# Human Factors in Health Technology
## *Socio-Technical Systems Approach*

The University of Nottingham
UNITED KINGDOM · CHINA · MALAYSIA

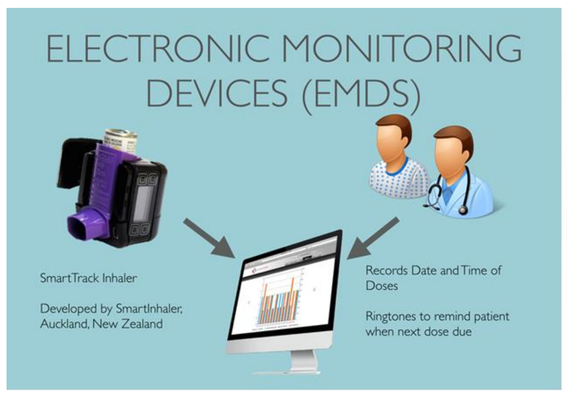

a) *Sam Howard, Alexandra Lang, Sarah Sharples*
b) *Sue Cobb, Anne Floyde, Rob Edlin-White*
c) *Sarah Atkinson, Laura Pickup*
d) *Alexandra Lang, Sarah Atkinson, Sue Cobb*

**Human Factors Research Group (HFRG)**
www.nottingham.ac.uk
@UniofNottingham


**Socio-Technical Systems approach on different scales**
**Product – Task – Environment – Organisation – System and Context**

## Product User Evaluations – The 'SmartTrack' Smart Inhaler by Adolescents with Asthma[a)]

Seven adolescents with asthma aged between 11-16 used an EMD for one month with their normal preventer inhaler. Participants were interviewed by the researcher at the beginning, middle and end of the trial. The interview included their experiences and attitudes towards it's appearance and how they felt about the device recording medication taking behaviour.




- Clips around a standard inhaler
- Records date and time of actuated dose
- Screen displays when the last dose was taken, time & settings
- Ringtones can be set up with a patient's treatment plan to alert them to next dose
- Connects to a PC and uploads information to a Smart

Adolescent Evaluation:
'Taking Control of Condition'
'Social Compatability'
'Sharing and Feedback of Adherence Data'
'Practical Improvements for More Effective Use'

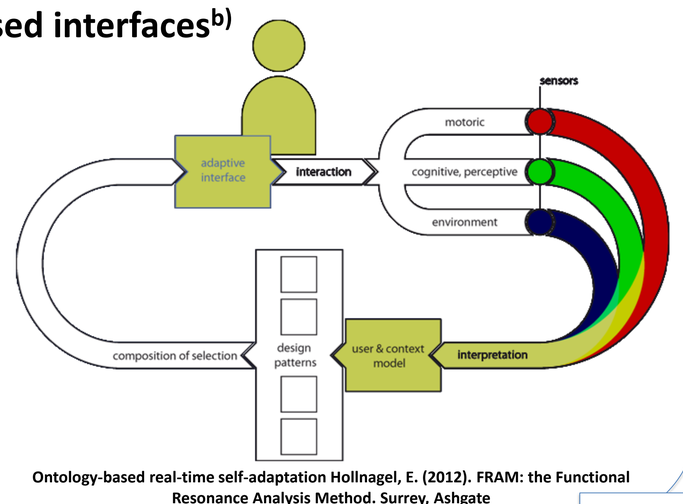
***Take home message***: This study provides insight into the attitudes of adolescents with asthma towards a device to monitor their inhaler use and to remind them when their next dose is due. The results showed a positive response from participants for having their inhaler use recorded and shared with key stakeholders, such as their parents, doctor and nurses. The results highlighted the need for further user-focused research to investigate how the appearance and design of these devices can be developed and improved to meet the needs of potential users who could experience real benefit from both the monitoring and reminding functionality. (Howard et al. 2014)

**Ref: 1)**

## Product User Evaluations for use in a specific Environment- Interactive TV systems and the implementation of adaptive personalised interfaces[b)]

The project investigated the use of adaptive interfaces as a dynamic tool to customise technology and thus increase inclusivity. We have recently established a working relationship with the Radford Care Group in Nottingham, a day centre for older people, which is a charitable organisation run largely by volunteers. HFRG researchers currently visit the centre on a weekly basis to work with members in researching attitudes to, and exploring issues with, the use of technology.

The MyUI User and Context Management Infrastructure detects and interprets relevant characteristics of the end user and her/his environment which bring about special accessibility requirements. This information is stored and updated in a user profile which serves as basis for generating an individualized user interface.




Ontology-based real-time self-adaptation Hollnagel, E. (2012). FRAM: the Functional Resonance Analysis Method. Surrey, Ashgate

**Ref: 2)**

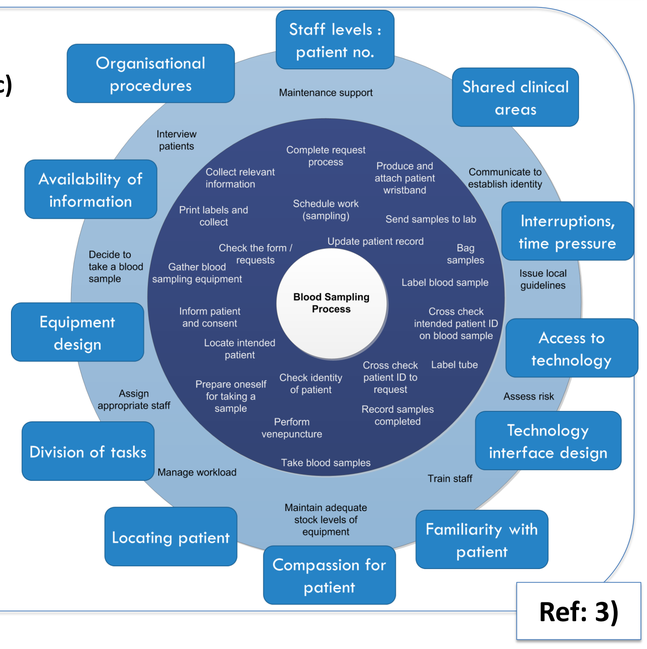
## Task and Process Evaluation within a System – Right First Time: Blood sampling in acute hospital care settings[c)]

The aim of this pilot study was to apply a Human Factors/Ergonomics systems approach to understand why variability in performance of blood sampling continues to be reported despite various initiatives, procedures and national guidelines.

A multi method approach was adopted and included the application of the Functional Resonance Analysis Method (FRAM) (Hollnagel 2012). The context of an Emergency Department was analysed and modelled to consider how the concept of systems resilience could be applied to ensuring more things go right first time.

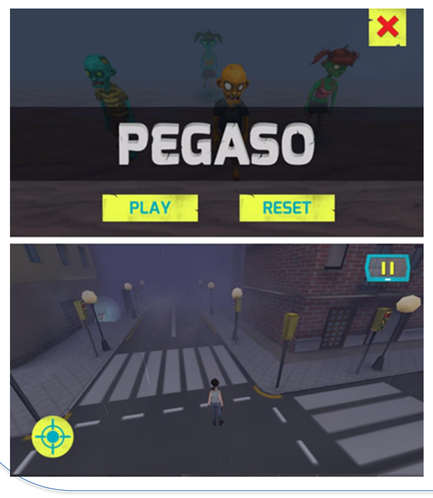

This study has applied state of the art evidence to understand why blood sampling can vary due to multiple factors including social, technical and organisational behaviour – highlighted within the blue rectangles.

**Summary**
Modelling the interactions of blood sampling functions highlights why accessibility, reliability and the design of healthcare technology influences practitioner performance. This level of understanding can direct how to promote resilience within the system through user centred design and effective reporting, monitoring and managing of technology issues.




**Ref: 3)**

## System development and trials for use in Context – PEGASO: Personalised Guidance Services for Optimising Lifestyle in Teenagers[d)]

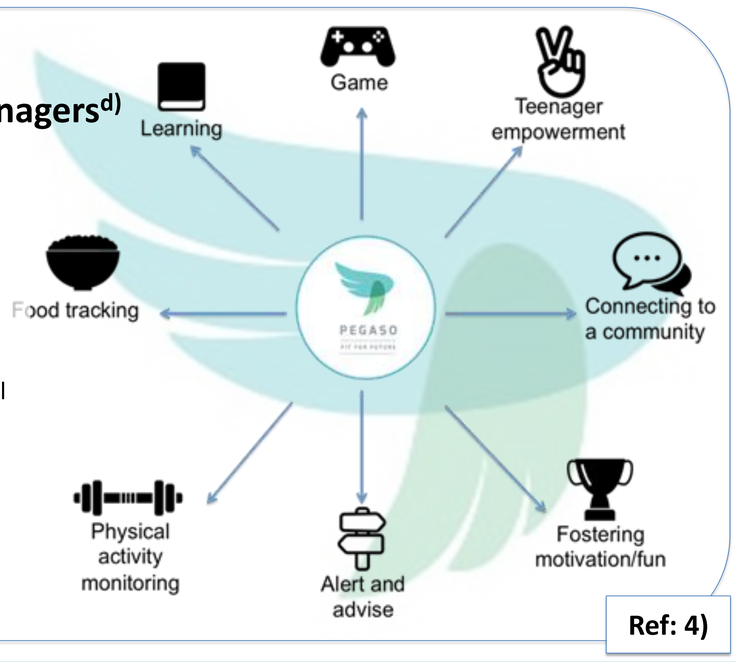



On the technology level, PEGASO is a multi-dimensional and cross-disciplinary ICT-based system that exploiting sophisticated and engaging game mechanics will motivate behavioural changes towards healthy lifestyles thus preventing overweight and obesity in the younger population.

PEGASO involves the formative design and development and summative evaluation of individual technology components (wearable sensors, mobile app, serious game) and the integrated PEGASO system as a whole. It will consider the personal behaviours and goals of individual users, utilise the opportunities associated with technology systems and social media and examine the contextual, social and environmental influencers on system user and acceptance.

PEGASO UCD approach includes -Participatory Design and Technology testing with teenagers in four countries – England, Scotland, Italy and Spain.

- Early user requirements capture, I
- Iterative design testing and evaluation by teenagers over 3 formative design cycles
- Long term trial (6-9 months) of the system by 350 teenagers across the four partner sites




**Ref: 4)**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2) Edlin-White, R., Cobb, S., D'Cruz, M., Floyde, A., Lewthwaite, S., & Riedel, J. (2011). Accessibility for older users through adaptive interfaces: opportunities, challenges and achievements. In Human-Computer Interaction. Towards Mobile and Intelligent Interaction Environments (pp. 483-489). Springer Berlin Heidelberg.
3) PHB Bolton-Maggs (Ed) D Poles et al. on behalf of the Serious Hazards of Transfusion (SHOT) Steering Group. The 2014 Annual SHOT Report (2015).
4) Alexandra Rosewell Lang, Maria Carme Carrion Ribas, Sarah Atkinson, Sue Cobb, Marco Mazzola, Mireia Espallargue. The role of UX in designing technologies for teenage healthy lifestyles. CHI 2014 Workshop. University of Nottingham, UK; AQuAS, ES; Politechnico di Milano, IT