

# Methodological Considerations in the evaluation of Technologies; drawing on the experiences of the SMART projects

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# SMART Consortium



- University of Sheffield: project management, technical management, medical physics, expertise in congestive heart failure
- University of Ulster: health informatics
- University of Newcastle: user centred design
- University of Bath: medical physics/ engineering, expertise in pain management
- Sheffield Hallam University: expertise in stroke
- Third sector organisations: access to patient groups/ advice



# Telehealth; problems with the existing evidence base

- A lot of investment in innovation
- Plethora of small scale evaluations
- Moving work out of laboratories is hard to achieve
- Obtaining evidence of cost and clinical effectiveness difficult in the absence of device mainstreaming and adoption

*Self Management*

# Drawing on our own experiences; the SMART Consortium Projects

- SMART1: technology for upper limb stroke rehabilitation in the home
- SMART2: technology for self management of three long term conditions (CHF, stroke, chronic pain)
- SMART+: extending the SMART2 system to other long term conditions

# SMART1 Equipment



# Participant using the SMART system at home



# Features of the SMART1 rehabilitation system

- Enables the user to continue their rehabilitation at home
- Includes prescribed rehabilitative interventions
- Provides immediate feedback to the user

*Smart  
Self Management*

# Evaluation of the SMART1 device

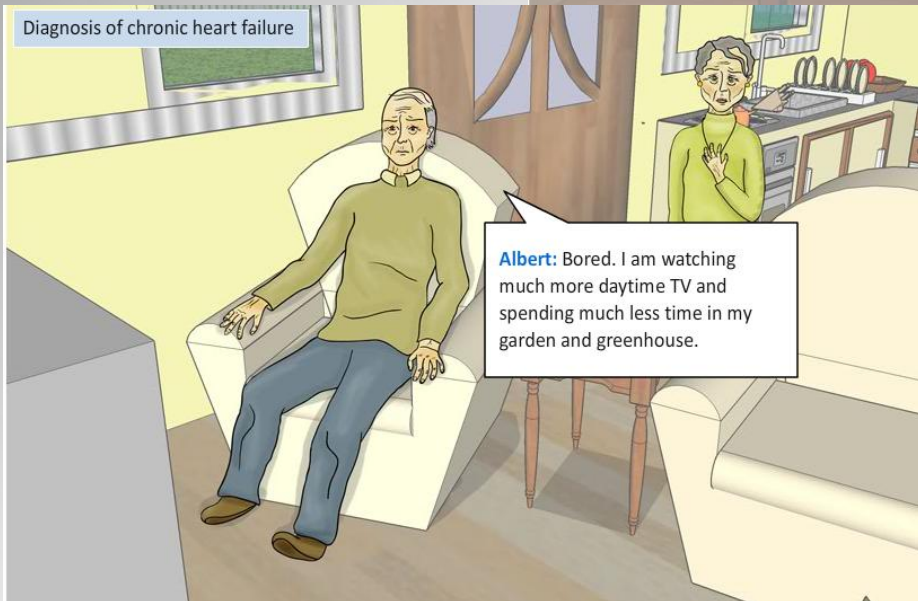
- funding expired from EPSRC 2006 - relationship brokered with Philips R&D
- formative and small scale summative evaluation completed
- Follow on funding from Sheffield Hallam University for further development work with Philips R&D
- 2007 Philips take decision to pull out 'not close enough to market'

# SMART 1 continued....

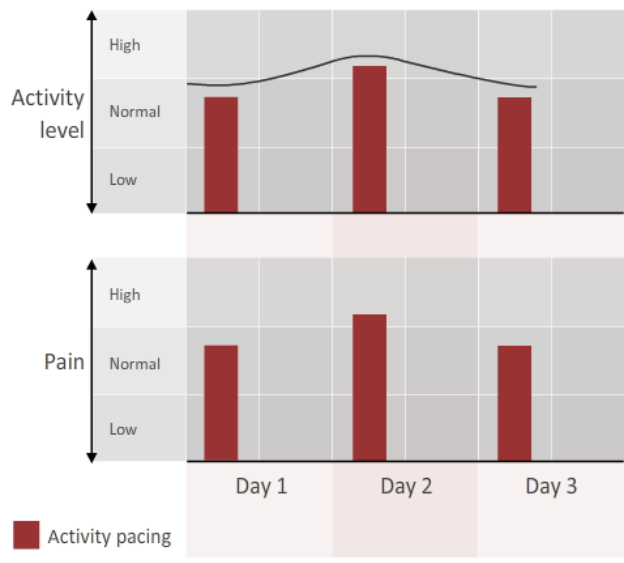
- Philips loan sensors to UK partner universities
- Work continues with post graduate students
- Design masters student redesigns attachment garments
- PhD student examines the feedback mechanisms via sustained use of the system with five people with stroke at home

# Taking SMART1 forward - another project!

1. New industrial partner- to update and stabilise prototype and produce in numbers
2. Further exploration with rehabilitation commissioners and providers e.g. infrastructure requirements and acceptability of changes to care pathways
3. A business case underpinned by economic and business models



## Daniel's story



The key to this behavioural strategy is to change the unit of measurement from task completion (or pain level) in the short term to consistency of activity over the long term.

The strategy of activity pacing fits well with a therapy based on the patient carrying out tasks related to his or her personal goals and values, in order to increase quality of life up to a desirable level.

# Features of the SMART2 self management system

- It will be configured to be intelligent so that user data can be interpreted and messages given to the user without human intervention
- It will be tailored to the therapeutic needs of the individual as would a traditional plan of rehabilitation or enablement
- The ultimate aim will be to assist users to achieve the goals that they identify for themselves

# Prototype System Architecture

Home hub; touch screen computer



Mobile device with inbuilt GPS and accelerometry



Other devices added to meet the specific needs of people with each of the long term conditions

# Evaluation of the SMART2 device

## Formative evaluation

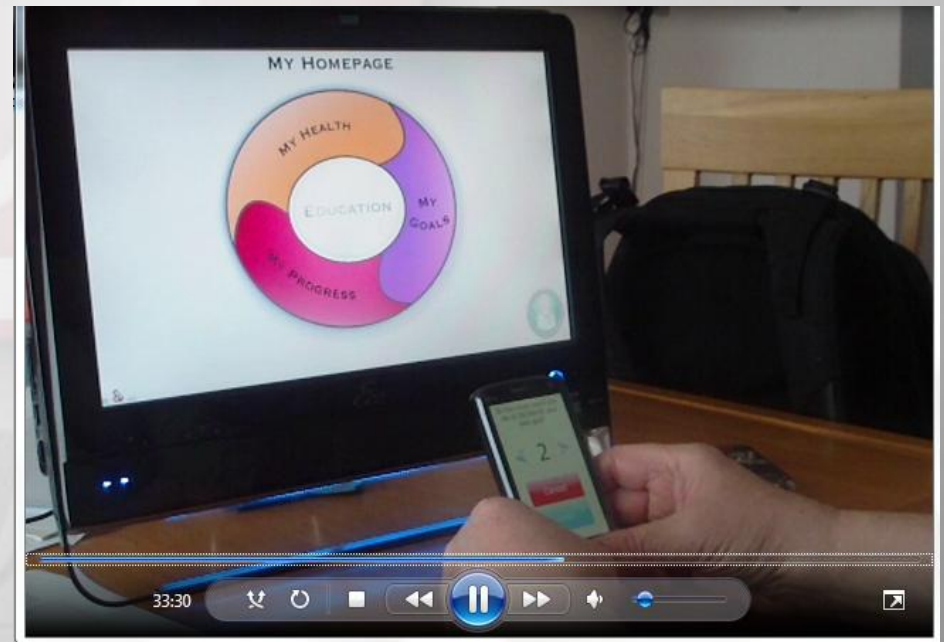
Three iterations of each of the three prototypes

Usability and functionality issues identified and corrected by

- cognitive walkthrough
- cooperative evaluation

## Summative evaluation (2011)

- realistic evaluation
- up to 60 participants (20 with each LTC)



# Taking the SMART2 forward - another project

Needs for;

- Further device refinement - to meet the needs of people with a range of conditions
- A business case underpinned by economic and business modelling
- Further exploration of issues of adoption in practice
- An industrial partner for mainstreaming

# What have we learnt?

- A business approach is necessary from the outset; without a robust business case industry are unlikely to invest
- When a stable prototype is produced, there is then need for extended work to explore the implications of use in practice
- Adherence by end users cannot be presumed
- The above are essential before moving onto producing evidence of population benefit

# A common framework?

Business case development

User centered design embedded into device development

Evaluation that adheres to the MRC framework for evaluation of complex interventions