Ulster University

Nanotechnology and Integrated Bioengineering Centre

How to commercialise your research. A case study with Intelesens

NIBEC

Professor Jim McLaughlin,
Director of NIBEC

INNOVATION 2016

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- **Innovation** is the process and outcome of creating something new, which is also of value.

- Innovation involves the **whole process** from opportunity identification, ideation or invention to development, prototyping, production marketing and sales, while entrepreneurship only needs to involve commercialization (Schumpeter).

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What is innovation?

- Today it is said to involve the **capacity to quickly adapt** by adopting new innovations (products, processes, strategies, organisation, etc)

- Also, traditionally the focus has been on new products or processes, but recently new **business models** have come into focus, i.e. the way a firm delivers value and secures profits.

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Dimensions of innovation

There are several types of innovation

- Process, product/service, strategy,

which can vary in degree of newness:

- Incremental to radical,

and impact:

- continuous to discontinuous

Drivers for innovation

- Financial pressures to reduce costs, increase efficiency, do more with less, etc
- Increased competition
- Shorter product life cycles
- Value migration
- Stricter regulation
- Industry and community needs for sustainable development
- Increased demend for accountability
- Demographic, social and maket changes
- Rising customer expectations regarding service and quality
- Changing economy
- Greater availability of potentially useful technologies coupled with a need to exceed the competition in these technologies

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Technology and Science to a business

- Idea / concept
- Plan
- Sketch
- Proto-type
- Team
- Facilities

- Funding
- Proto-type
- Proof of Concept
- Business Plan
- Partners
- Company with Funding

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A Company set up

- Mission
- Objectives
- Market Competition (Citations)
- Market Drivers
- Market Mix
- Additionality
- Partners

- Identified Problems with Market Place
- IP
- Time-line
- Costs
- Management
- Board
- Route to market
- Exit Strategy

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Technology Transfer Process

- Generate ideas / technology disclosures
- Screen/assess/evaluate

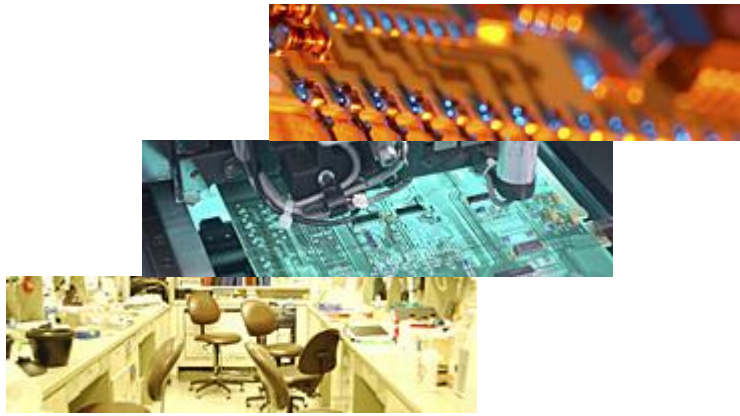
  identify those with greatest potential
- Prove concept – technical/market

  INI and Internal UUTech
- Commercialise

  Licence

  Spin out

  Assign



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Nanotechnology and Integrated Bioengineering Centre

NIBEC

- **A Centre of Excellence and celebrating 20 years**
- **The Pipeline for Innovation….basic research underpinning the new ideas and capability.**

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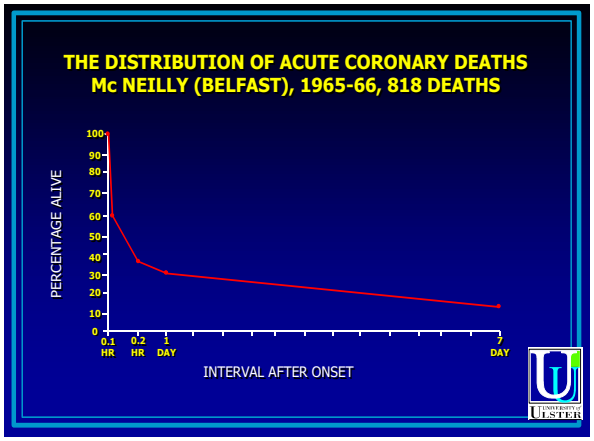
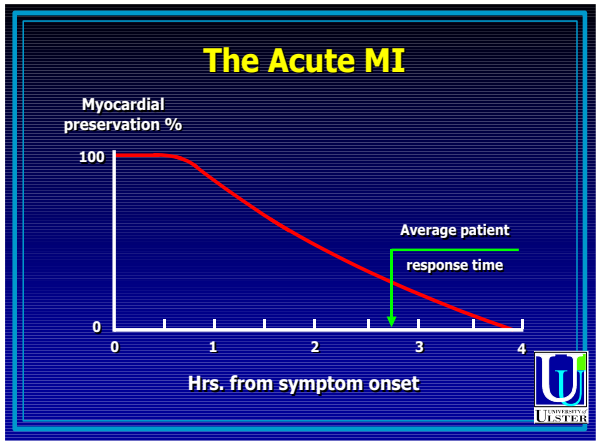
History:

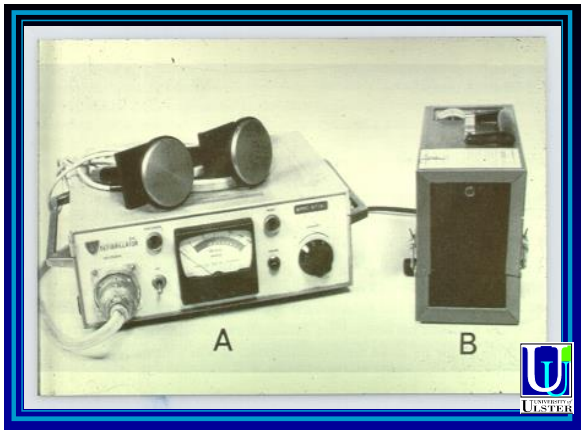
NIBEC founded in 1985 by Professor John Anderson

Traced back to Professor Partridges idea of mobile coronary care

New building in 1994 and 2004







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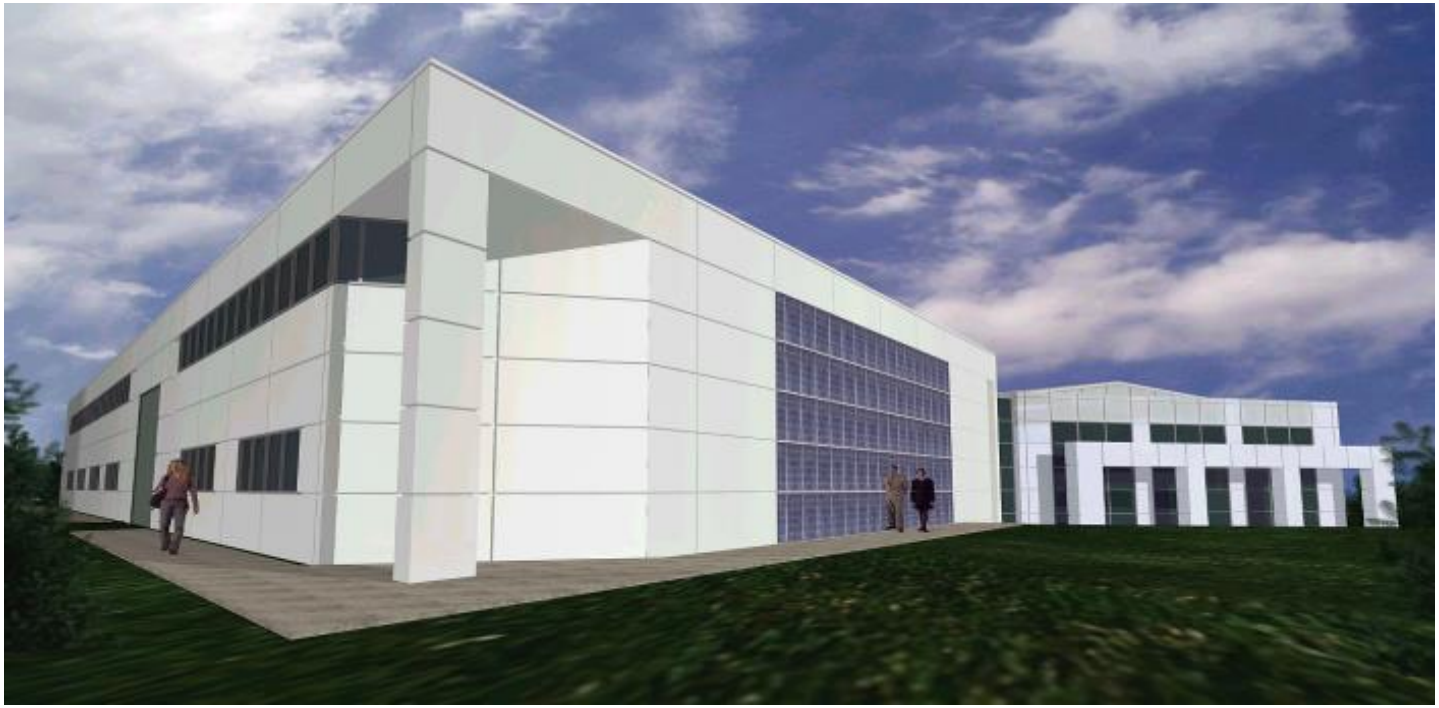
Nanotechnology and Integrated Bioengineering Centre

Nanotechnology and Integrated Bioengineering Centre (NIBEC)

£45 million funding since 2001



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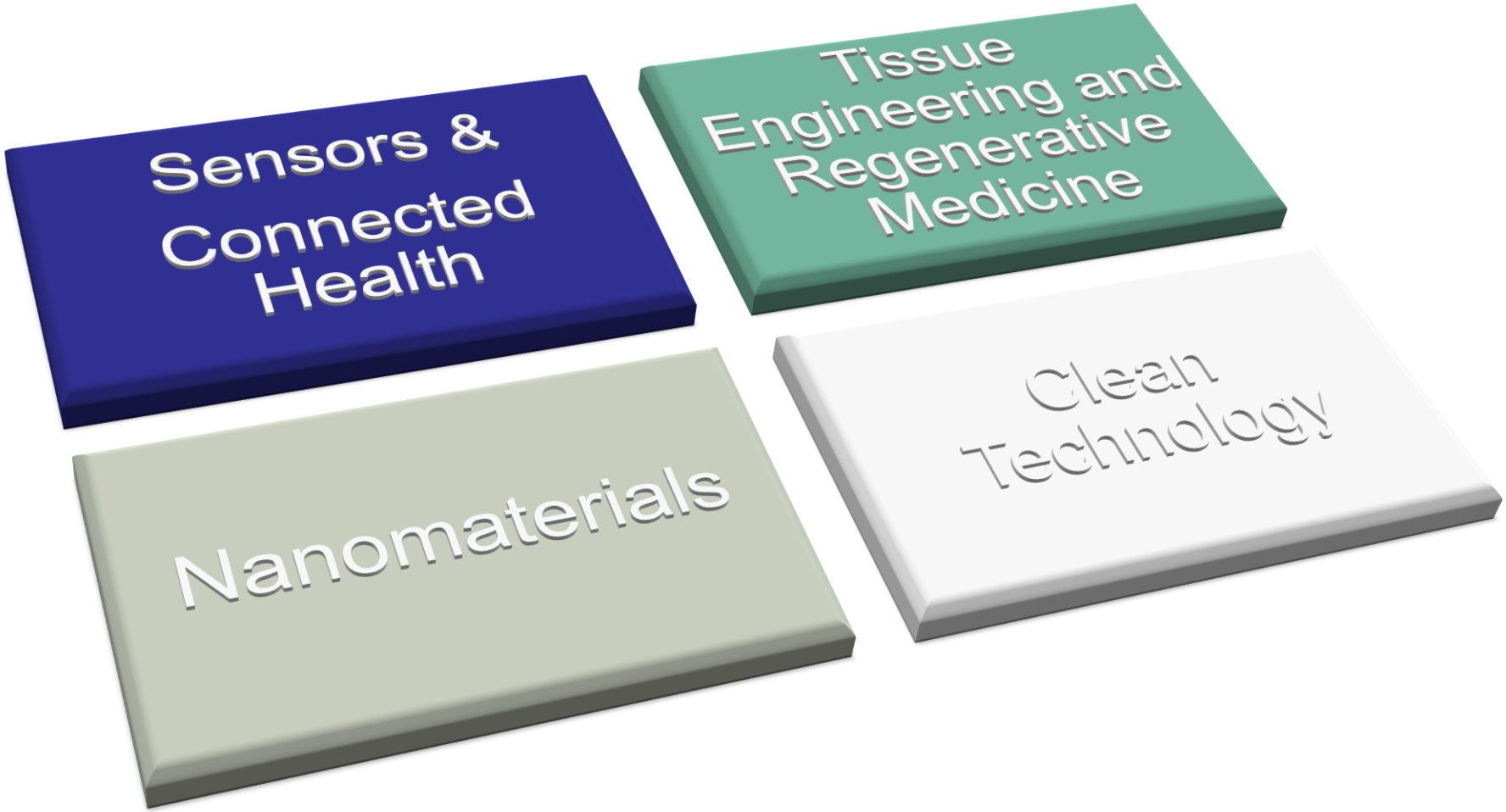

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Heartsine

The 1970's NIBEC Vision

Corporate Headquarters:
HeartSine Technologies, Inc.
940 Calle Amanecer
Suite E
San Clemente, CA 92673
United States

Phone: 1.949.218.0092
Fax: 1.949.218.0093
Toll Free: 1.866.HRT.SINE

European Office:
HeartSine Technologies, Ltd.
Canberra House
203 Airport Road West
Belfast, BT3 9ED
Northern Ireland

Phone: +44 (0)28 9093 9400
Fax: +44 (0)28 9093 9401

http://www.heartsine.com

HeartSine

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Impact and Technology Transfer

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Spin-Outs from NIBEC

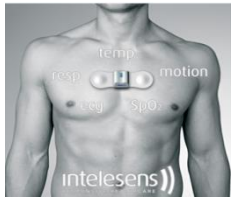
Nanotechnology and Integrated Bioengineering Centre

- Patents
  - 35 patents : Wide range in the area of Medical Devices and Technologies
- IPR
  - Heartsine, Heartscape, Intelesens, Laboratories Fournier, Maersk Medical, Tyco, Axis Composites, Lenis Aer
- Spin Outs
  - Heartsine, Heartscape, Intelesens, Surf-Spec
- Spin-in
  - Sisaf

HeartSine Inventor. Innovator. Lifesaver.

HEARTSCAPE technologies, inc.

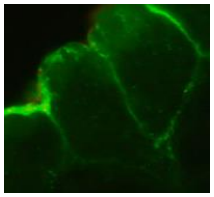
intelesens RESPONSIVE HEALTHCARE



SURF SPEC

SISAF

Spin-in)



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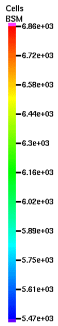
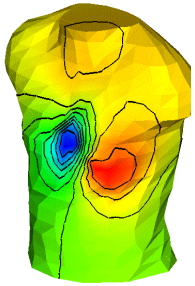
HEARTSCAPE technologies, inc.

NIBEC Nanotechnology and Integrated Bioengineering Centre

Cardiac Mapping

- Cardiac Mapping –led by Professor Jennifer Adgey and Professor John Anderson
- Electrodes – JMcL and EMcA
- Numerous MD programmes
- Led to large volume of high quality published / patented output
- Commercialised as PRIME-Meridian-Heartscape – Verathon and now Roper.





80-Lead Vest:
58 anterior leads
12 lateral leads
10 posterior leads

PRIME ECG Mapping

MRC Medical Research Council

Ulster University

VERATHON

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PHYSIO CONTROL

stryker

HeartSine®

NIBEC

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Take over by Physio Control in Nov 2015
Physio Control buy out by Stryker in Feb 2016

The first HeartSine defibrillator was the AED – The Automated External Defibrillator- Launched in 2008

- **FDA cleared AED's in 44 countries**
- **Key algorithms to assist CPR – using ICG**

The Defibrillator in every building is still the vision.

HeartSine samaritan® PAD

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RESPONSIVE HEALTHCARE

GE Healthcare

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The body-worn wireless patch based ecg, respiration rate, temperature and activity with on board smart algorithms designed for the hospital and home (Zensor)

Management and board

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RESPONSIVE HEALTHCARE

Board of Directors

Chairman - Clif Alferness - Seattle
Medical device innovator and entrepreneur
Medtronic, Physio Control

CEO - Michael Caulfield - Belfast
Corporate Leader - Seagate, Marconi

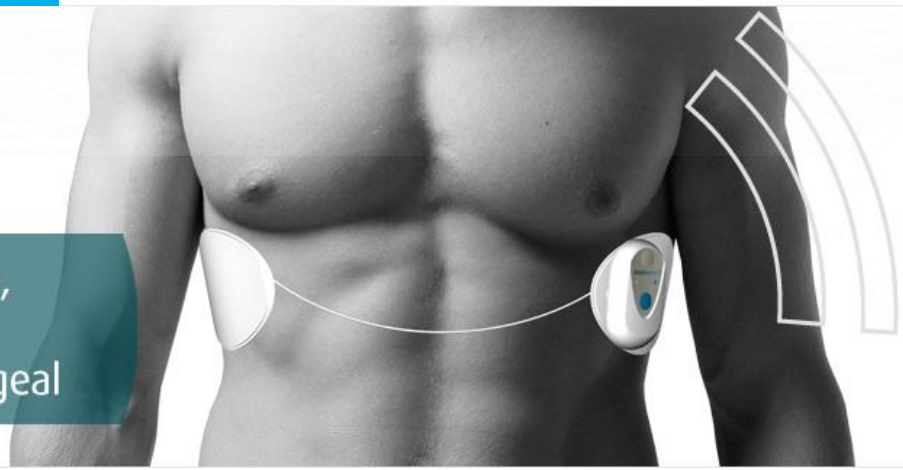
CTO – Professor Jim McLaughlin – Belfast
Founder and Director of NIBEC @ UU

Non-Exec Director – Akel Akel - Chicago

Non-Exec Director – Aidan Langan – Enterprise Equity Belfast

Non-Exec Director – Mark Ennis
Chairman Invest Northern Ireland

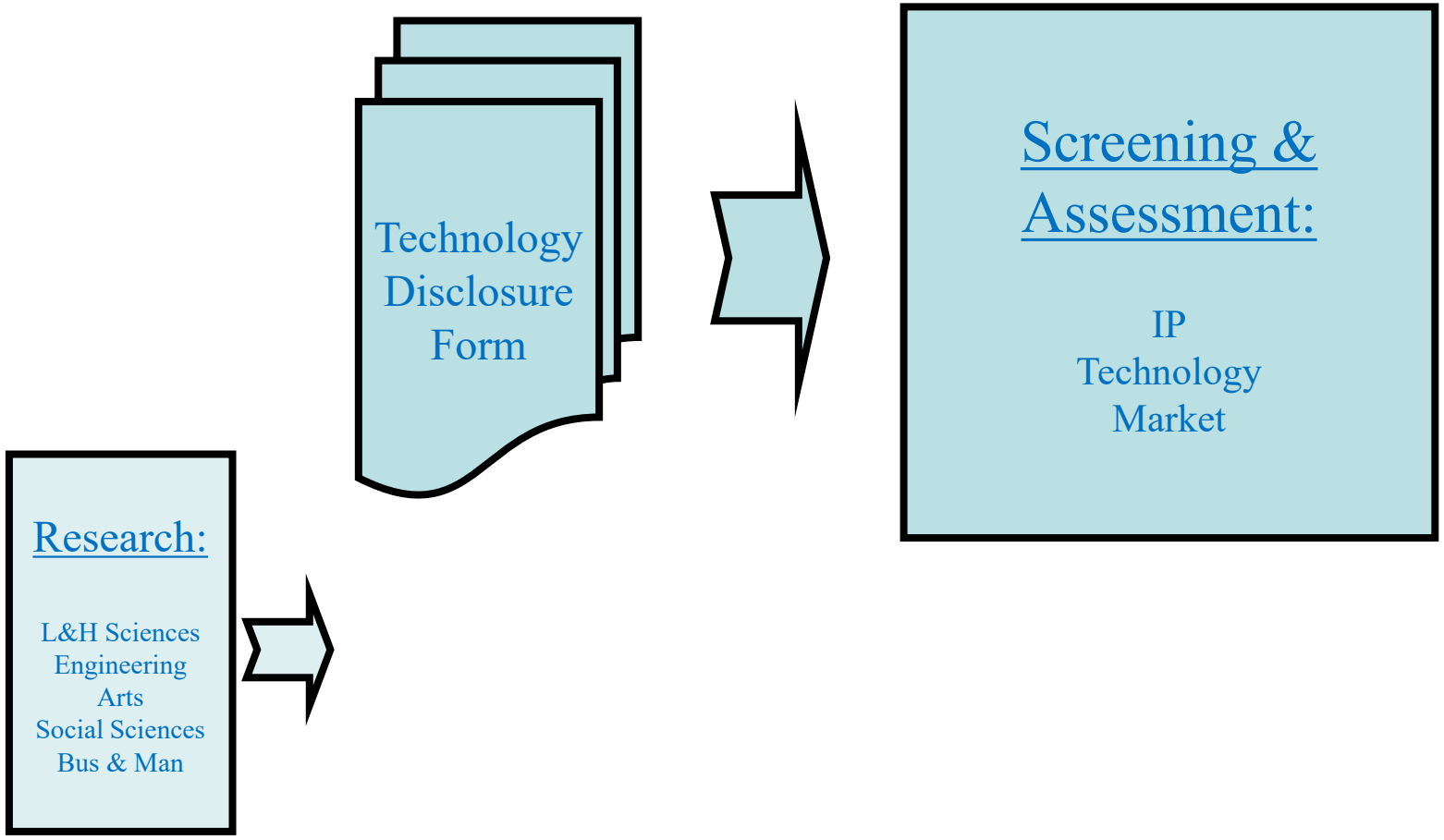
Caroline McGoran - IUL



David Ataid e– New Chair

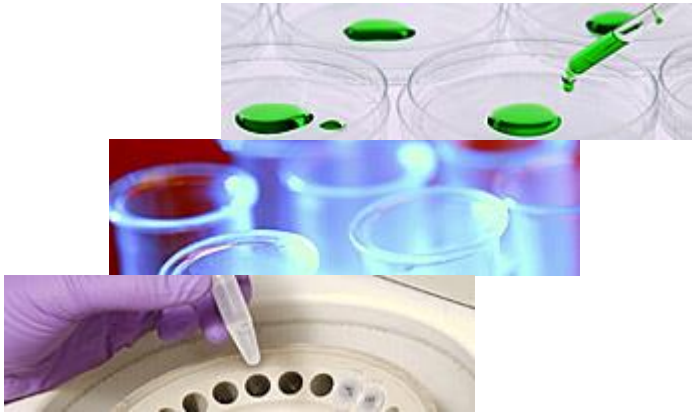
wellcome trust

Phase 1


Technology Disclosure Form
Screening & Assessment:
IP
Technology
Market
Research:
L&H Sciences
Engineering
Arts
Social Sciences
Bus & Man

Patenting Decisions

- Decide whether to file, and if so when
- Take into account any deadlines
  - Publication (e.g. talk, web presentation)
  - Grant application
- Patent strategy
  - Claims
  - Countries
- Inventorship
- Applicant(s)



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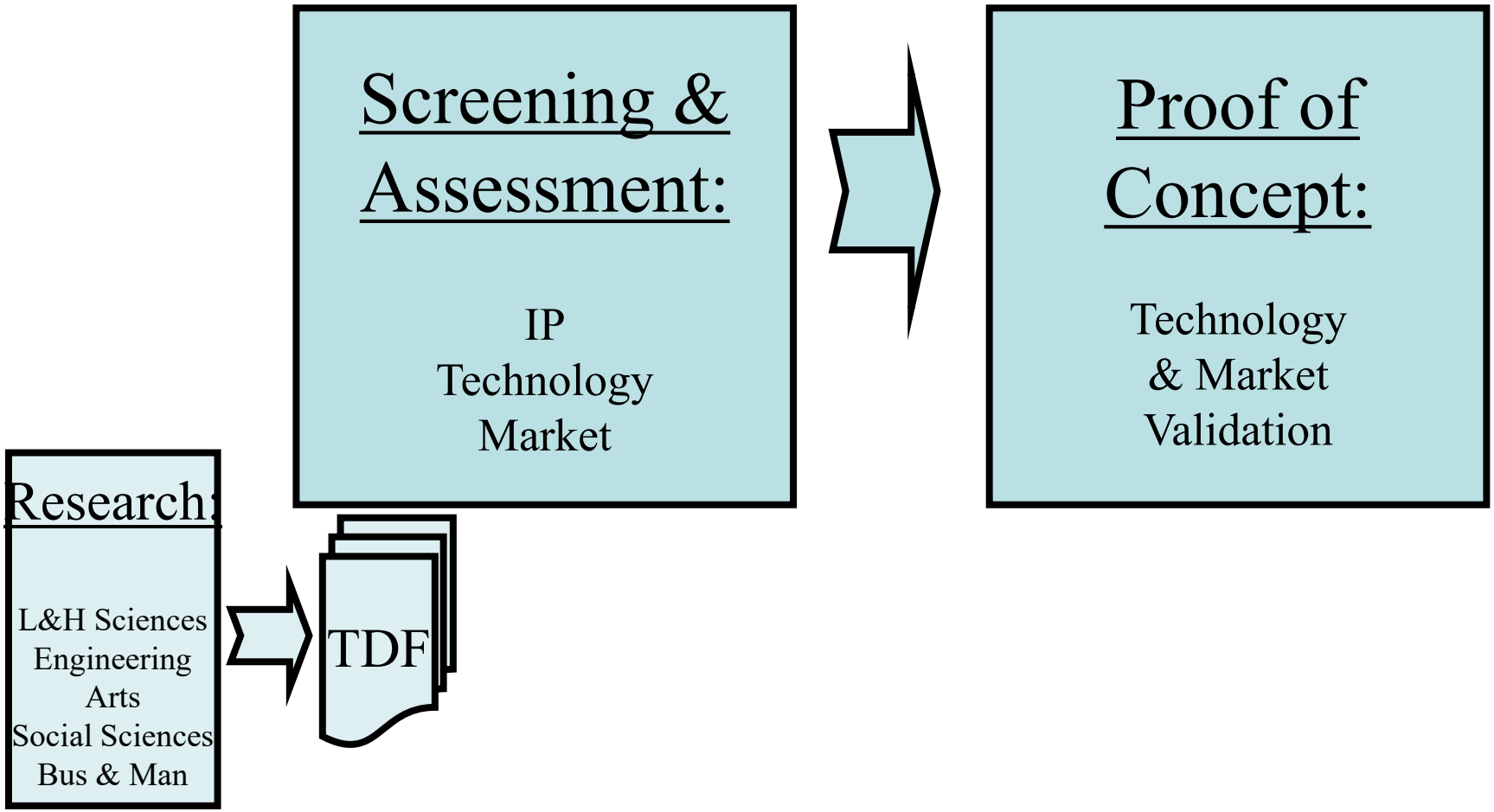
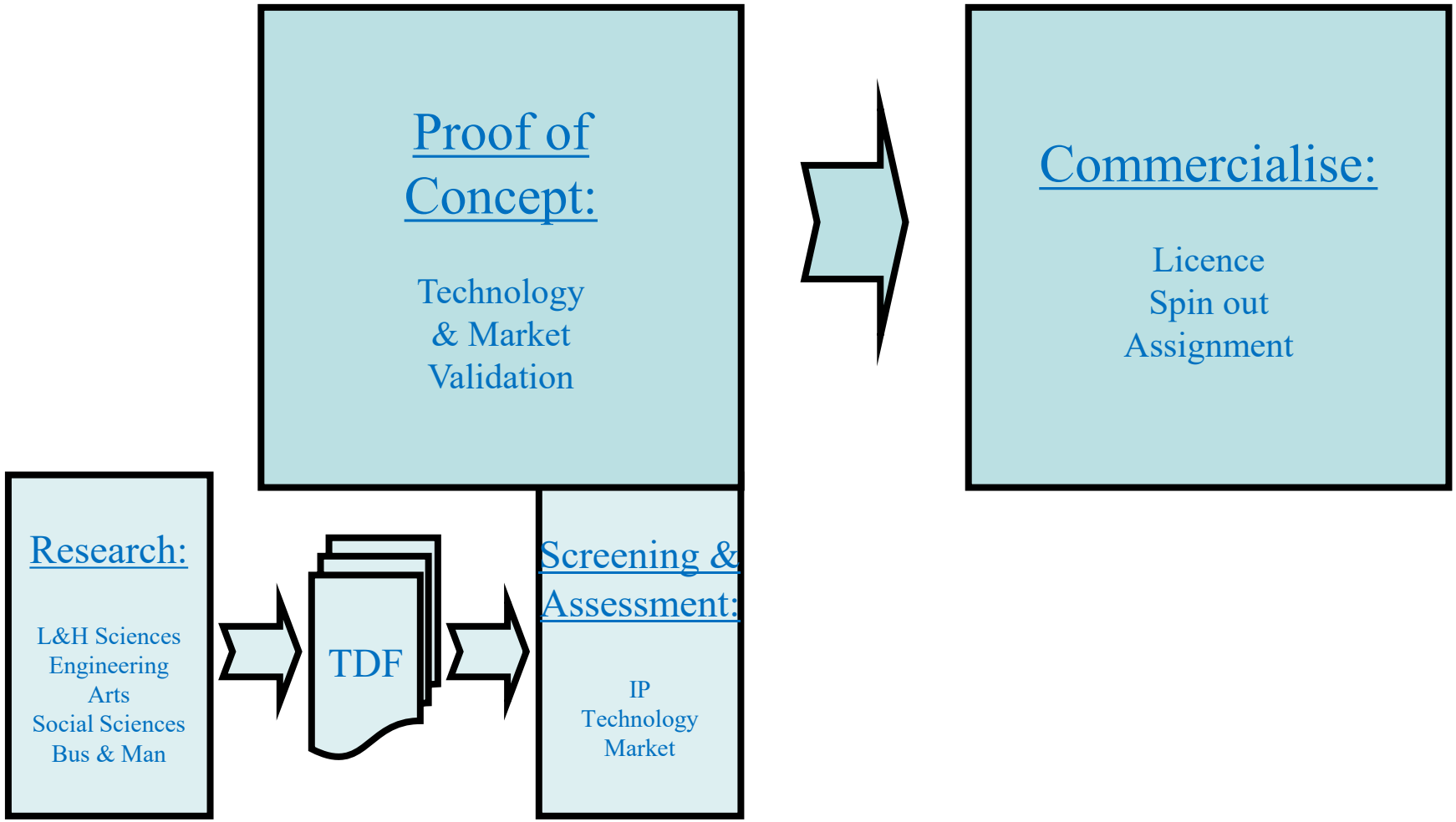
Phase 2


Screening & Assessment:
IP
Technology
Market
Proof of Concept:
Technology & Market Validation
Research:
L&H Sciences
Engineering
Arts
Social Sciences
Bus & Man
TDF

Phase 3


Proof of Concept:
Technology & Market Validation
Commercialise:
Licence
Spin out
Assignment
Research:
L&H Sciences
Engineering
Arts
Social Sciences
Bus & Man
TDF
Screening & Assessment:
IP
Technology
Market

Phase 3 - Venture or Licence?

- Case by case
- Opportunity beyond POC
- Timeframe? - months / years
- Trials/Phases? - long term/expensive
- Can value be identified in timeline?
- UUTech role? - investor/facilitator/both
- Partnership/leverage investment
- “Investable” CEO/Mgt Team
- Exit strategy?
- Licence/Incubate/Reject?

Spin out - Commercial Considerations

- Is there a Market - Who are customers, Which countries, ID competitors, Features and Benefits of the new technology
- Experienced Management
- Is There a Business?
- Secure IP?
- New Product(s)/Platform Technology
- Who is likely to be able to best exploit the technology
- Cost of entry ie Product Development, Marketing budgets etc
- Business Plan
- Funding to exploit technology: government grants, proof of concept funds, seed capital, UCFNI, venture capital, Invest NI

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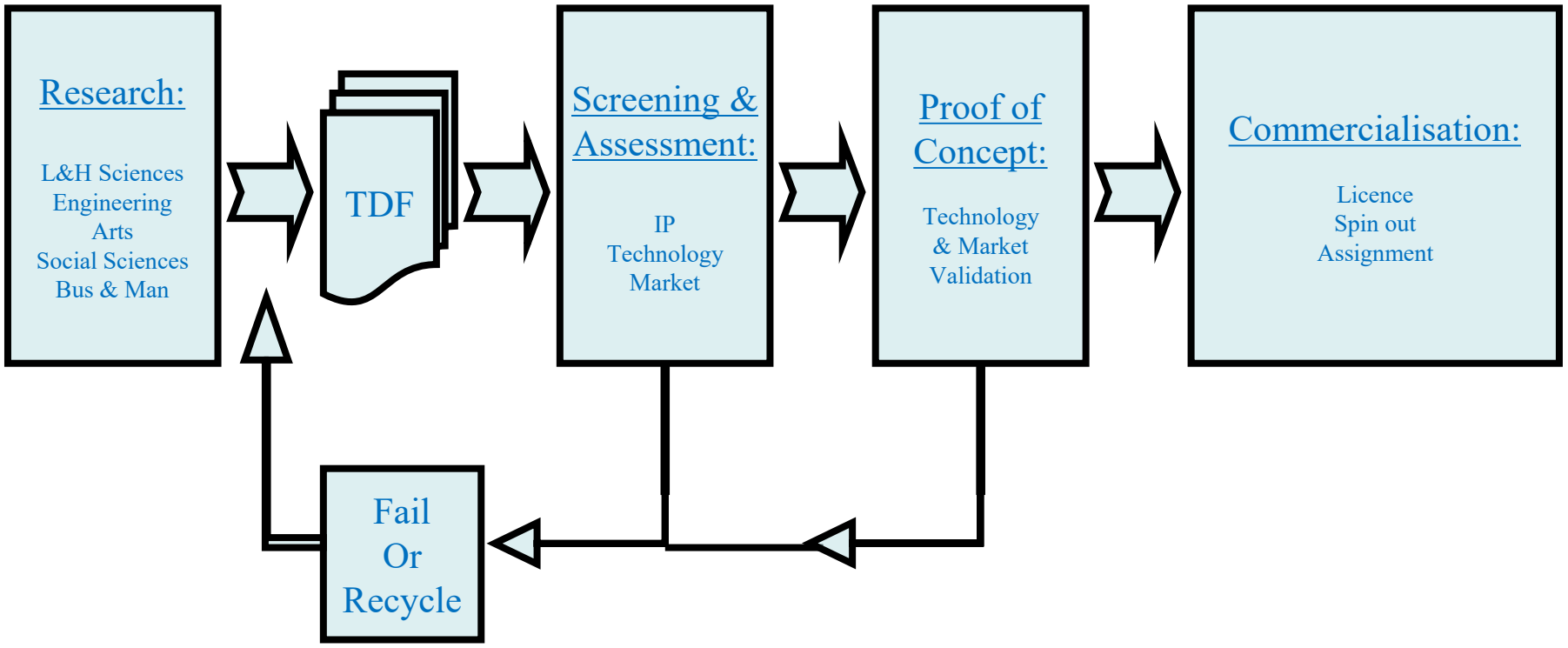
Technology Transfer Process



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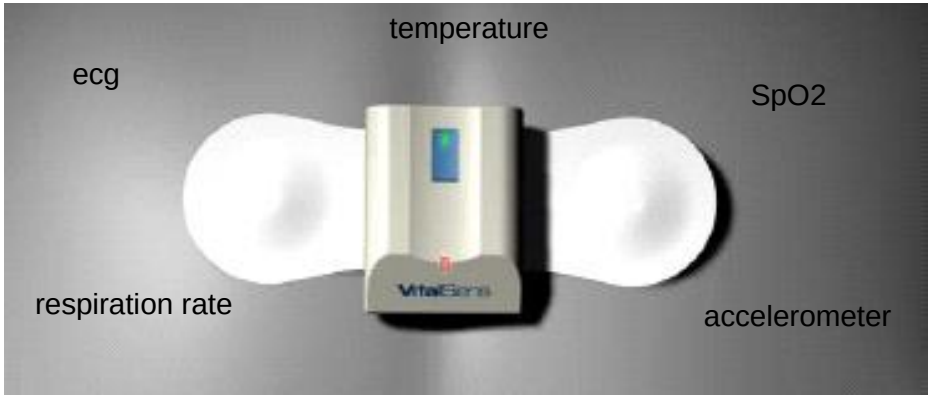
A new Company

- My Experience
- The Team
- The first Steps
- Fun...but it is real
- Regulations
- Insurance
- Rental
- Skilled People
- H&S
- Staff Welfare
- Marketing
- Cash Flow

Wireless Vital Signs Platform

- ST+D has developed its platform as the basis of OEM products
- Short range or cellular telemetry
- Range of vital signs possible
  - Respiration
  - Blood oxygen (late 2007)
  - Temperature
  - Motion, activity and falls
  - Cardiac output
  - ECG
- Compact, light, easy to wear



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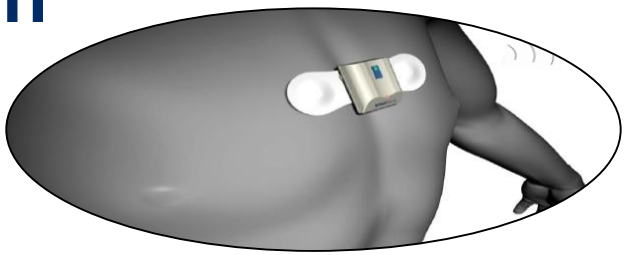
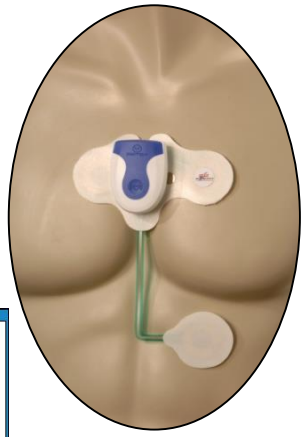
ECG Pattern Recognition

- Bradyarrhythmia
- Ventricular Tachycardia
- Supra Ventricular Tachycardia
- Self-terminating Ventricular Fibrillatio
- Asystole
- Atrial Flutter
- Atrial Fibrillation
- 1st Degree Heart Block
- 2nd Degree Heart Block
- 3rd Degree Heart Block





Clinical Study complete with Ulster Hospital:
Dr Roy Harper

- ***Congenital heart defects***
- ***Congestive heart failure***
- ***Heart muscle disease***
- ***Heart valve disorders***
- ***Other diseases, such as lung conditions***
- ***External forces such as electric shock or severe chest injury***

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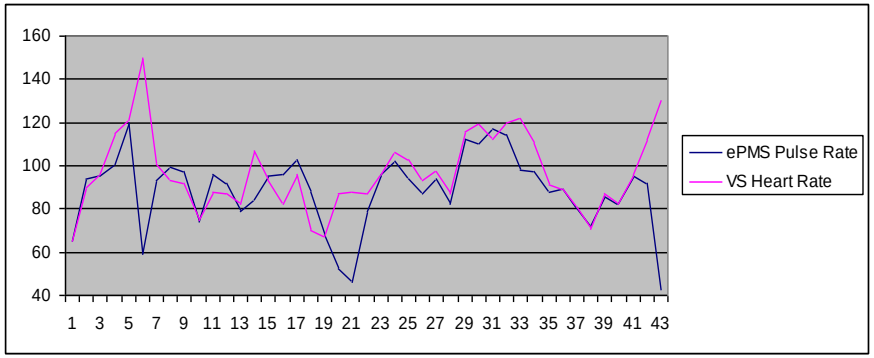
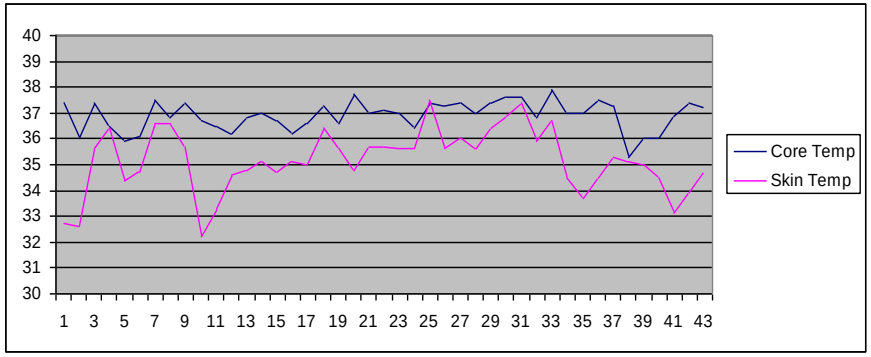
ECG, temp and motion monitoring on a patch





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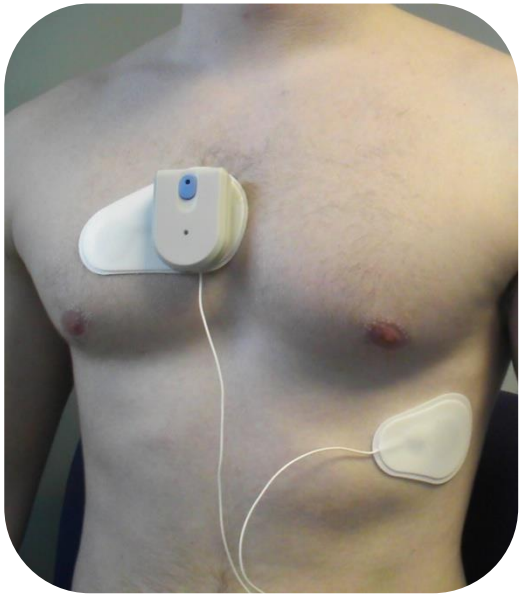
Outside Players

- Clients
- Clinical or user teams
- Investors
- Government (e.g. NHS)
- Regulatory Bodies
- Economic Assessment
- Sub-contractors
- Out side specialist
- Financial / Business
- Global Strategy

Vitalsens
March 2010



The key aims of the evaluation of the Vitalsens system were to assess;

- The **reliability** of the device
- The **accuracy** of the physiological measurements
- The **feasibility** of streaming observational data at pre-definable intervals to a electronic care record
- The **robustness** of this type of approach to gathering patient vital signs / observations **compared** to the paper-based bed-end chart approach
- The **acceptability** to nursing staff and patients
- The **effectiveness** of the technology and the **usefulness** to medical staff
- The **potential impact** this technology could have on **improving** patient care and outcomes.

Design

- Modelling
- Simulation
- Make use of the best of IT
- Rapid Proto-typing
- MatCad; Solid Works, Multisim, Labview
- Embedded Software
- Validation
- Test
- Beta Trails

Test in the Real World

- Mock Trials
- Feedback
- Economic Assessment
- User
- Benefits Robustness of design
- Market Segmentation based on feedback
- New IP
- User friendliness
- Ethnography

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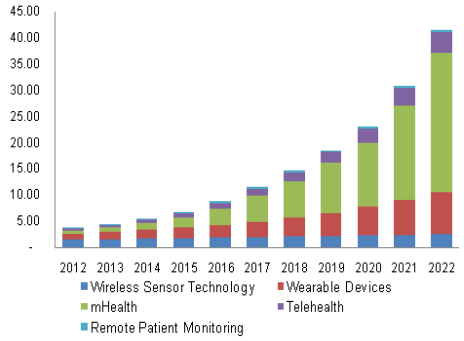
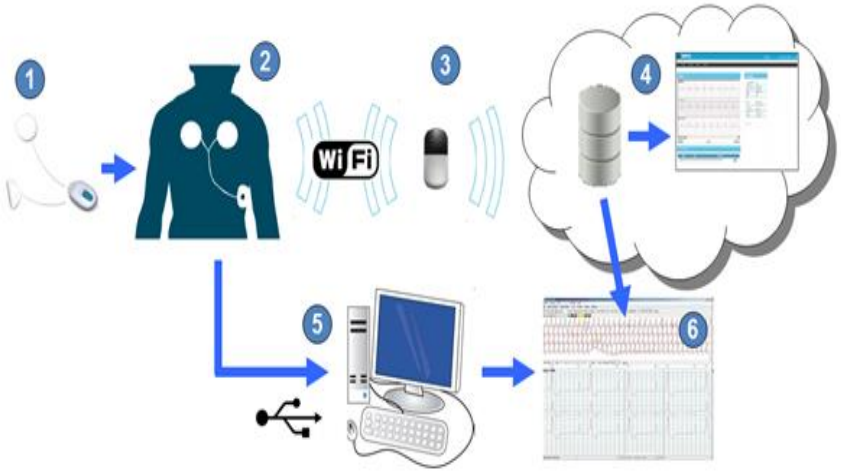
Intelesens Today

- 33% owned by GE Healthcare
- 12 Major Hospital Trials focused on False Positives and alarms – ROC curves
- 2 FDA Approved Products
- 40 staff employed – algorithm development; electrodes; embedded systems; clinical engineering; quality; manufacture.





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Introducing Intelesens surveillance monitoring solutions

Home monitoring

zensor
For Life Yet Lived

intelesens
RESPONSIVE HEALTHCARE

3-lead ecg
arrhythmia detection
heart rate
respiration rate
accelerometer
wi-fi
full disclosure usb

www.zensor.co.uk

Sub-acute monitoring

CARESCAPE Surveillance Monitoring

intelesens
RESPONSIVE HEALTHCARE

Wearable specificity

Wireless

Cableless

High sensitivity

High

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SiSaf

SiSaf Ltd.

SiSaf Ltd is an innovative drug delivery company focussed on the design and formulation **of solid nanoparticles** and their application in **topical, sub lingual, and other dermal forms of drug delivery**.

SiSaf's proprietary technology is based on a novel synergistic drug delivery formula that uses nanoparticles to **allow active compounds to penetrate deeper into the dermal layer**, to target the cell membrane, and to be released in a controlled manner.

SiSaf's technology has the potential to considerably **enhance the safety and efficacy of proteins and peptides** and labile or insoluble molecules.

Patents on method of producing functionised Si; SiSafe, for increasing the stability of biological compounds; Use of SiSafe for delivery of biological compounds including proteins for anti-ageing applications.

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SiSAf







Founder and Managing Director: Dr. Suzanne Roghieh Saffie-Siebert

Professor Jim McLaughlin Director and CSO

John Hartnett and Tim Brundle (Investors and Directors)

Scientists: Drs. Nessim Troabi-Pour; Mukhtar Ahmed; Jeremy Hamill

SiSaf scooped a major prize – for development of an innovative drug-delivery system at the Irish Technology Leadership Group's (ITLG) annual awards ceremony in Silicon Valley, California.

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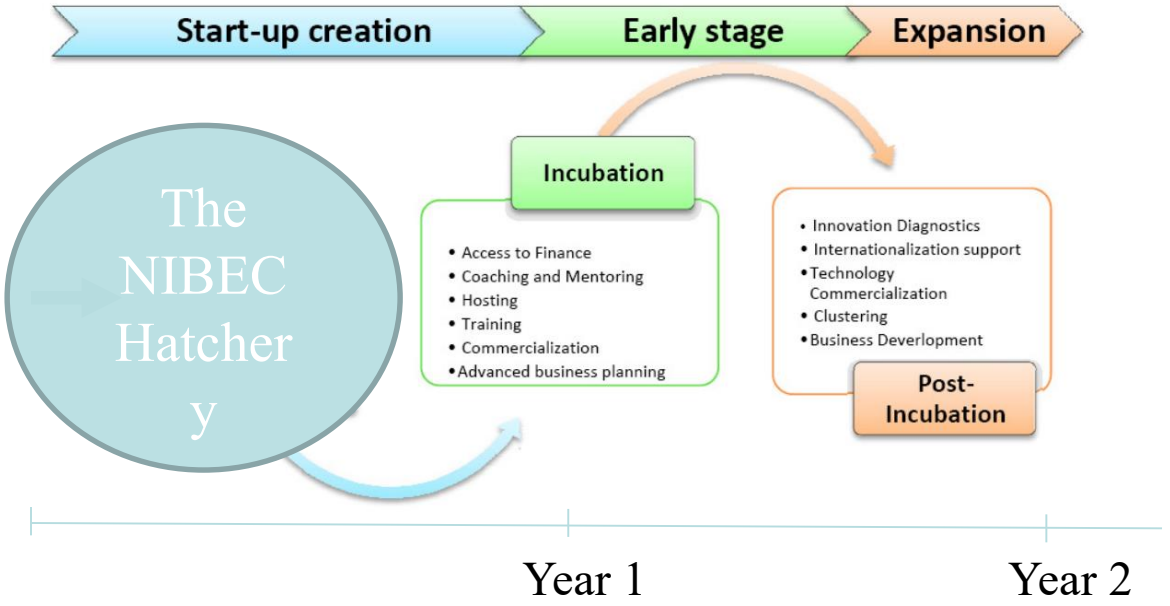
SiSAf

From Hatchery to success

- the proposed academic model
- to work alongside UU Research Strategy
- Required to accelerate innovation process



The NIBEC Hatchery offers staff/students support and office/bench space to work on their business concept while continuing their studies/work. Possibly a one year process, it will allow the innovator to freely explore their concept/s and find time, confidence and ability to present a sound and robust market-led *commercialization plan* rather than an academic concept which is a typical process found in Universities today.

The innovators will receive mentoring resources via various OOI/IUL workshops. They will also receive access to facilities at NIBEC, especially the new rapid design laboratory.

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Cost Model – NIBEC Hatchery

- **Bench Space** – typically 9sq m will be £6k.
- **Access to Equipment** – depending on the nature of activities between £2k and 4 k.
- **Expected number** of hatchery type ventures in first year – 3 with a follow on three for the next three years.
- **No buy out of teaching or research** as the innovator will find their own time. They will look for permission from UU to set-up, help when required and the ability to seek grant aid funding that is available for such ventures.
- **IP could be discussed** - certainly foreground declared as Ulster/IUL owned but may make sense to put into the company and build up early valuation.
- **University stake** could be reviewed on a one-by-one basis, based on risk, type, time to market and costs. Everyone wants a winner so flexibility, passion, smart set-up and strong empowered leadership are required. The company needs its USP, freedom to operate and a personality of its own. Therefore eventual high quality entrepreneur-led mentoring will be required.

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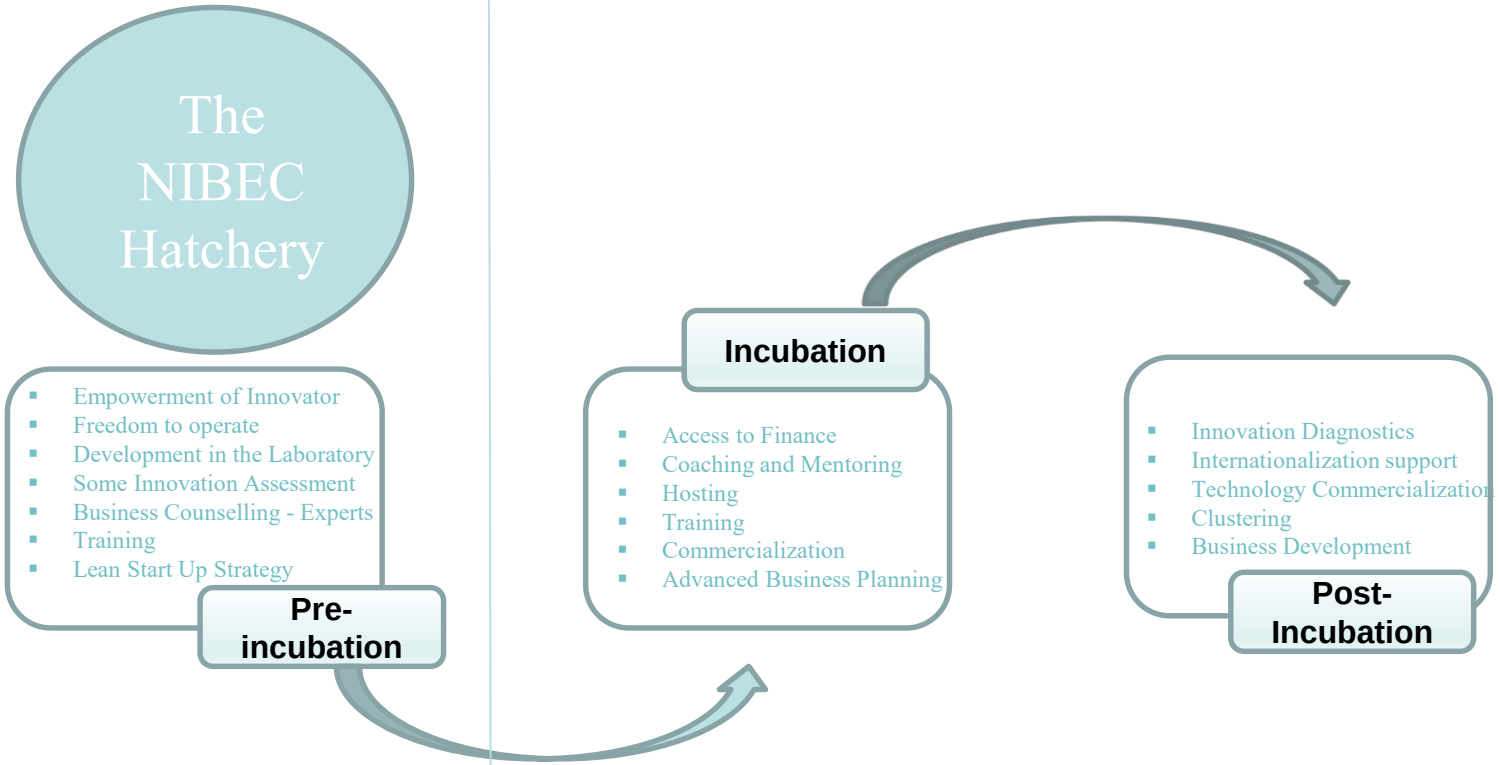
The NIBEC Hatchery



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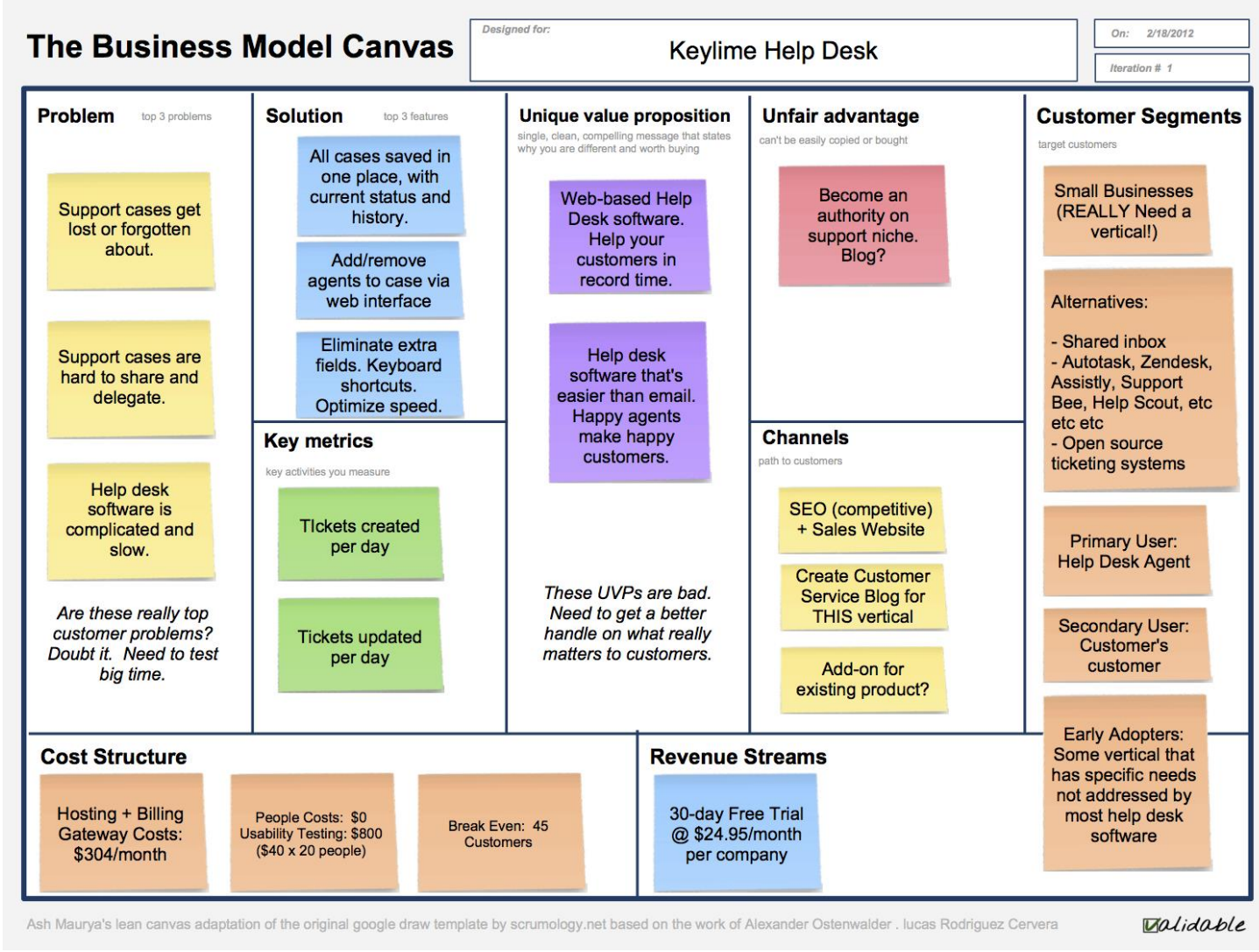
Lean Start Up Model – S. Blank



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Another Company… Will we get there faster?

Good Luck to you all!