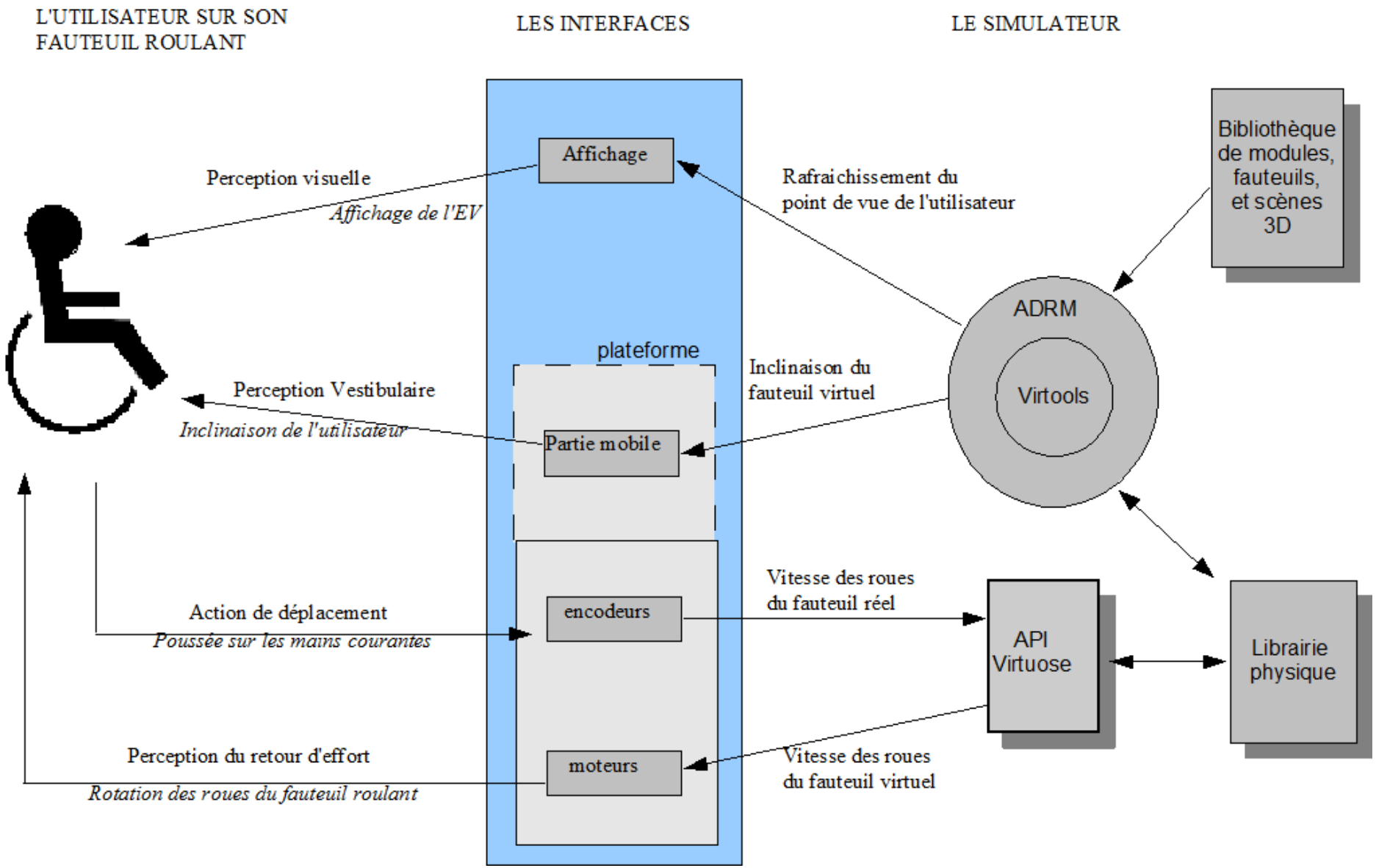
  - vérifier l'accessibilité de nouveaux projets urbains (assistance à la maîtrise d'ouvrage) et de rénovation des ERP (Établissements Recevant du Public),

  - aider à entraîner, sans risque, les personnes récemment handicapées à l'utilisation d'un fauteuil roulant,

  - partager entre les laboratoires un simulateur de fauteuil pour étudier et tester de nouvelles aides techniques (fauteuils, véhicules, équipements …).



Simulator Architecture

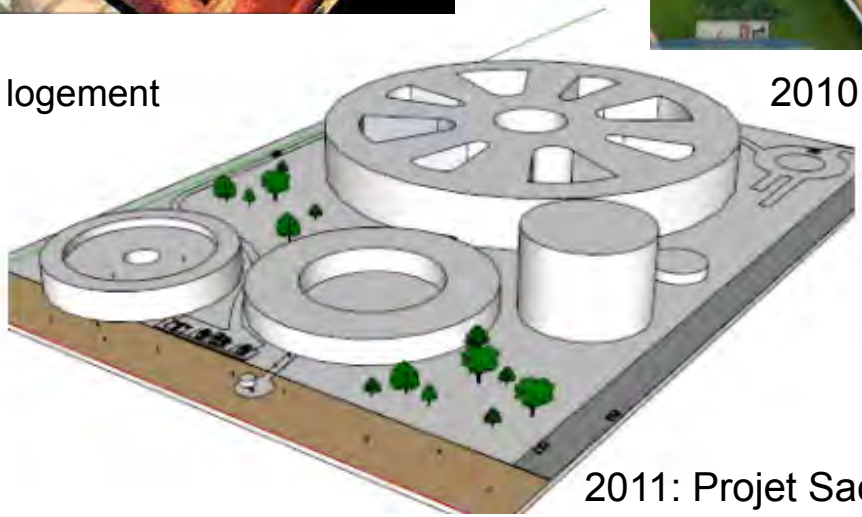


Virtual Environments

- Mise en place d'une méthode de création et de traitement de données CAO pour générer les environnements 3D (Intérieurs, bâtiments, ERP, quartier) :

Intérieur d'un logement

2010: Mureaux: Centre de formation EDF



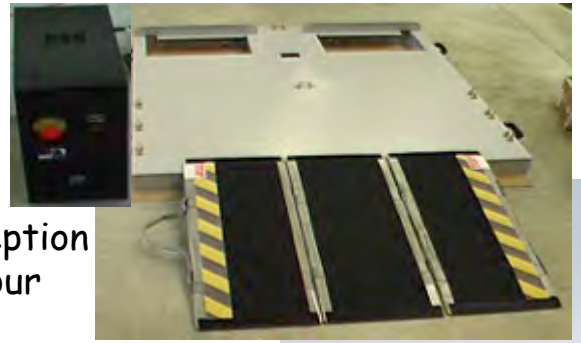
2011: Projet Saclay

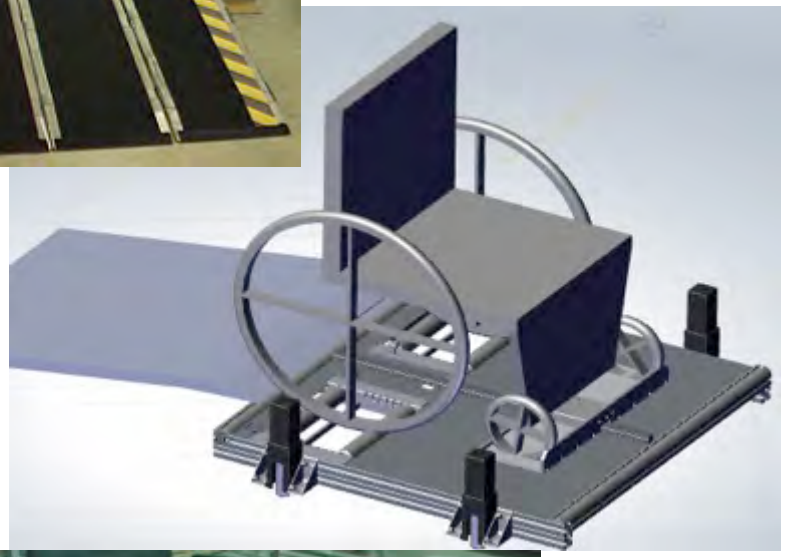
Interactive Objects

- Création d'une bibliothèque de fauteuils roulants, de personnages 3D et de véhicules avec leur comportements qui seront intégrés dans les scènes 3D:

- Modélisation d'obstacles dont des éléments de mobiliers urbains qui seront insérés dans les scènes (éléments qui peuvent gêner la circulation).

Robotic Platform & Visualisation





- 2009-2010 Cahier des Charges et Conception CAO d' une plateforme à rouleaux à retour d' effort avec les contraintes suivantes:
  - Plateforme accessible en fauteuil.
  - Prise en compte de différents fauteuils.
  - Être facilement transportable et installable.

- Lancement d' une Thèse par les Arts et Métiers sur la mise en place d' une méthode d' étude de configuration de simulateurs de RV

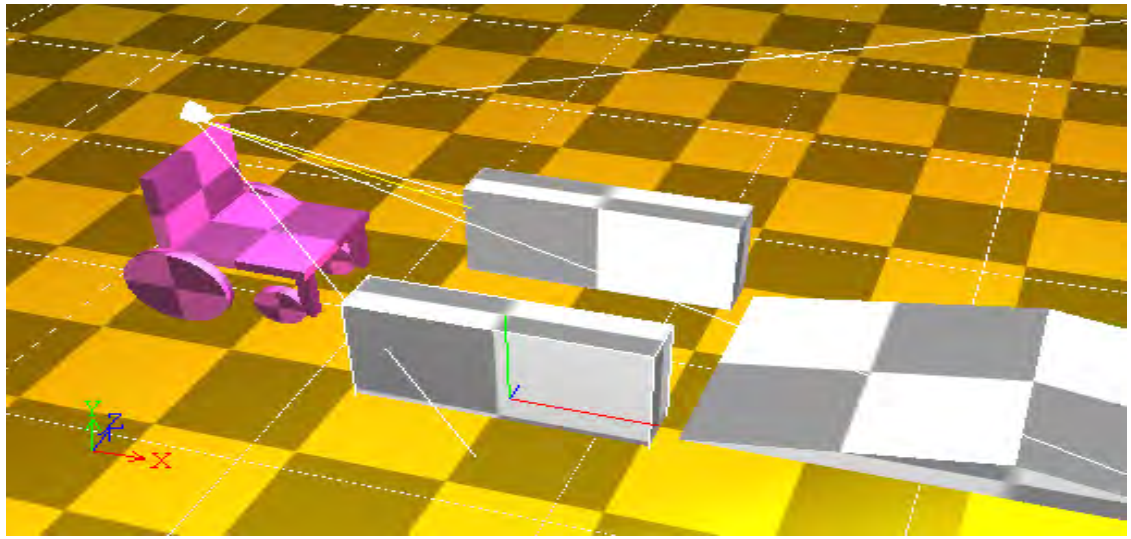
- Fin 2010 Réalisation d' un prototype de plateforme et couplage de la plateforme avec le simulateur

- 2010-2011 Conception d' une plateforme mobile à base de vérins électriques ou de cabestans (5° tangage, 3° roulis) et réalisation.

- 2011-2012 Tests et évolutions la plateforme

Physical Engine & Force feedback

- Étude et réalisations de prototypes de squelettes de simulation de la physique de déplacement de fauteuils roulants qui répondent aux besoins suivants:
  - Gestion du différentiel entre les roues motrices
  - Gestion des collisions avec les obstacles (murs, pentes…) et en particulier les contacts roues/sols
  - Gestion de la dynamique de déplacement (accélération, freinage, pentes)



- 2010 : évaluation des moteurs Havok (Intel), PhysX, XDE, Bullet (OpenSource) puis réalisation d'une première maquette de couplage entre AccesSim et Bullet

- 2011 : Lancement d'une Thèse CIFRE ➔

Budget

Entity	I/an	Budget	IDF Funding
EDF R&D	2	508 106,00 €	127 026,50 €
CEA - LIST	2,5	374 000,00 €	149 600,00 €
ARTS - LCPI (Paris)	3,6	450 000,00 €	257 572,00 €
UVSQ - LISV	4,7	410 000,00 €	247 764,00 €
CEREMH	1,9	239 080,00 €	107 586,00 €
Total		1 981 186,00 €	889 548,50 €

Video AccesSim finale Trophées Laval Virtual 2014

Example of a current project

3D LIVE

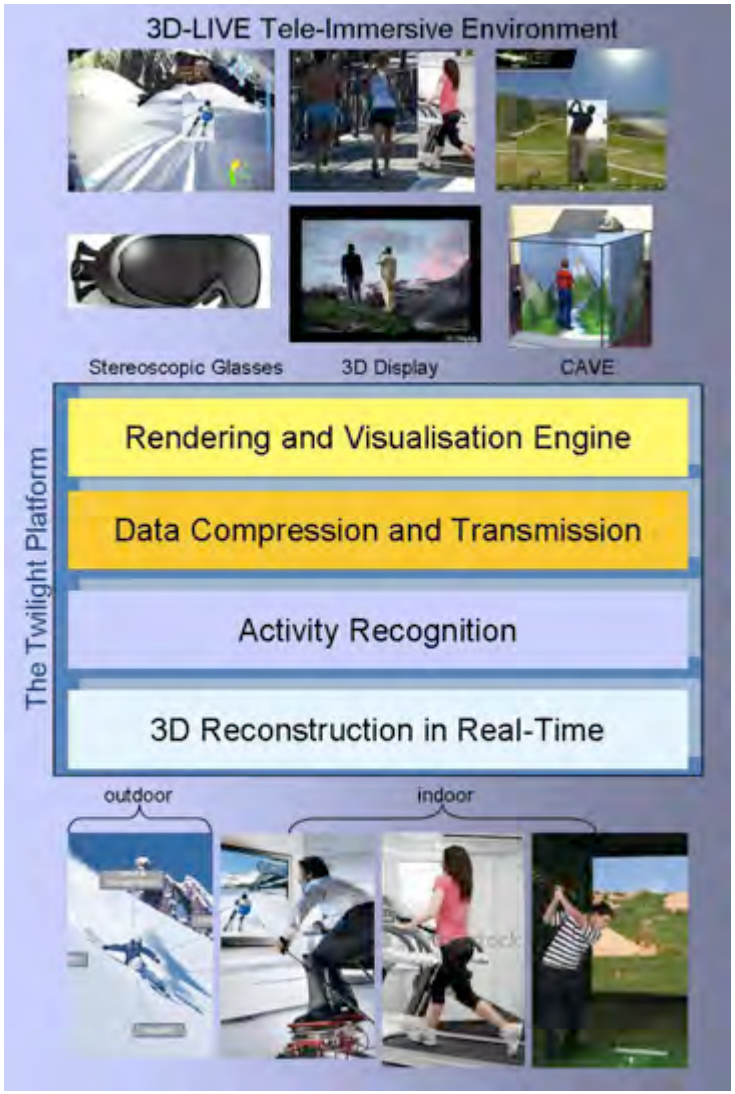
european project

Live Interactions through Visual Environments

3DLive european project

The main research goal of 3DLIVE project is to investigate the impact of 3D Tele-Immersive Environment (3D-TIE) on **people behavior and feelings when they (golfers, skiers, joggers) practice together** from indoor and outdoor situations.

3DLive european project



3DLive Tele-Immersive Platform

3DLive Consortium

CENG: Collaborative Engineering S.R.L. , Italy

CERTH/ITI: Centre for Research and Technology Hellas, Greece

IT Innovation: University of Southampton, UK

ARTS: Arts&Metiers ParisTech, France

SportC: SportsCurve GmbH, Germany

Cyber: Cyberlightning Ltd, Finland

3DLive european project

A shift from Industrial Design towards Experiential Design

- The new era of networked communities and increasing consciousness on the paramount importance of **citizens' participation** and societal issues offers an unprecedented opportunity to **reconcile the relationship between people and technology**

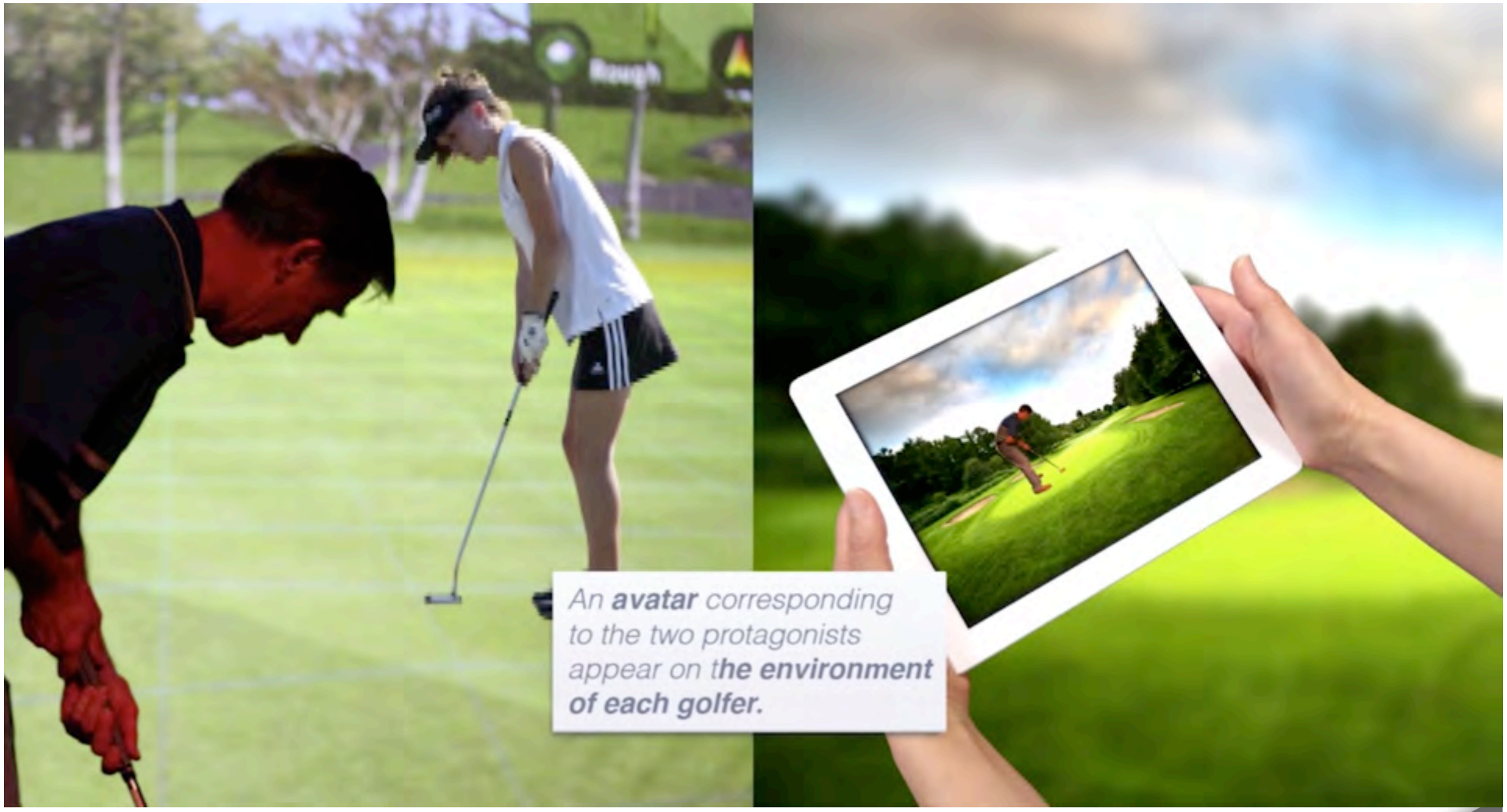
- Enables to focus on **human experience** as a corner stone in the design process and potential adoption of new technologies (e.g. IoT)

3DLive european project

3DLive european project

3DLive european project

3DLive european project

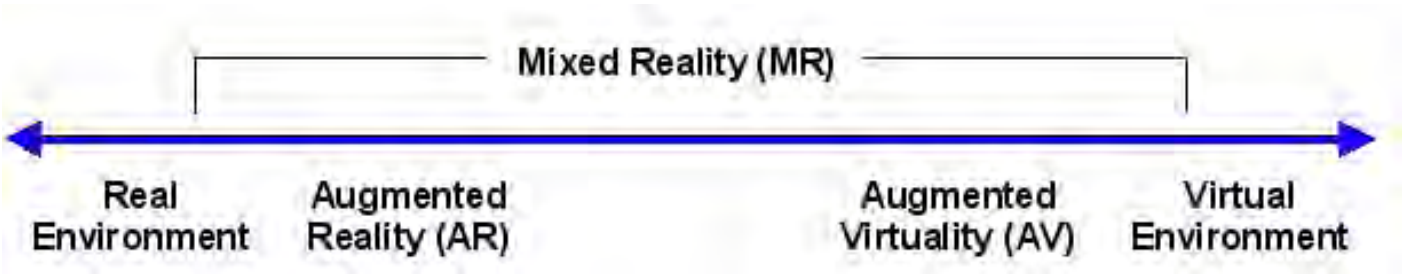


3DLive european project

3DLive european project

Video on 3D Live project

What about VR ? (AR, MR)



The reality-virtuality continuum by Milgram [1994]

1965-1968 “**The Ultimate Display**” (Ivan Sutherland) => **50 years of work on HMD**

Mars 2014 : « En rachetant Oculus, **Facebook** parie sur la Réalité Virtuelle »

Mark Zuckerberg 25 mars 2014 Palo Alto

I'm excited to announce that we've agreed to acquire **Oculus VR, the leader in virtual reality technology**.

Mark Zuckerberg 25 mars 2014 Palo Alto

Our mission is to make the **world more open and connected**. For the past few years, this has mostly meant building mobile apps that help you share with the people you care about. We have a lot more to do on mobile, but at this point we feel we're in a position where we can start focusing on what platforms will come next to **enable even more useful, entertaining and personal experiences.**

Mark Zuckerberg 25 mars 2014 Palo Alto

This is where Oculus comes in. They build virtual reality technology, like the Oculus Rift headset. When you put it on, **you enter a completely immersive computer-generated environment, like a game or a movie scene or a place far away**. The incredible thing about the technology is that you **feel like you're** actually **present in another place with other people**. People who try it say it's different from anything they've ever experienced in their lives.

Mark Zuckerberg 25 mars 2014 Palo Alto

Oculus's mission is to **enable you to experience the impossible**. Their technology opens up the possibility of completely new kinds of experiences.

Mark Zuckerberg 25 mars 2014 Palo Alto

But this is just the start. After games, we're going to make Oculus **a platform for many other experiences**. **Imagine enjoying a court side seat at a game**, **studying in a classroom** of students and teachers all over the world or **consulting with a doctor** face-to-face -- just by putting on goggles in your home.

Mark Zuckerberg 25 mars 2014 Palo Alto

This is really a new communication platform. By feeling truly present, you can **share unbounded spaces and experiences** with the people in your life. Imagine sharing **not just moments** with your friends **online**, **but entire experiences and adventures**.

Mark Zuckerberg 25 mars 2014 Palo Alto

These are just some of the potential uses. By working with developers and partners across the industry, together we can build many more. **One day, we believe this kind of immersive, augmented reality will become a part of daily life for billions of people.**

That's what we say since 1999!!!

LAVAL VIRTUAL

Mark Zuckerberg 25 mars 2014 Palo Alto

Main question:

When Mark Zuckerberg is moving to Laval?!-)

Next step ?
VIRTUAL TELEPORTATION

Emotion, key factor

Marriott's 4D Travel Experience

THE FULLY IMMERSIVE, 4-D VIRTUAL JOURNEY TRANSPORTS YOU FROM BIG BEN TO MAUI RIGHT FROM OUR LOBBY.

Video SIGHT (the future)

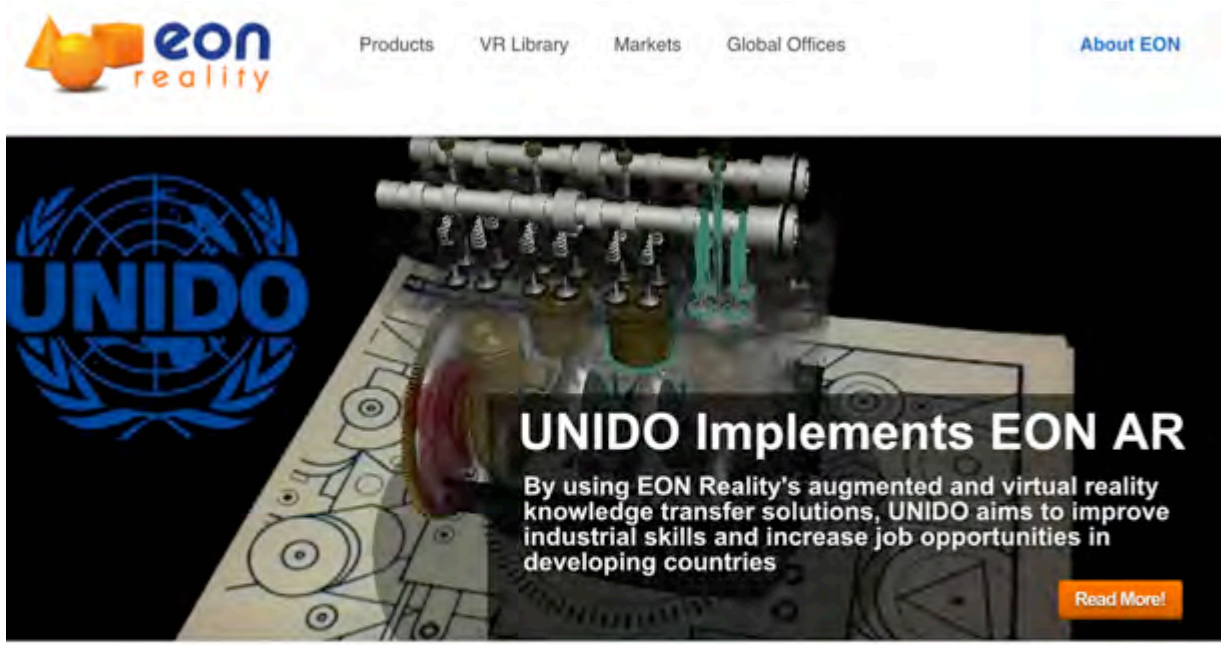
Example of a new project

EON REALITY

Augmented User Experience

1999

Eon Reality



1999: The Company launched EON Studio as its first virtual reality software authoring tool

Dan Lejerskar

Mats Johansson

1999 - 2014

Eon Reality

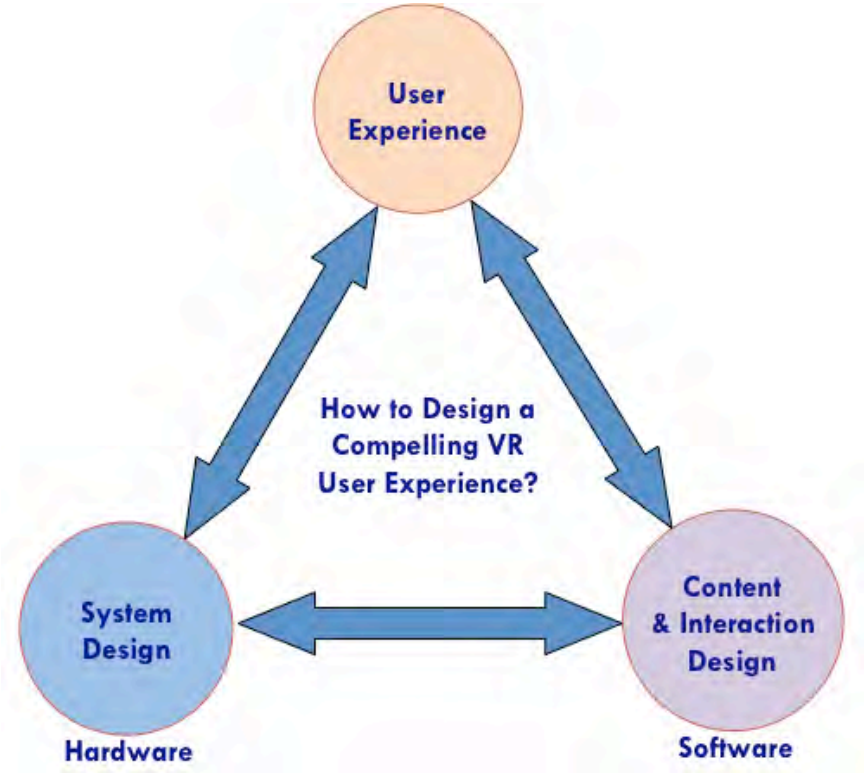
eon reality

LAVAL VIRTUAL

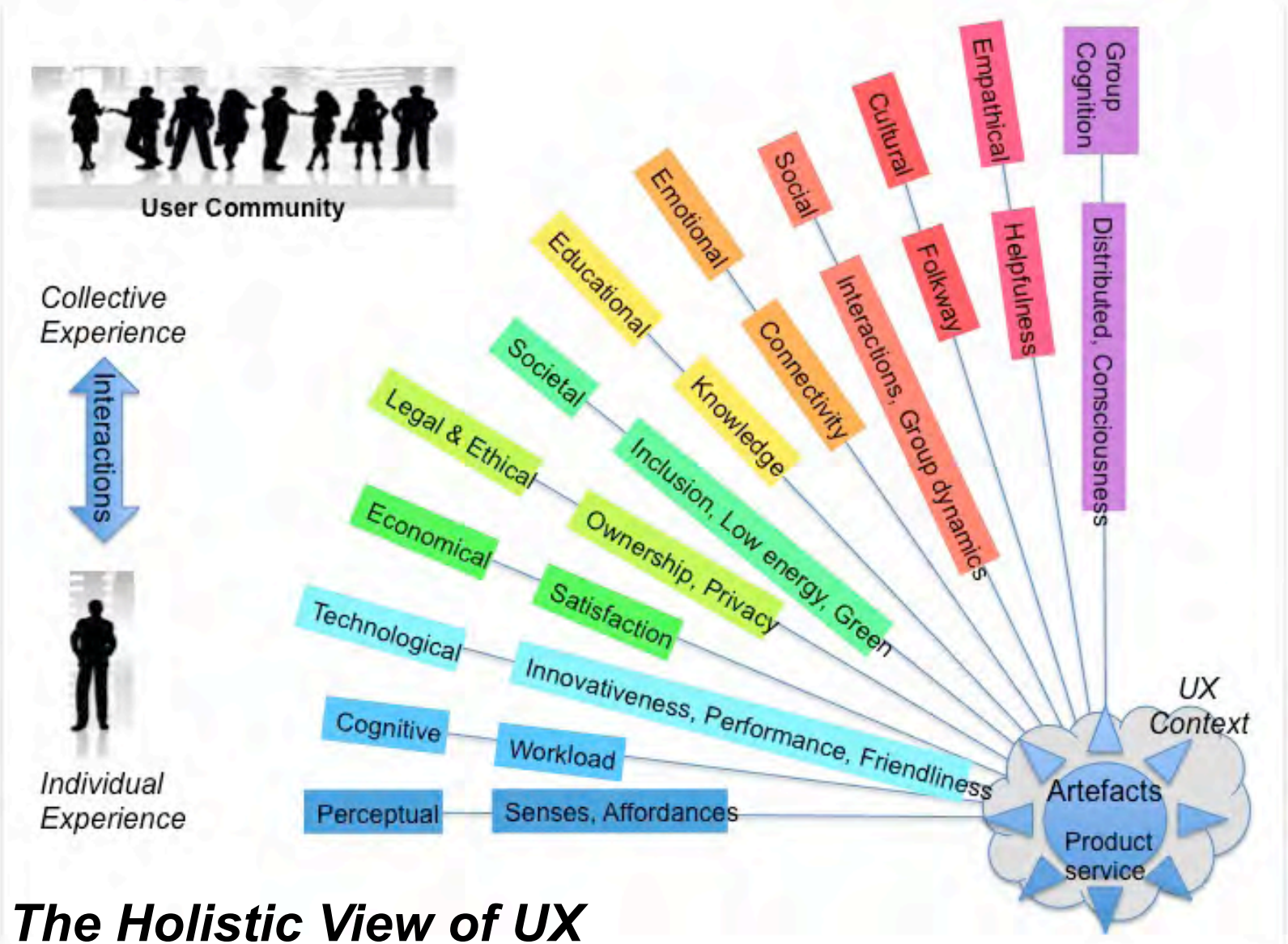
Laval Virtual and Eon Reality grew up

Experience Design Methodologies for Virtual & Augmented Reality

« my VX »

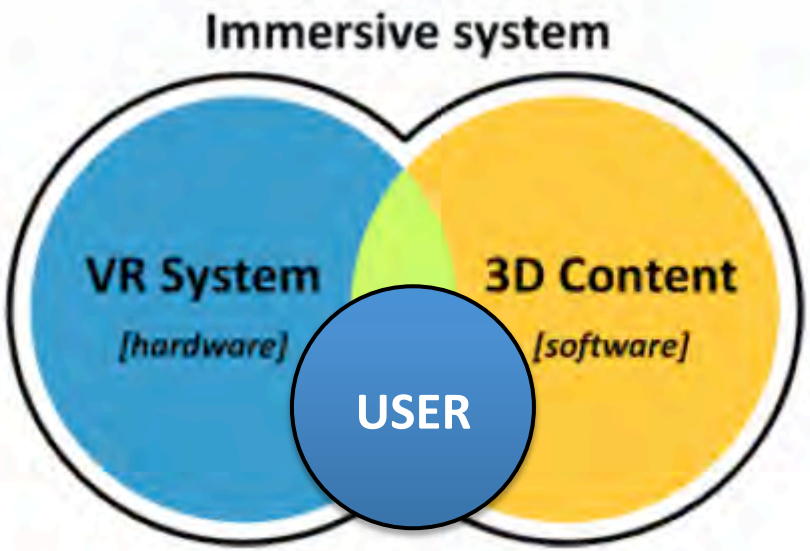


Through the study of the <u>Immersive User Experience</u> within an immersive Virtual Reality system (iCube & iDome), we propose to address the challenge of <u>improving the user experience.</u>



The Holistic View of UX

(Pallot, 2012) Pallot, M., and Pawar, K. S. 2012. *A Holistic Model of User Experience for Living Lab Experiential Design*. In Proceedings of the 18th International Conference on Engineering, Technology and Innovation, ICE'2012 "Innovation by Collaboration and Entrepreneurial Partnerships", Munich, Germany, 18-20 June 2012, DOI= http://dx.doi.org/10.1109/ICE.2012.6297648



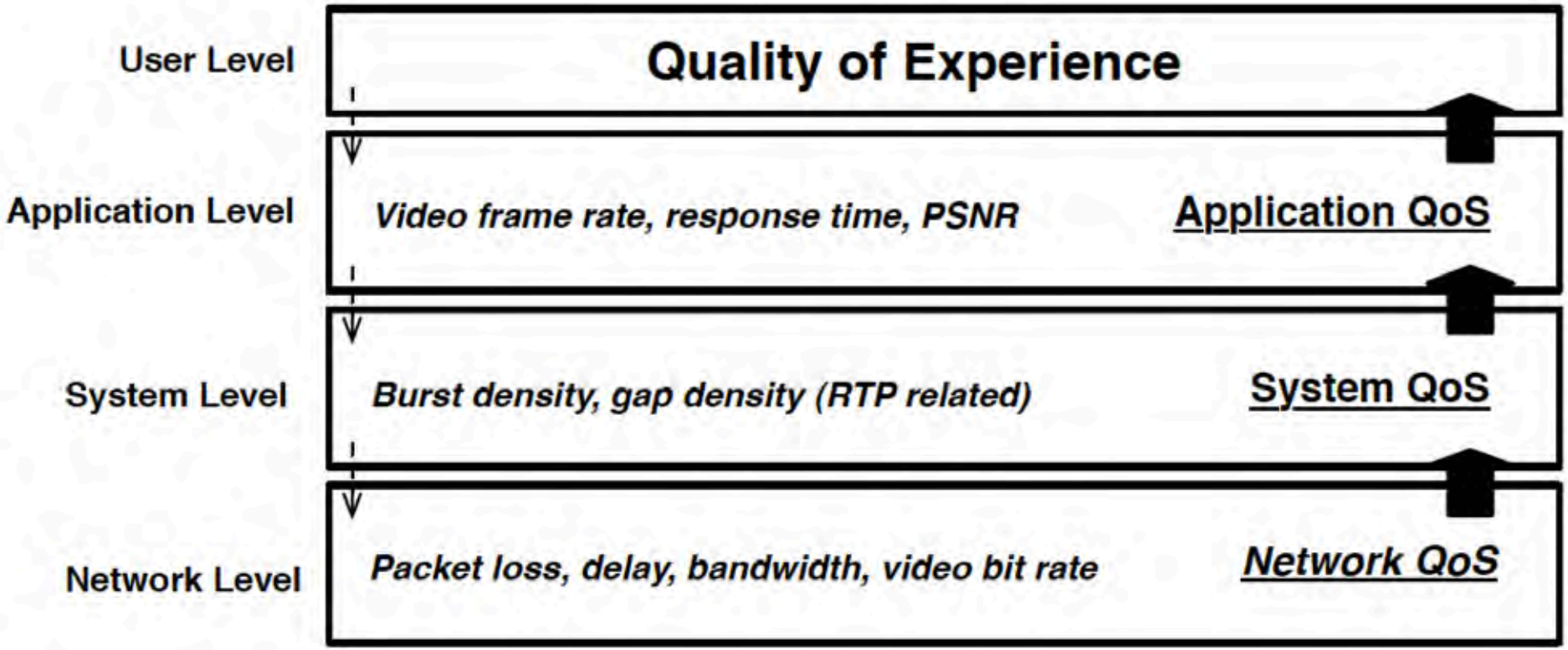
USER EXPERIENCE

Study of the Immersive User Experience to determine all the key factors

Factors	Technical - QoS	Human - QoE
SYSTEM	xx	xx
CONTENT	xx	xx
SYSTEM+CONTENT	xx	xx

$$\text{USER EXPERIENCE} = f\,(\text{Factors}_{\text{SYSTEM}}, \text{Factors}_{\text{CONTENT}}, \text{Factors}_{\text{SYSTEM + CONTENT}})$$

A little bit of scientific theory on VR experience



(WU, 2009) Wu, W., Arefin, A., Rivas, R., Nahrstedt, K., Sheppard, R. and Yang, Z. 2009. Quality of experience in distributed interactive multimedia environments: toward a theoretical framework. In Proceedings of the 17th ACM international conference on Multimedia (MM '09). ACM, New York, NY, USA, 481-490. DOI= http://doi.acm.org/10.1145/1631272.1631338

A little bit of scientific theory on VR experience

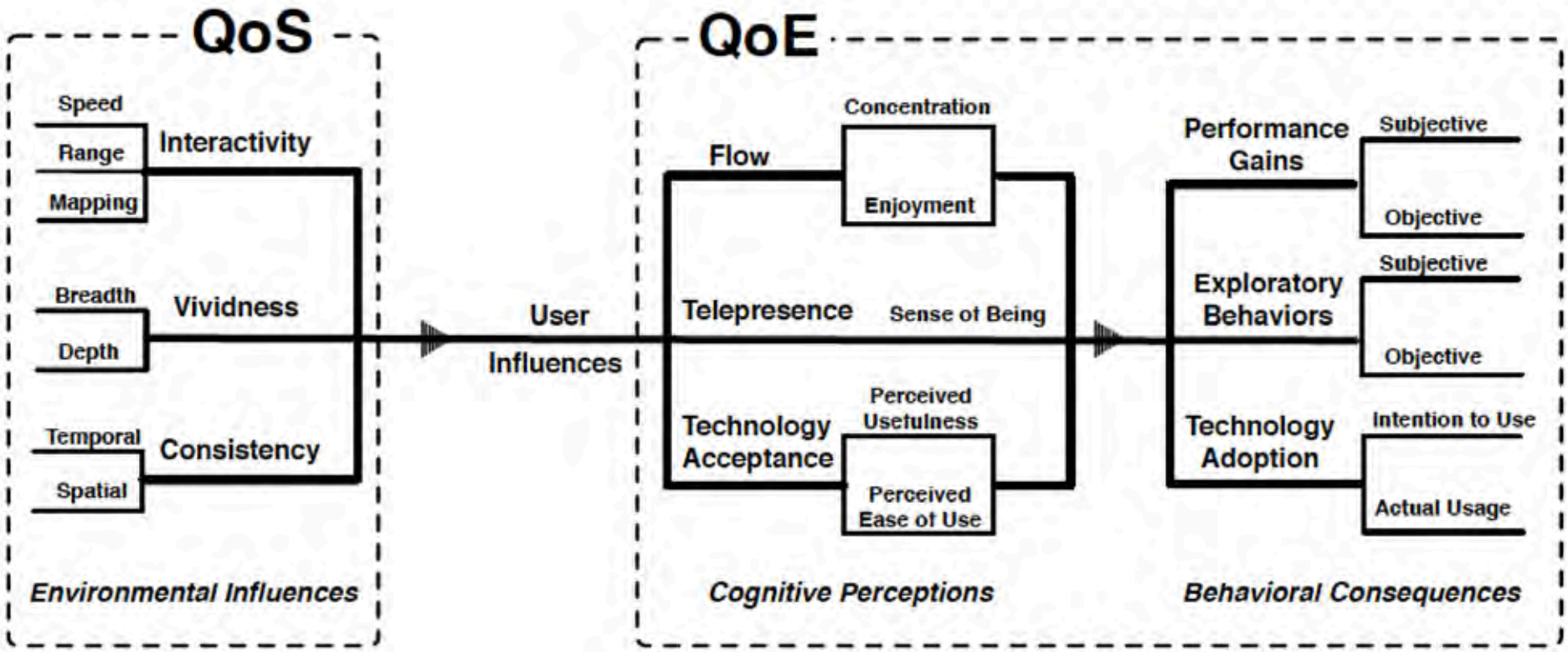
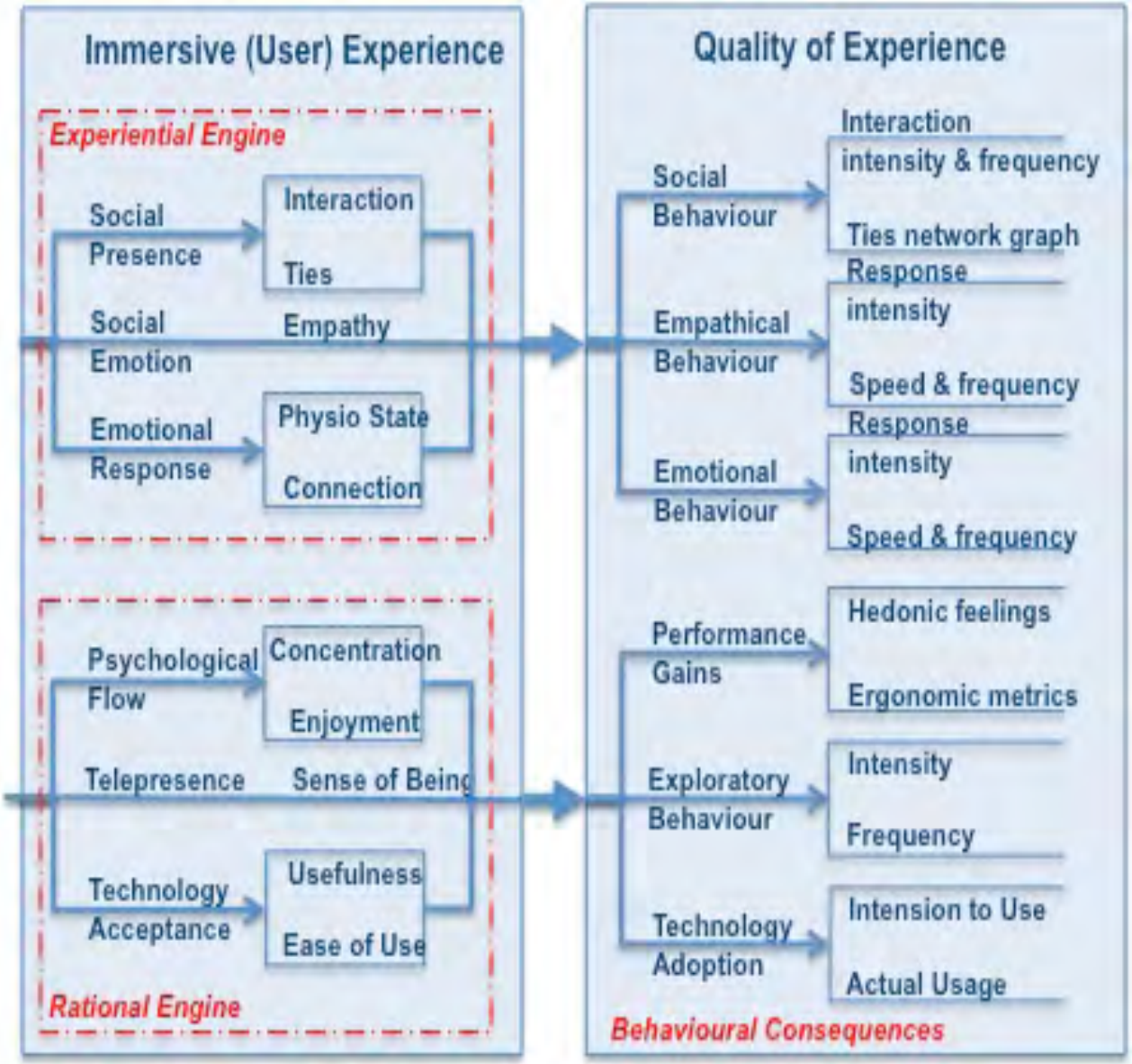


Figure 4: Quality Framework in DIMEs

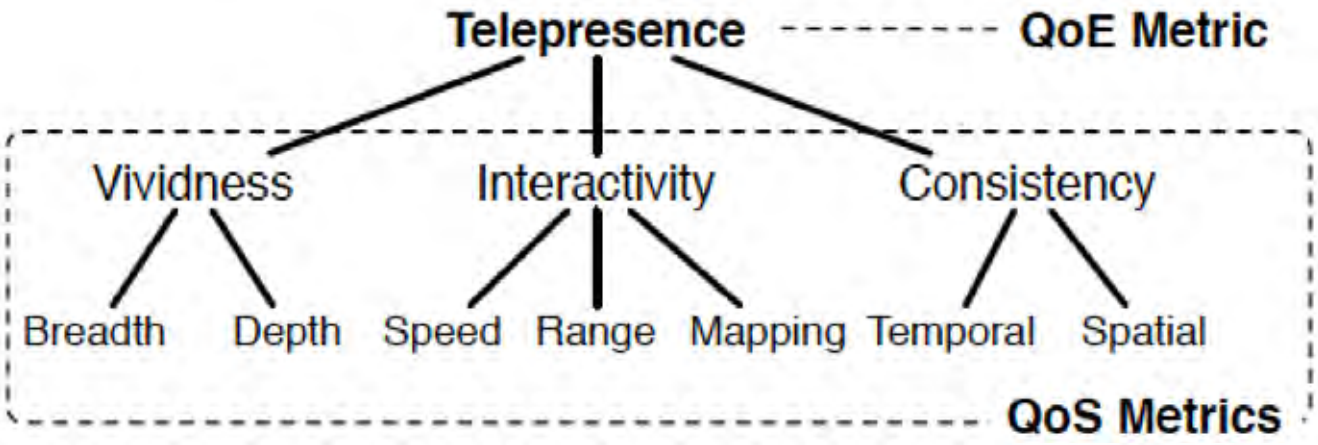
Source: (WU, 2009)

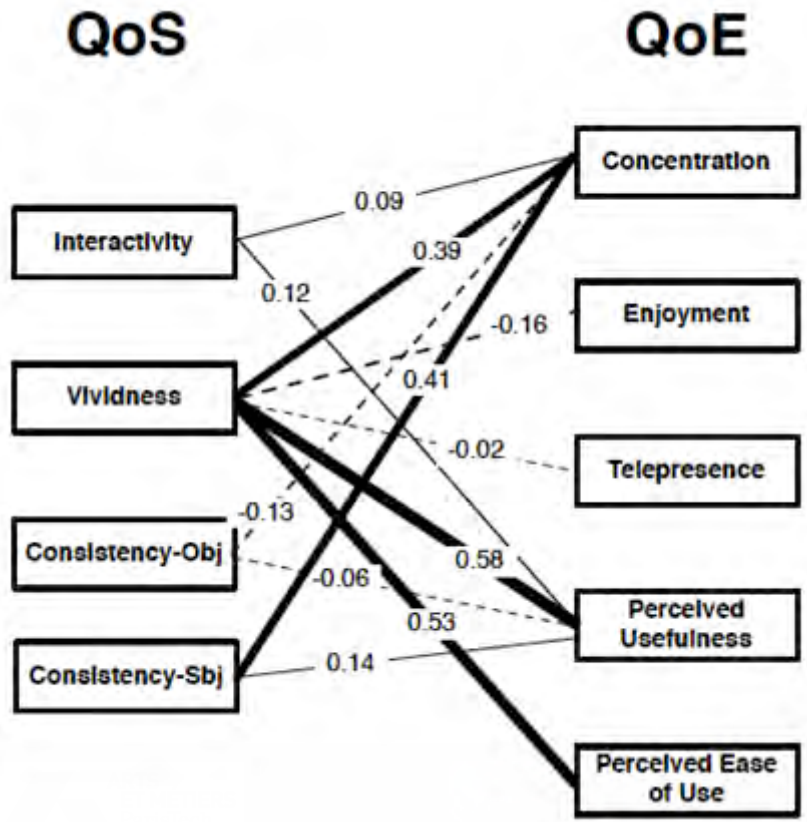
A little bit of scientific theory on VR experience



Source: (Pallot, 2013) based on (WU, 2009)

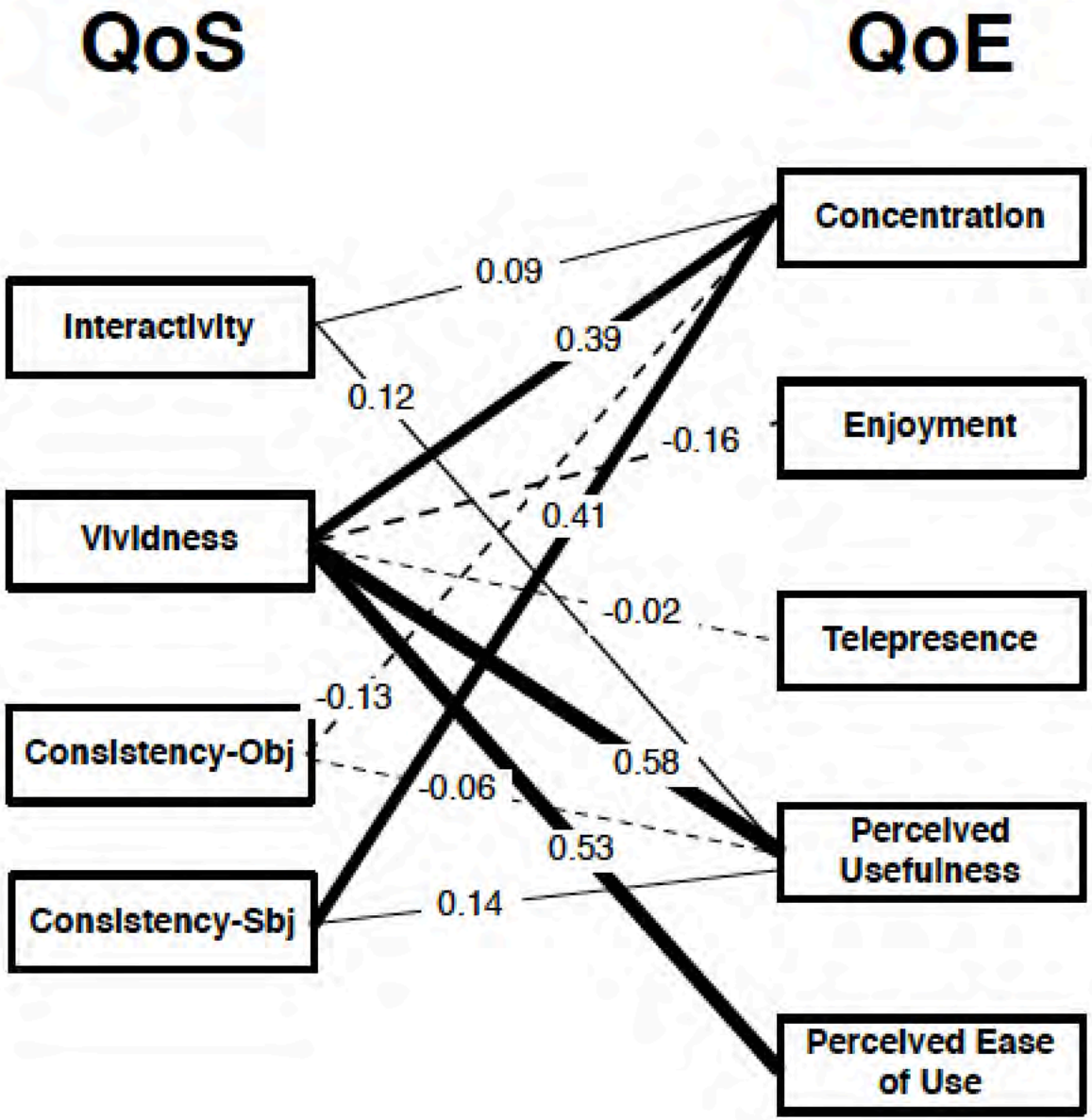
A little bit of scientific theory on VR experience





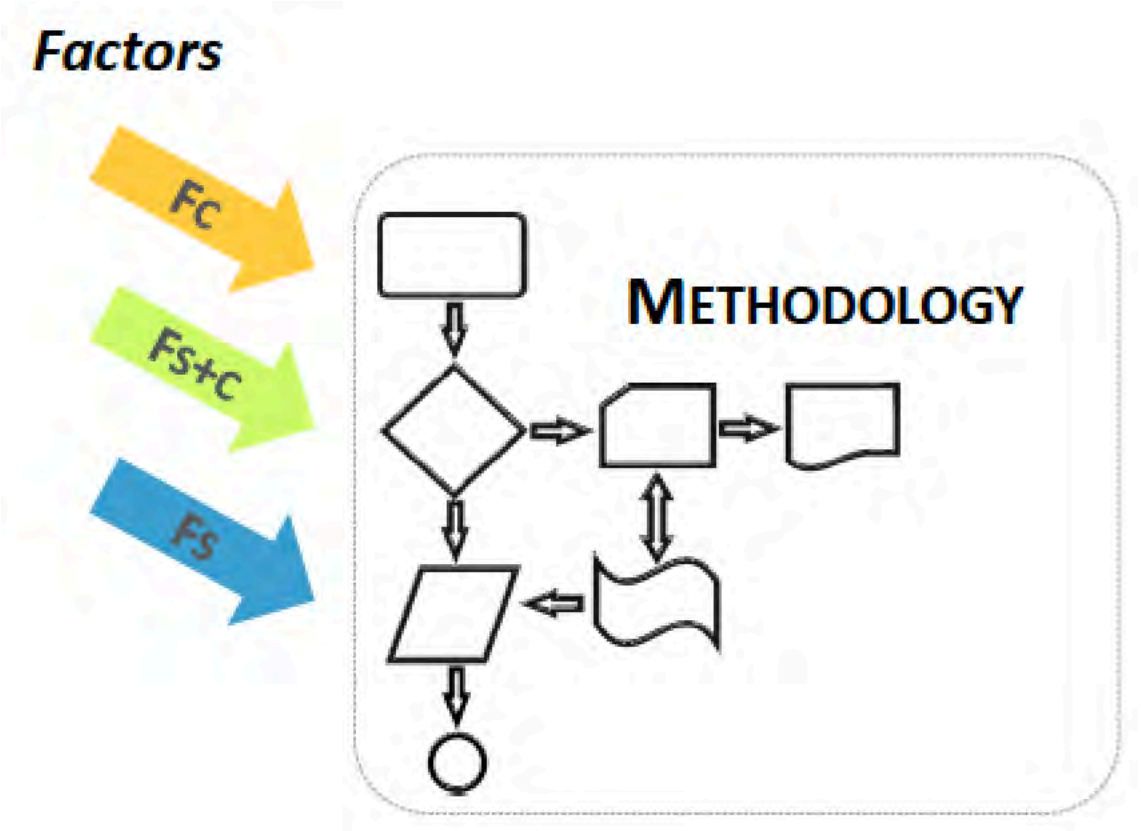
Source: (WU, 2009)

A little bit of scientific theory on VR experience



Source: (WU, 2009)

EON Reality + AM ParisTech



Develop a <u>design methodology</u> of VR systems (from both technical and 3D content points of view) that will improve the user experience.

USER EXPERIENCE = f (Factors$_{SYSTEM}$, Factors$_{CONTENT}$, Factors$_{SYSTEM + CONTENT}$)

EON Reality + AM ParisTech

ARTS ET MÉTIERS ParisTech

A dedicated team to this research action

« my VX »

USER EXPERIENCE = f (Factors$_{SYSTEM}$, Factors$_{CONTENT}$, Factors$_{SYSTEM + CONTENT}$)

A **1st PhD** will study and determine which factors influence the user experience

Then, based on these factors, we need to build and assess a methodology to design immersive environments which induce an augmented virtual experience

2nd PhD: formalize a methodology for systems based on [Factors$_{SYSTEM}$, Factors$_{SYSTEM + CONTENT}$]
3rd PhD: formalize a methodology for content based on [Factors$_{CONTENT}$, Factors$_{SYSTEM + CONTENT}$]

3 Engineers - PhD students in Laval

Experimental research with regularly concrete results

EON Reality + AM ParisTech

Our goal is to define and share, in Laval, an <u>unique design approach</u> of VR systems that will improve user experience.

- *Innovative project*
- *Never been done before anywhere in the world*
- *It will be co-created and experimented in London!*

PLACE DES CITOYENS

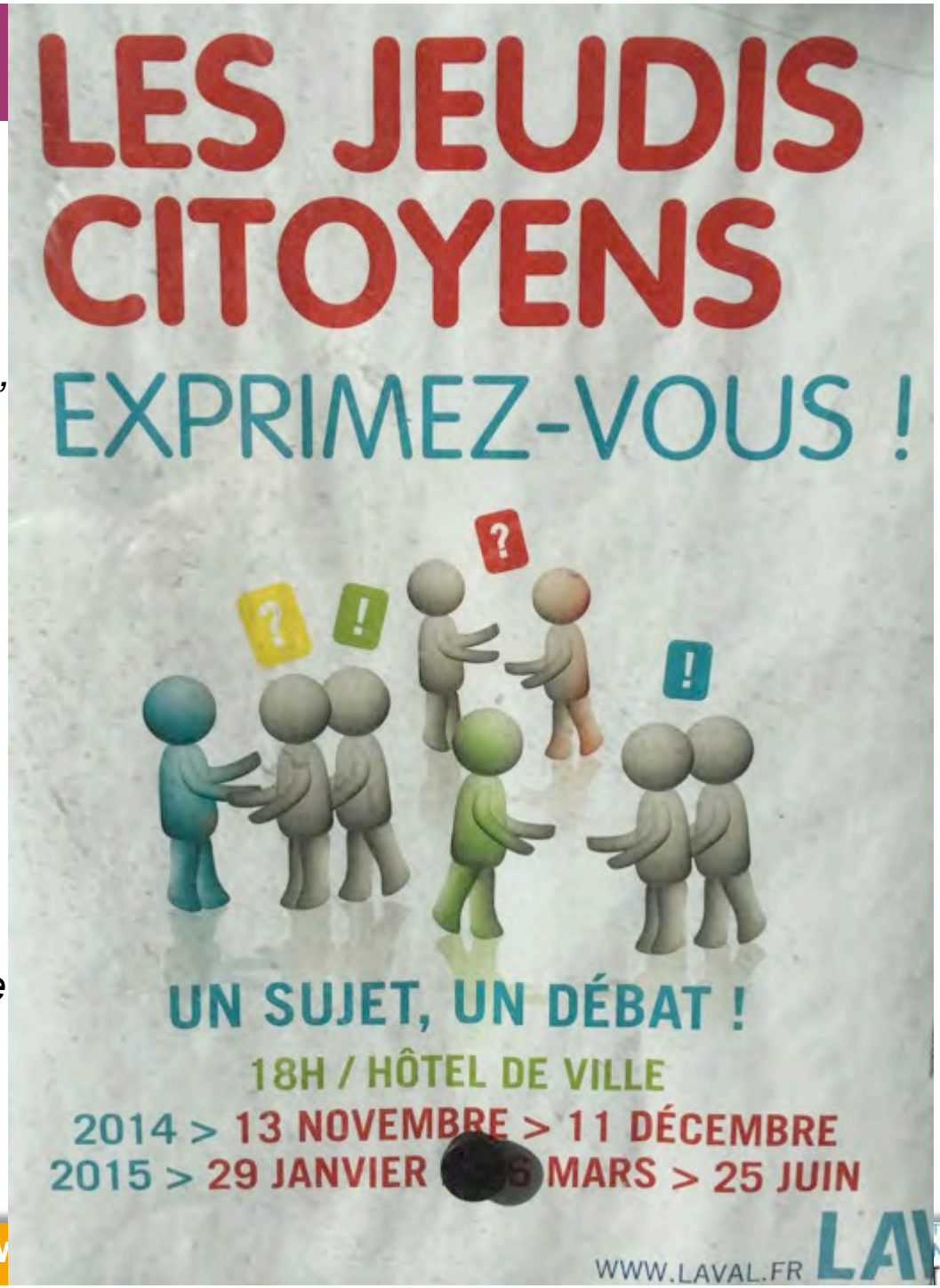
Example of a future project

URBI & ORBI

Participatory Democraty

Thursdays citizens,
Express yourself!

a subject, a debate



Participatory democracy

How many people can get involved at the same time?

How to organize the discussion to obtain the opinion of each participant?

The Urbi & Orbi project

From a largely individualistic « democracy of words »

to a fully collaborative « democracy of action »

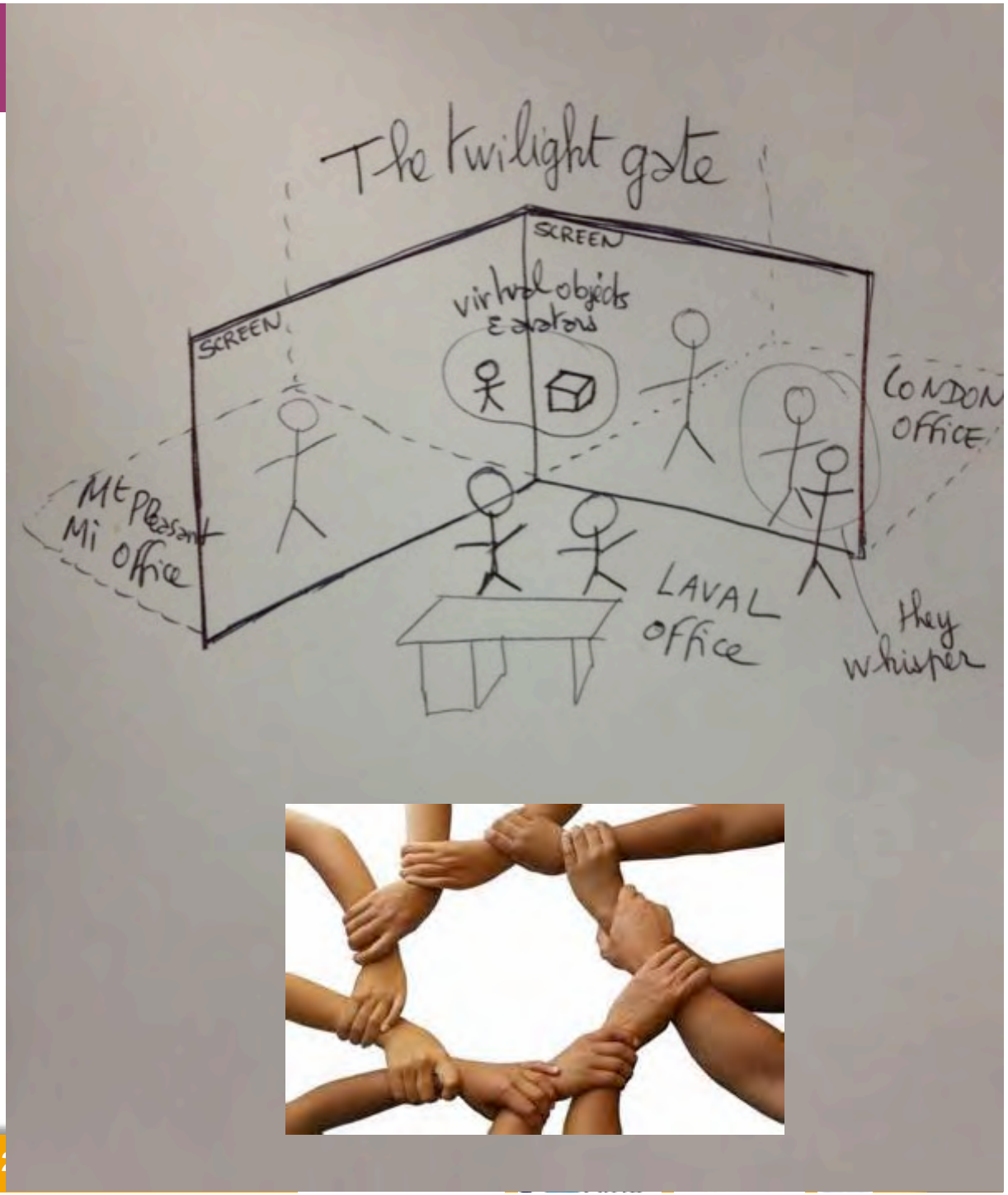
Candace Gibson, Ph.D / Janine Janosky, Ph.D / Howard Levine, M.Sc. (Eng.) / Timothy Pletcher, Ph.D / Sean Quigley, B.A., M.A / Simon Richir, M.Eng, Ph.D / Dag K.J.E. von Lubitz, Ph.D., M.D. (Sc.)

U&O project – *Operational platform*

A tightly-coupled integration of **people-ideas-technology** into a generally and **easily accessible operational platform** in which the bottom-up flow of ideas is facilitated by the technology-based transforming mantle within which the current, and largely individualistic “democracy of words” is transformed into a fully collaborative “democracy of action”: The Urbi et Orbi Project.

Because of its large and dynamic university and college, excellent Internet connectivity (arguably best in Canada), proximity to “talent pools” in Canada and the US, and its “manageable” size, **London** offers an ideal operational target for implementation and testing of the concepts constituting the Urbi et Orbi Project.

The Urbi & Orbi project



Globally distributed ToL training session in Café Candace: Emerging Leaders and London Managers, architects in Laval, France, and business analysts in Mount Pleasant, MI discussing placement and impact of the envisaged London Museum of Art and Technology

© Simon Richir, 2014

The Urbi & Orbi project

1. While we talk about collaboration a lot we actually don't do it very well. ToL is a provincial organization doing this with groups and organizations.

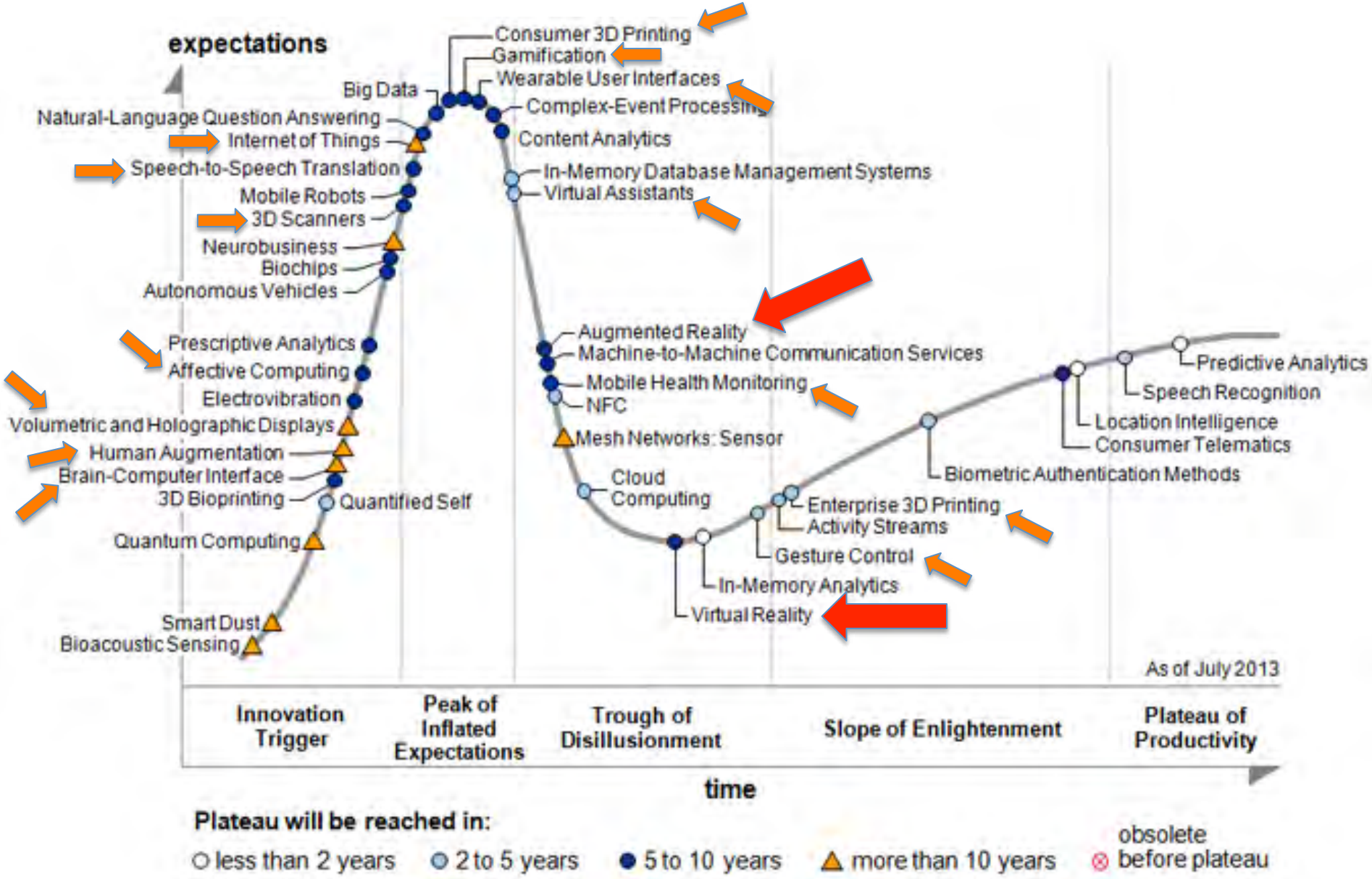
2. VR provides a way to gather a lot of people and to bring expertise from around the world to local problems. It creates a way to collaborative visual solutions that are immersive.

3. We want to build and test this combination, Urbi et Orbi, in London first

URBI & ORBI

Participatory Democraty

CONCLUSION



Monitor technology!

iGlass

Reality reinvented

Augmented User Experience

Emotion is THE key factor

Mark Zuckerberg 25 mars 2014 Palo Alto

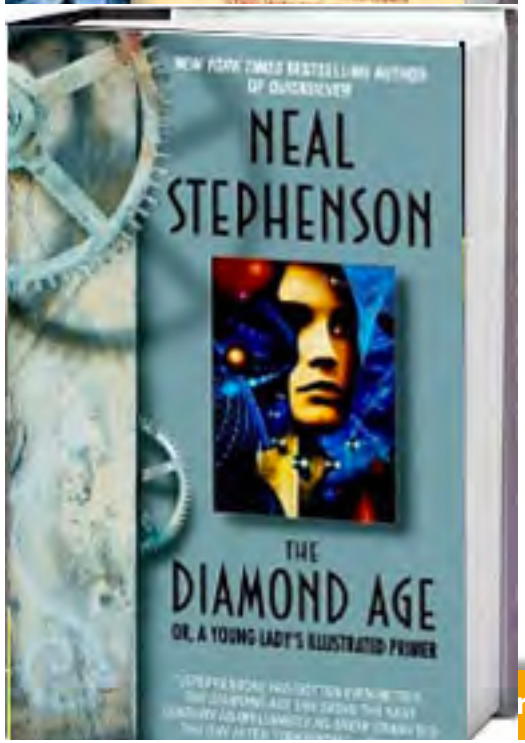
Virtual reality was once the dream of science fiction. But the internet was also once a dream, and so were computers and smartphones.

The future is coming and we have a chance to build it together. **I can't wait** to start working with the whole team at Oculus **to bring this future to the world, and to unlock new worlds for all of us.**

References…

Neal Stephenson's **Metaverse**

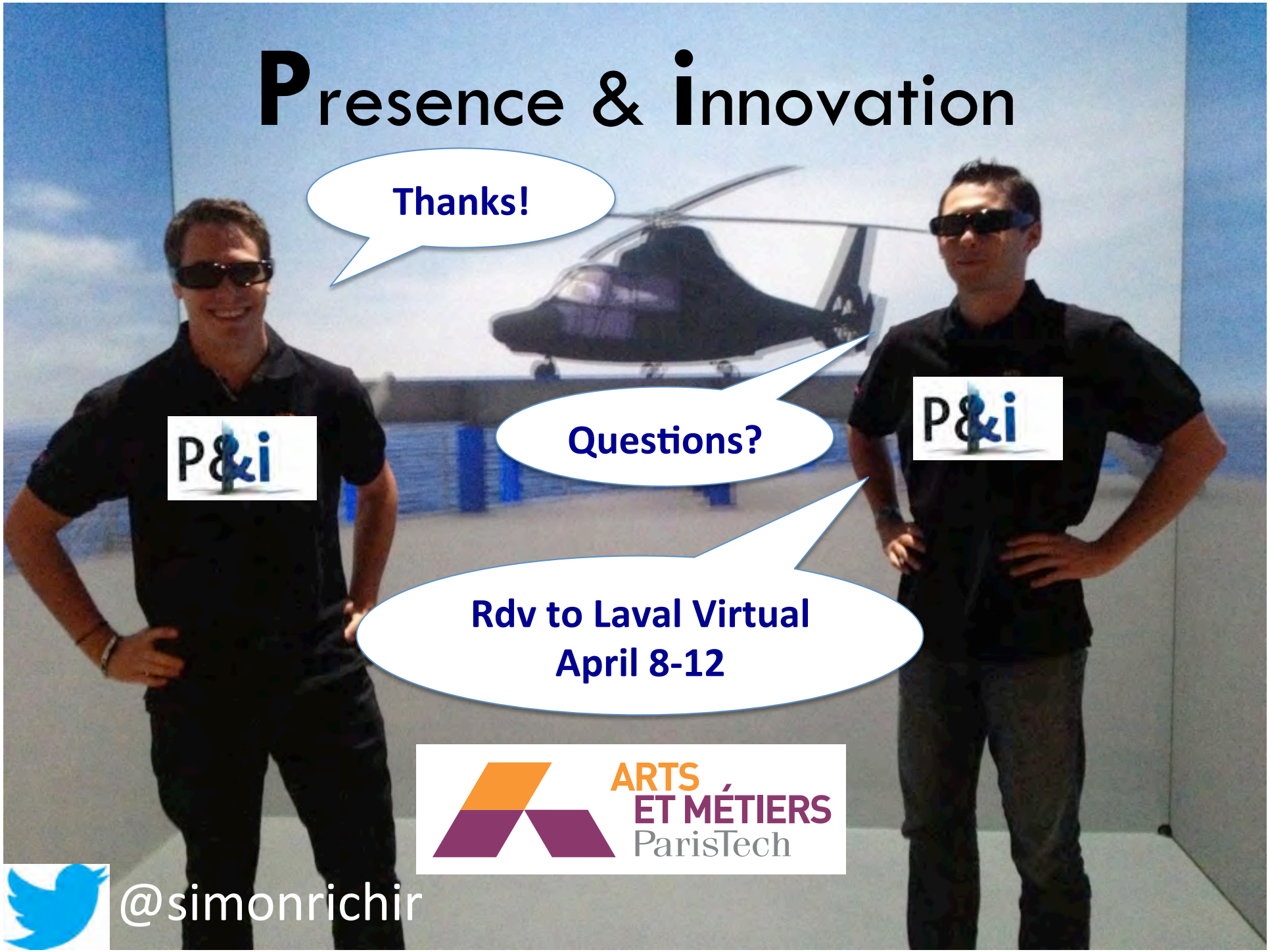
In reality, Hiro Protagonist delivers pizza for Uncle Enzo's CosaNostra Pizza Inc., but in the **Metaverse** he's a warrior prince. Plunging headlong into the enigma of a new computer virus that's striking down hackers everywhere, he races along the neon-lit streets on a search-and-destroy mission for the shadowy virtual villain threatening to bring about Infocalypse.



Set in twenty-first century Shanghai, it is the story of what happens when a state-of-the-art interactive device falls into the hands of a street urchin named Nell. Her life-and **the entire future of humanity-is about to be decoded and reprogrammed**....

Vernor VINGE's AR

The many technological advances depicted in the novel suggest that the world is undergoing ever-increasing change, perhaps destined for a technological singularity.


Presence & innovation
Thanks!
Questions?
Rdv to Laval Virtual
April 8-12
P&i
P&i
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ET MÉTIERS
ParisTech
@simonrichir