

# Researching the intersections: the value of interdisciplinarity

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University of Limerick



HOST INSTITUTION



PARTNER INSTITUTIONS



# Definitions



## **Webster:**

Interdisciplinary:

Involving two or more academic, scientific, or artistic disciplines

Multidisciplinary:

Combining or involving more than one discipline or field of study

Transdisciplinary:

Interdisciplinary

## **Oxford:**

Cross-disciplinary:

Involving different areas of knowledge or study



# Interdisciplinary interests



## SDM-70

		Primary		Technical Descriptors (HV)						
		Primary	Secondary	Material Selection			Manufacturing			
Primary Aesthetics	Secondary	Reasonable Cost	Steel	Aluminum	Titanium	Welding	Die Casting	Sand Casting	Forging	
		Aerodynamic Look								
		Nice Finish								
		Corrosion resistant								
		Light Weight								
		Strength								
		Steel	Aluminum	Titanium	Welding	Die Casting	Sand Casting	Forging		

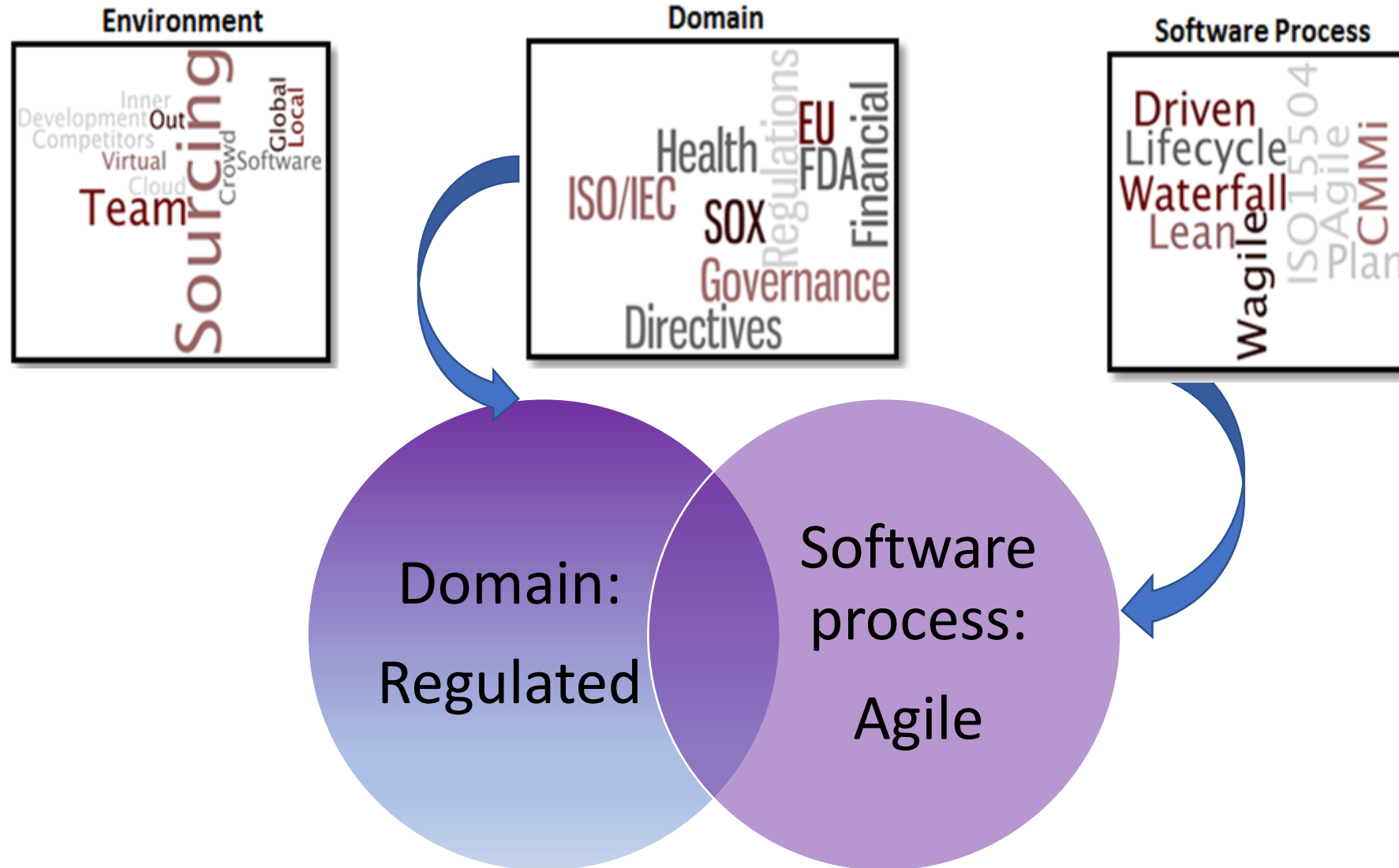


$$92 \mid \overline{203} \left\{ \frac{4}{87} \right\} \smile \phi \sqrt{3}$$

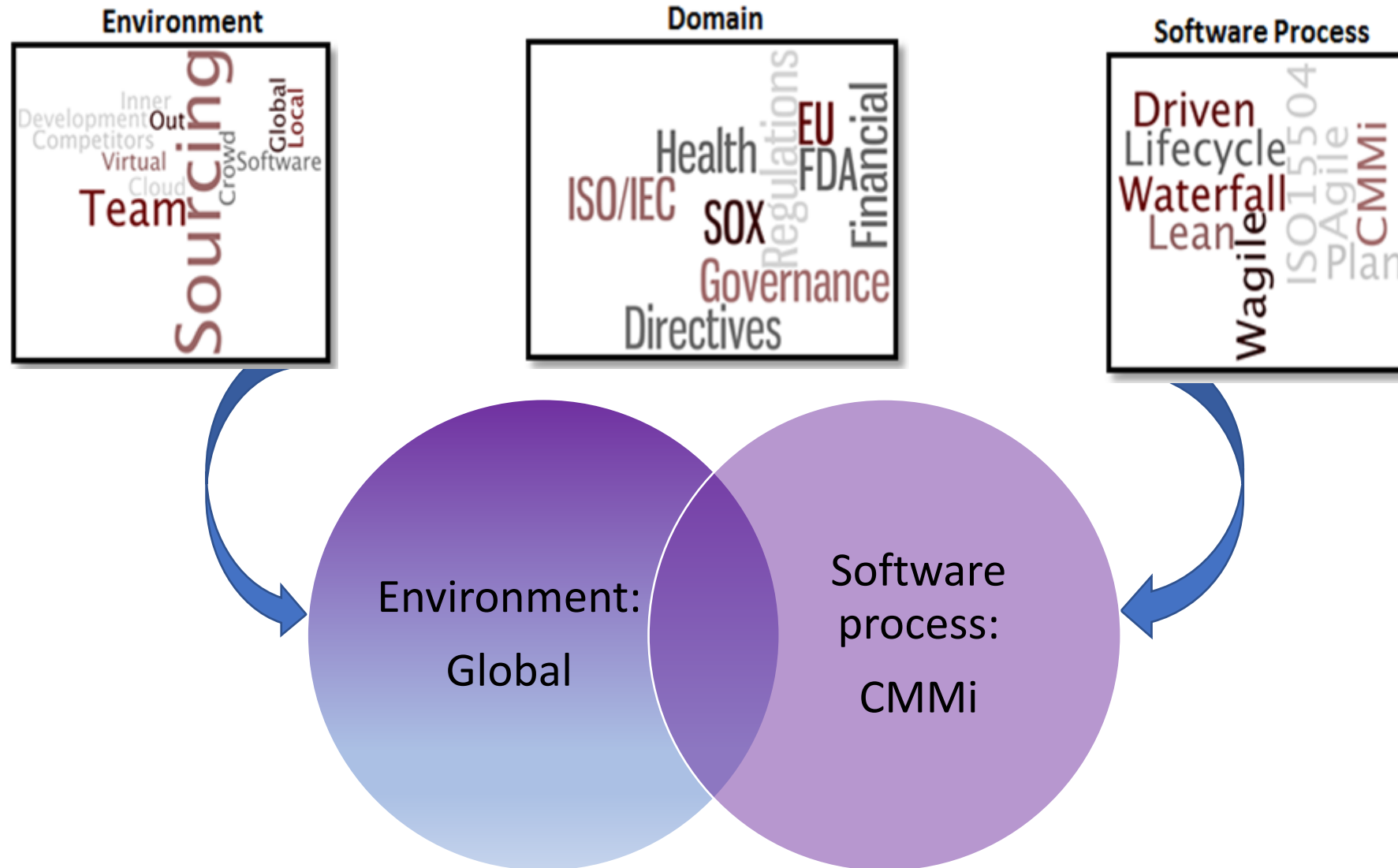
$$= 55 \left( \frac{6}{275} \right) + \frac{\pi}{z \text{ axis } \sqrt{3.1}}$$

$$)= \sqrt{ar(?) z + y = c \leq z} \quad 9 \text{ to}$$

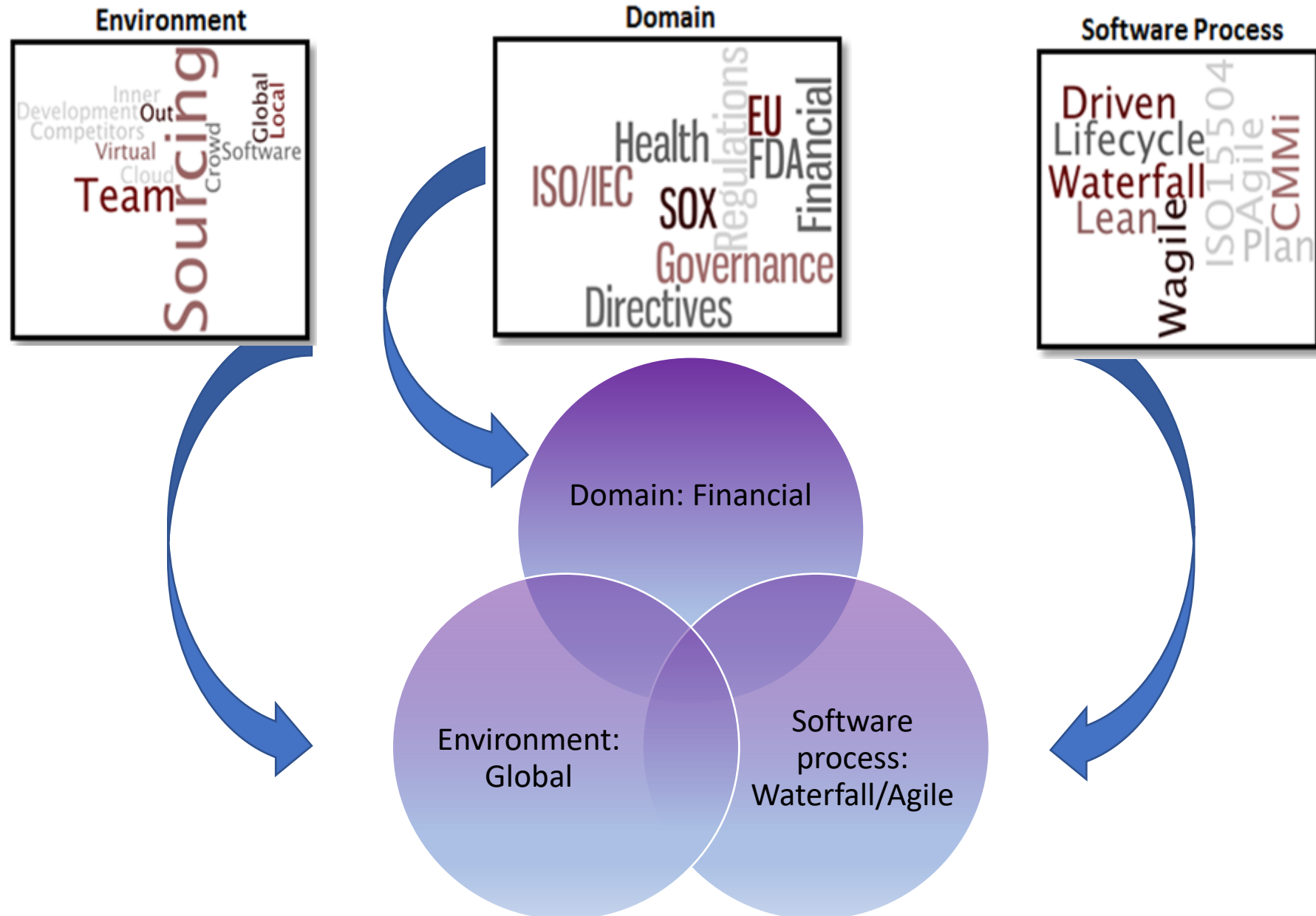
## Organisational Process Drivers



## Organisational Process Drivers



# Organisational Process Drivers



# What makes interdisciplinary research important?



- ✓ Combining aspects of software engineering research
- ✓ Integrating other disciplines with software engineering research
- ✓ Involvement with industry



# Diversity is Good <sup>[1]</sup>

- This is what a field like software engineering requires
- But ...
  - Those communities need to be (significantly) connected
  - We need to be able to talk to each other and work together
- Only then we will be able to offer the novel solutions that software engineering needs and maximize our impact



**Dr. Daniela Damian** @DanaHDamian · May 13

...

"humanities" is not separate from 'engineering"! says Adriana Porter Felt in her SEIP talk about engineering at scale at Google [#ICSE22](#) [@ICSEconf](#)  
Very much in line with [@lionel\\_c\\_briand](#) 's call for an even better integration of the two.

# What have I learned?



- ✓ Interdisciplinarity widens the scope of what can be researched
- ✓ Researching with people from other disciplines is interesting and fun!
- ✓ Research methods from other disciplines are useful to our discipline
- ✓ Publication opportunities (or difficulties?)



# Useful research methods

- ✓ Mixed methods
  - ✓ Requirements Engineering and Healthcare
- ✓ Action Research
  - ✓ Agile methods and Global Software Development
- ✓ Patient and Public Involvement
  - ✓ Healthcare and Software Implementation

# Requirements Engineering for Healthcare: Vulnerable Groups



**Recommendations for Developing Smartphone Applications for an Ageing Population**



Saudi Arabian  
Cultural  
Bureau

**Recommendations for Developing Health Information System Applications for use by Persons with Mild Intellectual and Developmental Disabilities**

# Nothing about us Without us <sup>[2]</sup>

## Ageing Population



250 + older adults

Focus groups,  
Prototype evaluation,  
Surveys, Interviews

## Persons with mild IDD



Hail, Saudi Arabia

Participative focus  
groups

19 men, 7 women

Qualitative study

**Stakeholder Feedback: Qualitative and Quantitative**

# Research Question

What are the recommendations to be considered by software engineers when developing software for persons with mild IDD / older adults

# Research Output

**Recommendations presented in Design Pattern<sup>[3]</sup> format**

*Each pattern describes a problem which occurs over and over again in our environment, and then describes the core of the solution to that problem, in such a way that you can use this solution a million times over, without ever doing it the same way twice*

<b>Recommendation</b>	<b>Control number of choices available for the user when they are progressing through the application</b>
<b>Category</b>	Graphical User Interface
<b>Problem or goal</b>	Experts agreed that software developers should reduce the number of choices available in HIS applications for persons with IDD to ease cognitive load [a-c].
<b>Evidence/Proof</b>	<p>[a] Seale J, Garcia-Carrisoza H, Rix J, Sheehy K, Hayhoe S. A proposal for a unified framework for the design of technologies for persons with learning difficulties. Technology and Disability. 2018 Jan 1;30(1-2):25-40.</p> <p>[b] Gibson, R.C., M.-M. Bouamrane, and M. Dunlop, Design Requirements for a Digital Aid to Support Adults with Mild Learning Disabilities During Clinical Consultations: Qualitative 179 Study with Experts. JMIR rehabilitation and assistive technologies, 2019. 6(1): p. e10449.</p> <p>[c] Mobile app reviewer “This is an awesome app that is customizable for each user even down to two choices at a time.”</p>
<b>Solution</b>	Allow users to control the speed they move through the game by controlling the number of choices available as they progress through the application. This could be done through setting up a ‘number of choices at decision point’ when users are setting up the game, for example. Remember that people with any learning or cognitive difficulty can be slow in their performance and responses.

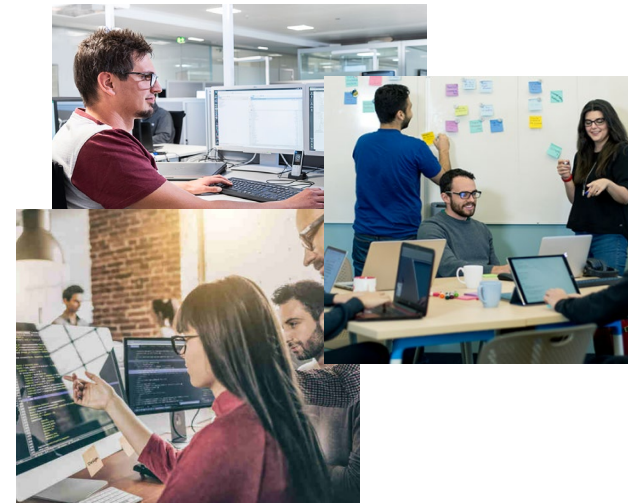
# Data Sources



Literature

Standards

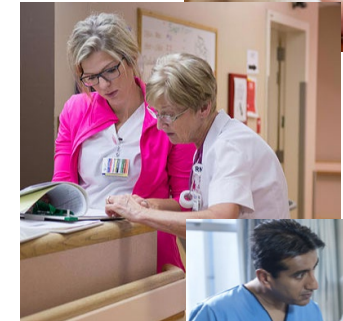
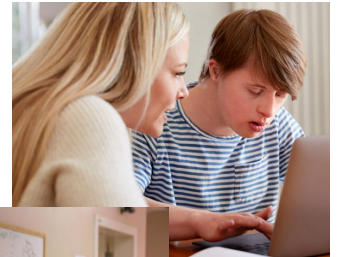
Commentary on  
Apps



User groups

Software  
Engineers

Experts



## Regulations to be considered



**EU Medical Device Regulation <sup>[4]</sup>  
entered into application on 26  
May 2021**

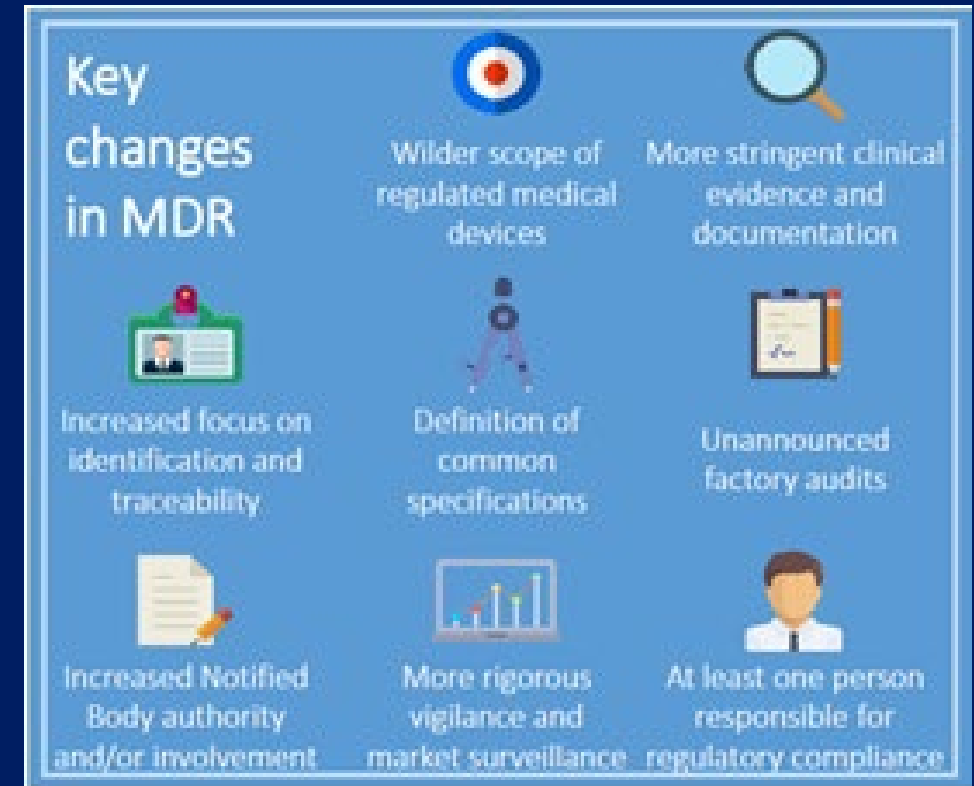
**EU Web Accessibility Directive <sup>[5]</sup>  
All public sector websites to comply by 23  
September 2020  
All public sector mobile applications will  
have to be accessible by 23 June 2021**

# EU Medical Device Regulation



‘Medical device’ means any instrument, apparatus, appliance, *software*, implant, reagent, material or other article intended by the manufacturer to be used, alone or in combination, for human beings for one or more of the following specific medical purposes:

- diagnosis, prevention, monitoring, prediction, prognosis, treatment or alleviation of disease
- diagnosis, monitoring, treatment, alleviation of, or compensation for, an injury or disability
- .....



[Fastrial.com](https://www.fastrial.com)

# Web Content Accessibility Guidelines



Member States shall ensure that **public sector bodies** take the necessary measures to make their **websites and mobile applications** more accessible by making them **perceivable, operable, understandable and robust.**



# Contributions from Research

45 recommendations for persons with mild intellectual and developmental disability

Usability, Accessibility, Content, Gamification <sup>[6]</sup>

44 recommendations for ageing population

Usability, Accessibility <sup>[7]</sup>

2 PhD graduates (2020, 2022)

Contribution to Education and Public Engagement

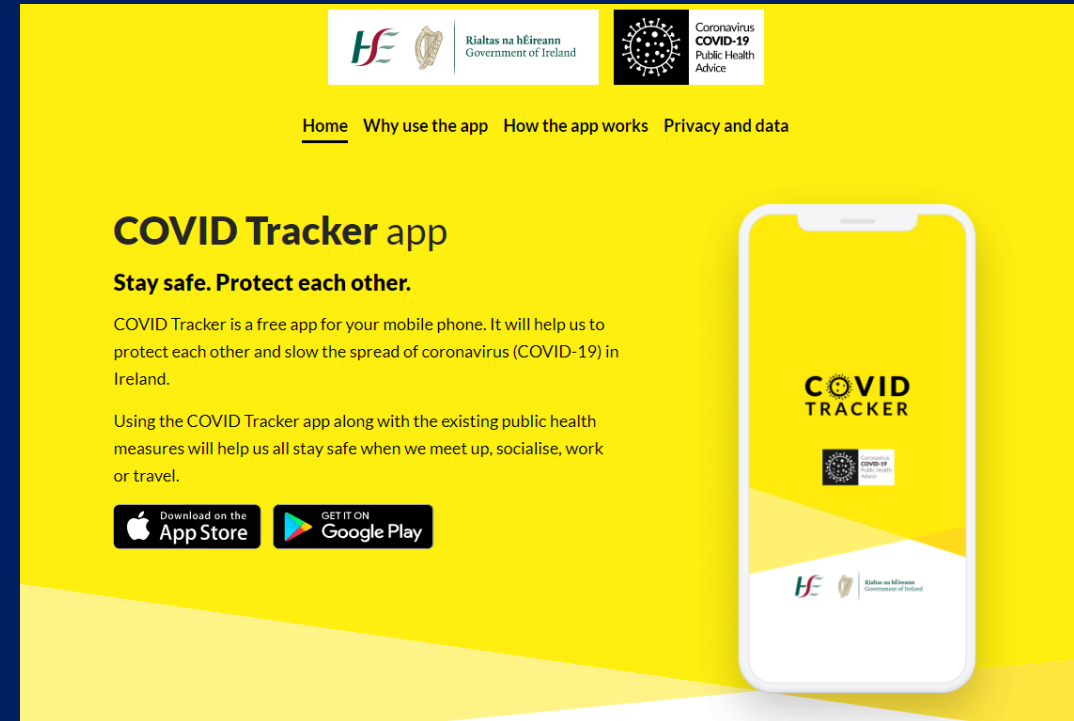


11 International peer-reviewed research papers:  
6 interdisciplinary, 3 with industry, 1 with international authors

# Including EU Accessibility Directive in the COVIGILANT Framework [8]



We need to consider accessibility in tracker apps, ensuring that technology is an enabler for everyone, rather than being a barrier for diverse groups.



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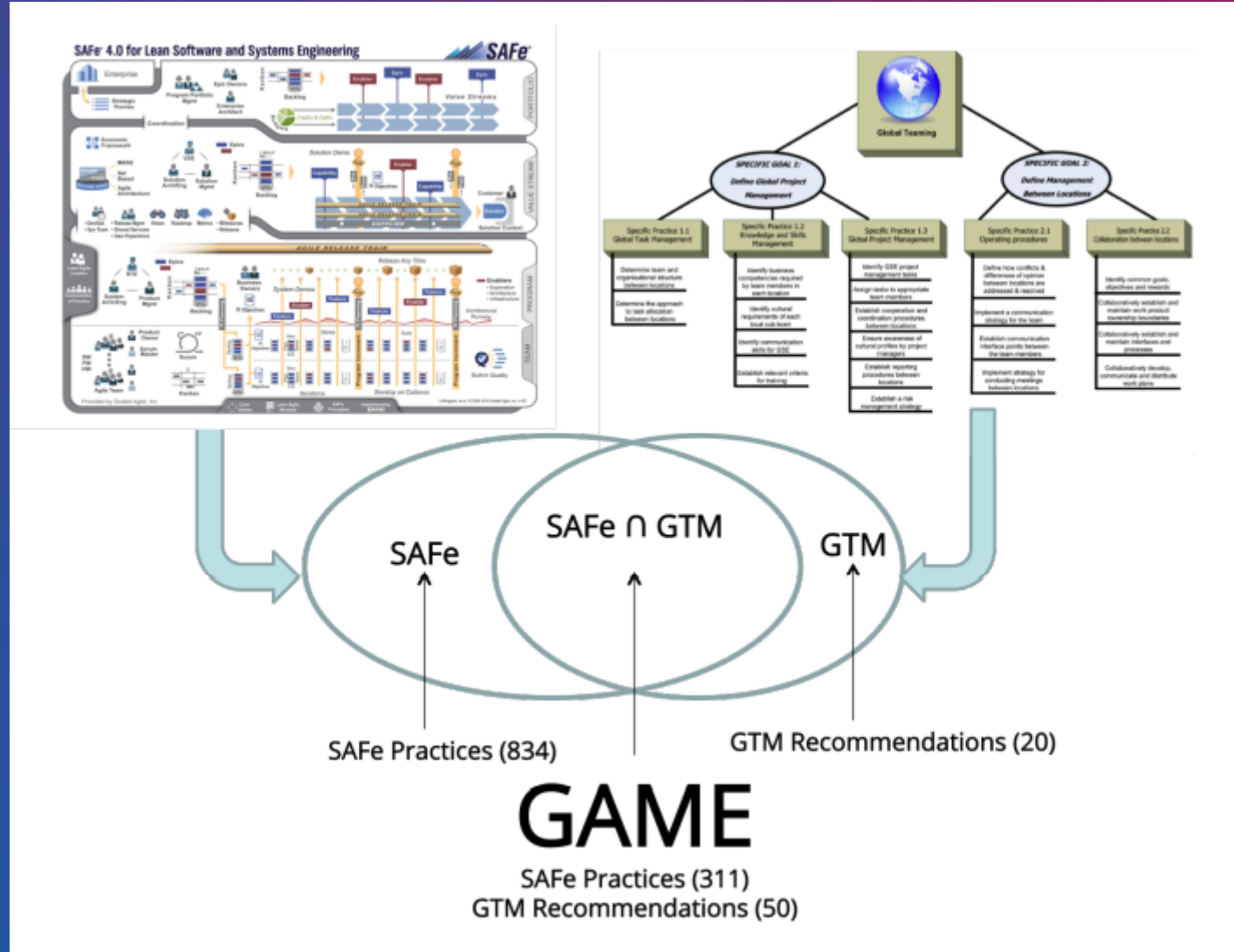
- ✓ Irish-owned and headquartered SME
- ✓ Optometry software
- ✓ Optical Lab software
- ✓ Over 8,000 sites in 77 countries use their software and services
- ✓ Over 280 staff
- ✓ Ireland, US, Canada, England, Wales, France, Italy, Sweden, Norway, Denmark, the Netherlands, Spain, Australia and China.

# Research Questions

- ✓ RQ1: How can we combine practices associated with global software development and scaled agile development?
  - ✓ Develop a process model that combines GSD practices and scaled agile practices in order to guide organizations who are applying agile practices in a global context
- ✓ RQ2: To what extent does the output from RQ1 address the needs of a company scaling agile in a GSD context?
  - ✓ To provide practitioners with a framework of implementable practices in GSD, as there is no comprehensive framework describing how to apply agile practices to GSD

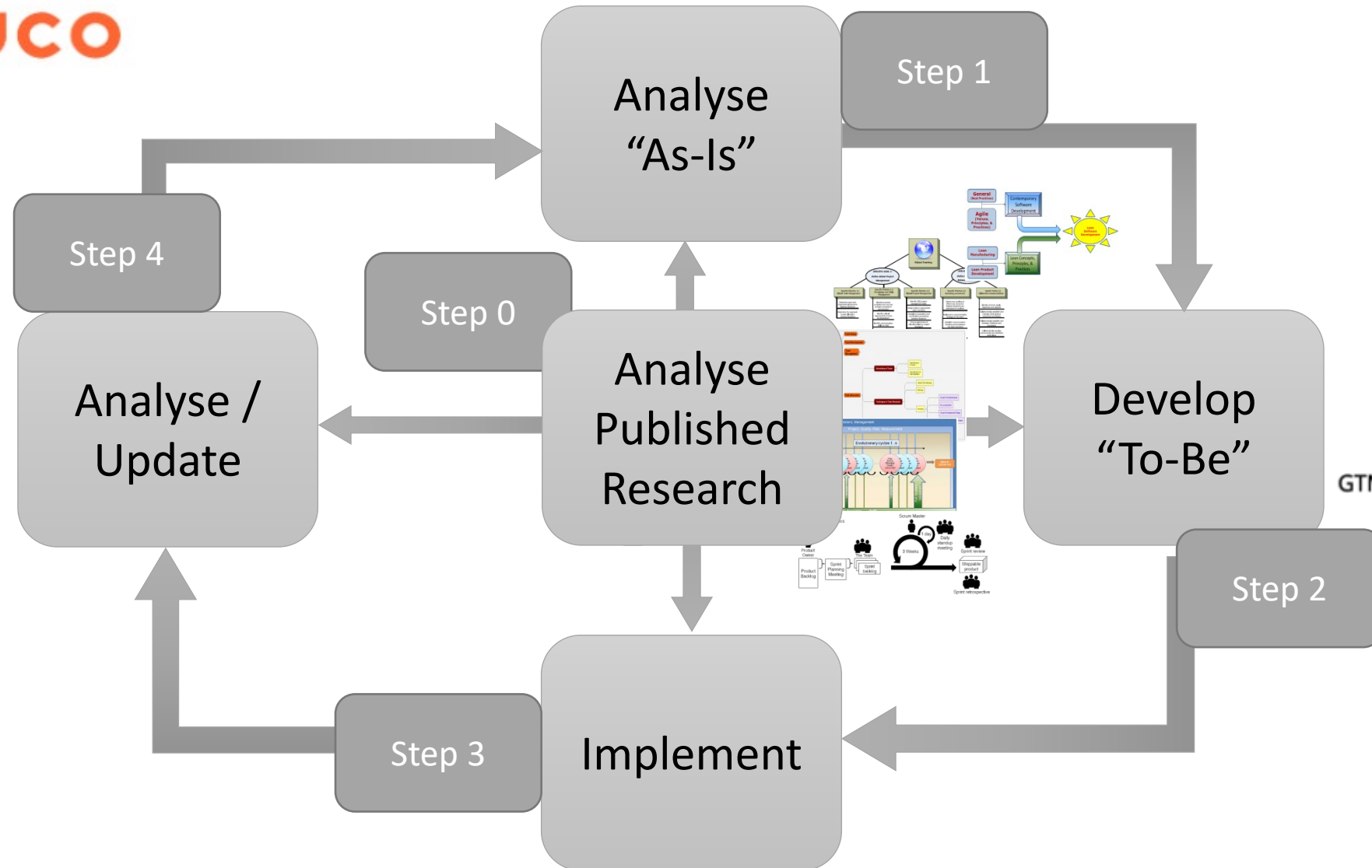
# GAME – Global Agile Model for Enterprises

[9, 10, 11]



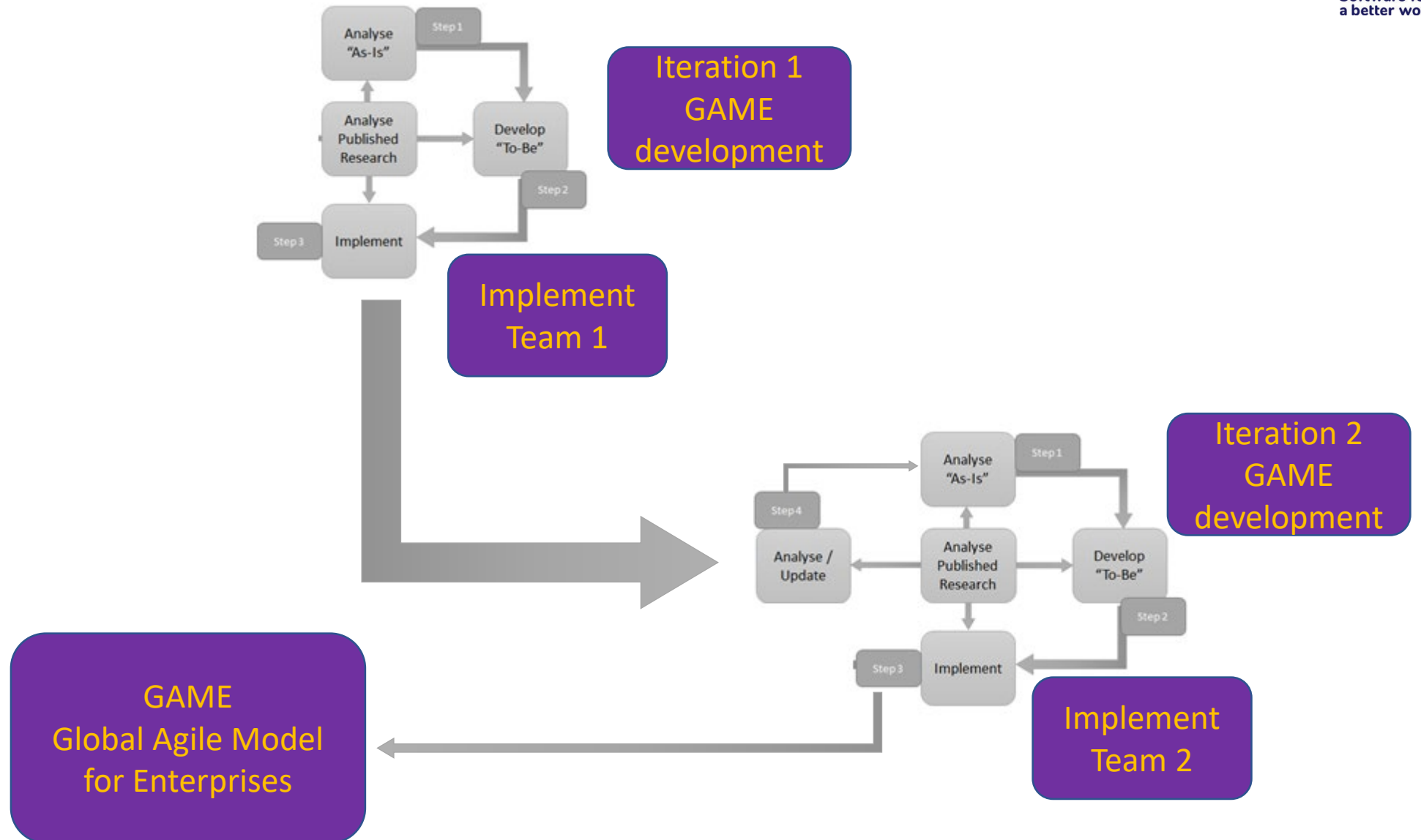
# Action Research Phases

**OCUCO**



**GAME**  
SAFe Practices (311)  
GTM Recommendations (50)





# Benefits from project



- ✓ Improved software process led to efficiencies
- ✓ Publications raised International profile
- ✓ Access to knowledge and training
- ✓ Further funding opportunities



- ✓ Industry-based research
- ✓ PhD student graduation
- ✓ Publications
- ✓ Outreach & Training Programs
- ✓ Further funding opportunities

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# Researching with the people



**BREASTech: Increasing physical activity in breast cancer survivors through technology-enabled care**



**On-line music therapy: supporting people living with dementia**

# Research 'with' or 'by'

## Breast cancer survivors <sup>[2]</sup>



Two Breast cancer survivors on research team

Workshop (15 women)  
Interviews (15 women)

Photovoice

## People living with dementia <sup>[3]</sup>



Action research project

Participation from people with dementia, carers, music therapists

**Patient & Public Involvement**

# Public and Patient involvement [12]

Public and patient involvement (PPI) in health research has been defined as research being carried out “with” or “by” members of the public rather than “to,” “about” or “for” them.

# Research Questions

- ✓ RQ1: What difficulties do breast cancer survivors have after they have completed primary breast cancer treatment and they return to their homes and community?
- ✓ RQ2: What are the support tools breast cancer survivors utilise to overcome address difficulties after completing primary breast cancer treatment? What are the advantages and disadvantages of these support tools?
- ✓ RQ3: How can technology be used to support breast cancer survivors after completing primary breast cancer treatment?



**Engineering your  
way to being more  
physically active**

# Stage 1: BreasTECH



- ✓ Engagement award to “promote cancer research to people affected by cancer and the public”
- ✓ Develop interest by participants in becoming involved in Patient and Public Involvement
- ✓ Engage breast cancer patients and survivors through *Photovoice*, around the topics of breast cancer, physical activity and technology.

## Photovoice [13]

“encourages people to use their voice and provides them with a platform to do so through the medium of photography.”



**Our lifelines**  
**Support comes in different forms**  
**There's an app for that [14]**

# What did we do?

1. Recruited breast cancer survivors to the Research Team.



2. Recruited 20 breast cancer patients and survivors



3. Held 2 workshops in Lero, University of Limerick.

# Connected Health Outcomes

“The workshops  
were so inspiring”



“ I've loved this whole process. It has been  
very helpful and therapeutic as well as  
great fun.”

# Research outcomes

**Breast cancer survivors were instrumental in designing workshops and study**

**MSc student project / research paper**

**Progressing with Research team who include Breast Cancer survivors**

**Designing next stage of project which focuses on technology supporting physical activity of breast cancer survivors**

# Useful research methods

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# What have I learned?



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- ✓ Publication opportunities (or difficulties?)



# Publication difficulties

Publishing in field that is not mainstream

Can cause difficulties for tenure / promotion / grant proposals

# But there are opportunities ....

## What Makes Agile Software Development Agile?

Marco Kuhrmann, Paolo Tell, Regina Hebig, Jil Klünder, Jürgen Münch, Oliver Linssen, Dietmar Pfahl, Michael Felderer, Christian R. Prause, Stephen G. MacDonell, Joyce Nakatumba-Nabende, David Raffo, Sarah Beecham, Eray Tüzün, Gustavo López, Nicolas Paez, Diego Fontdevila, Sherlock A. Licorish, Steffen Küpper, Günther Ruhe, Eric Knauss, Özden Özcan-Top, Paul Clarke, Fergal McCaffery, Marcela Genero, Aurora Vizcaino, Mario Piattini, Marcos Kalinowski, Tayana Conte, Rafael Prikladnicki, Stephan Krusche, Ahmet Coşkunçay, Ezequiel Scott, Fabio Calefato, Svetlana Pimonova, Rolf-Helge Pfeiffer, Ulrik Pagh Schultz, Rogardt Helda, Masud Fazal-Baqaie, Craig Anslow, Maleknaz Nayebi, Kurt Schneider, Stefan Sauer, Dietmar Winkler, Stefan Biffl, Maria Cecilia Bastarrica, and Ita Richardson

**Abstract**—Together with many success stories, promises such as the increase in production speed and the improvement in stakeholders' collaboration have contributed to making agile a transformation in the software industry in which many companies want to take part. However, driven either by a natural and expected evolution or by contextual factors that challenge the adoption of agile methods as prescribed by their creator(s), software processes in practice mutate into hybrids over time. Are these still agile? In this



## Impact Factor 7.77

# But there are opportunities ....

Original Article

Health Informatics Journal



## Mapping a Careflow Network to assess the connectedness of Connected Health

**Noel Carroll and Ita Richardson**  
University of Limerick, Ireland

Health Informatics Journal

2019, Vol. 25(1) 106–125

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DOI: 10.1177/1460458217702943

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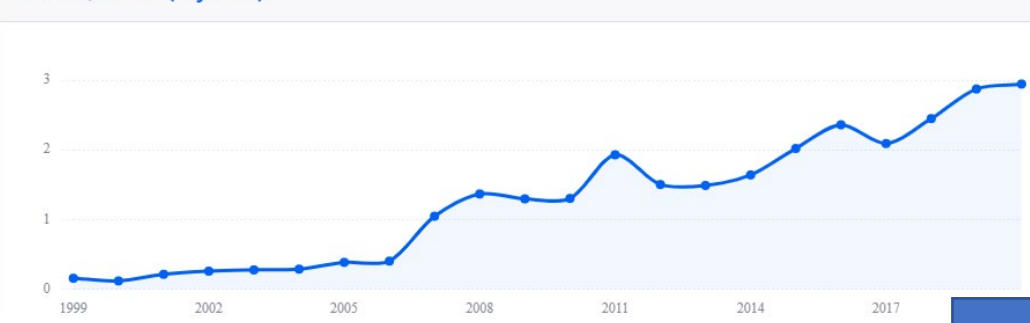
### Abstract

Connected Health is an emerging and rapidly developing field which has the potential to transform healthcare service systems by increasing its safety, quality and overall efficiency. From a healthcare perspective, process improvement models have mainly focused on the static workflow viewpoint. The objective of this article is to study and model the dynamic nature of health service systems to identify where potential issues exist within the service system and how Health technological solutions may support service efficiencies. We employ network analysis (SNA) as a modelling technique which captures the dynamic nature of the service. We demonstrate how it can be used to map the 'Careflow Network'.



# Impact Factor 2.944

Cites / Doc. (5 years)



# But there are opportunities ....

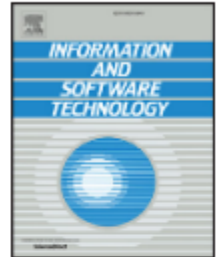
Information and Software Technology 106 (2019) 234–253



Contents lists available at [ScienceDirect](#)

Information and Software Technology

journal homepage: [www.elsevier.com/locate/infsof](http://www.elsevier.com/locate/infsof)



Challenges and recommended practices for software architecting in global software development

[Outi Sievi-Korte](#)<sup>a,\*</sup>, [Sarah Beecham](#)<sup>b</sup>, [Ita Richardson](#)<sup>b</sup>

<sup>a</sup> *Laboratory of Pervasive Computing, Tampere University of Technology, Korkeakoulunkatu 1, P.O. Box 553, Tampere 33101, Finland*

<sup>b</sup> *Lero, the Irish Softw Research Centre, University of Limerick, Ireland*



## Impact Factor 3.436

# But there are opportunities ....

Published on 7.6.2021 in Vol 9, No 6 (2021): June

Preprints (earlier versions) of this paper are available at <https://preprints.jmir.org/preprint/27753>, first published February 04, 2021.



## Best Practice Guidance for Digital Contact Tracing Apps: A Cross-disciplinary Review of the Literature

James O'Connell <sup>1</sup> ; Manzar Abbas <sup>1</sup> ; Sarah Beecham <sup>1</sup> ; Jim Buckley <sup>1</sup> ; Muslim Chochlov <sup>1</sup> ; Brian Fitzgerald <sup>1</sup> ; Liam Glynn <sup>2</sup> ; Kevin Johnson <sup>3</sup> ; John Laffey <sup>4,5</sup> ; Bairbre McNicholas <sup>4,5</sup> ; Bashar Nuseibeh <sup>1,6</sup> ; Michael O'Callaghan <sup>2</sup> ; Ian O'Keeffe <sup>1</sup> ; Abdul Razzaq <sup>1</sup> ; Kaavya Rekanar <sup>1</sup> ; Ita Richardson <sup>1</sup> ; Andrew Simpkin <sup>7</sup> ; Cristiano Storni <sup>1</sup> ; Danyanka Tsvyatkova <sup>1</sup> ; Jane Walsh <sup>8</sup> ; Thomas Welsh <sup>1</sup> ; Derek O'Keeffe <sup>1,4,5</sup>

**JMIR Publications**  
Advancing Digital Health & Open Science

Journal of Medical Internet Research

Article	Authors	Cited by	Tweetations (4)	Metrics
<ul style="list-style-type: none"> <li><a href="#">Abstract</a></li> <li>Introduction</li> <li>Methods</li> <li>Results</li> <li>Discussion</li> <li>Abbreviations</li> </ul>	<h3>Abstract</h3> <p><b>Background:</b> Digital contact tracing apps have the potential to augment contact tracing systems and disrupt COVID-19 transmission by rapidly identifying secondary cases prior to the onset of infectiousness and linking them into a system of quarantine, testing, and health care worker case management. The international experience of digital contact tracing apps during the COVID-19 pandemic demonstrates how challenging their design and deployment are.</p>			

# Impact Factor 5.43

# What have I learned?



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# Acknowledgements

This work was supported by

- SFI Lero Grant ([www.lero.ie](http://www.lero.ie)), 13/RC/2094\_P2
- SFI Covid-19 Rapid Response grant
- Alecs through EU Marie Skłodowska-Curie grant agreement No. 754489
- Irish Cancer Society Engagement Award CREA19NOR
- Saudi Arabian Cultural Bureau
- Ocuco Ltd
- IBM Ltd
  
- Researchers: Dr Bilal Ahmed, Dr Muneef Alshammari, Dr Sarah Beecham, Dr Owen Doody, Prof Jim Buckley and Covigilant team, Dr Cristiano Storni, Dr Damyanka Tsvyatкова, Dr Muhammad Abdur Razzak, Dr John Noll, Dr Michelle Norris, Dr Pauline Meskell

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For what's next

THANK YOU