



**STEM, STEAM, and Dream:
Educating an Imaginative and Skilled
Workforce**

**An EU perspective
Dr Jill Cush**

The South West College

- Spans the Counties of Fermanagh and Tyrone in West of Northern Ireland
- Annual operational budget £39 million
- 18,000 annual enrolments
- Approx 700 staff between full-time & part-time academic and support staff
- New campus buildings in Cookstown, Dungannon and Omagh



International Curriculum Projects Collaborations & Exchange



College Footprint

- D – Dungannon
- O – Omagh
- F – Fairview
- K – Killyhevlin
- C – Cookstown
- S – Strabane
- I – INTEC Centre



Virtual Delivery



Structure

- SWC Economic Engagement Model
 - Strategic Direction
 - College Development Plan
- Economic Engagement Activity
 - InnoTech Centre
- Innovation Centres
 - STEM Agenda
 - Design and additive manufacture
 - Renewable Energy
- Discussion

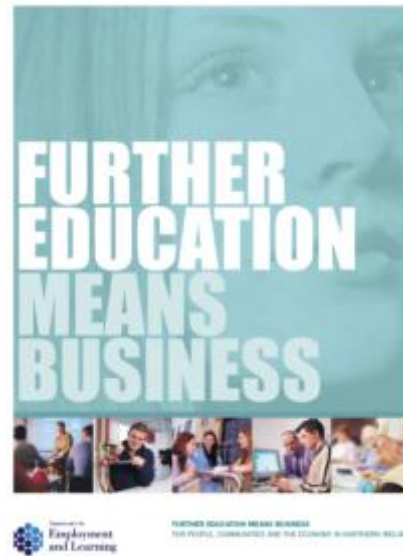
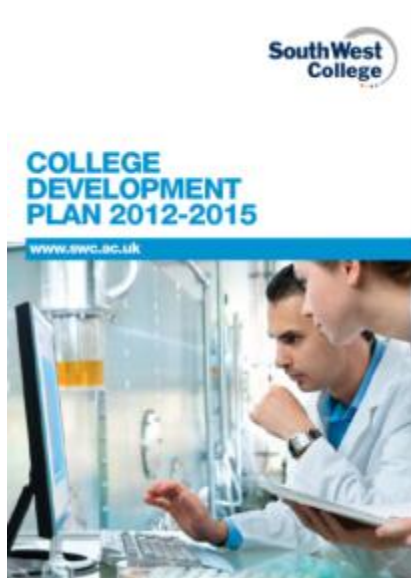


Economic Engagement - SWC

- Industry R&D
 - ~120 R&D projects per year
 - 25 staff – scientists, technologists and engineers
 - £10.7 million NPV
- Industry standard equipment in innovation centres
- Local, regional, national and international focus
 - 5 EU technology projects
- Industry driven curriculum
- 2500 annual engagements with businesses



Strategic Direction



- 99% of business in SWC catchment <50 employees
- 45 business with >100 staff

Regional Economic Strategy

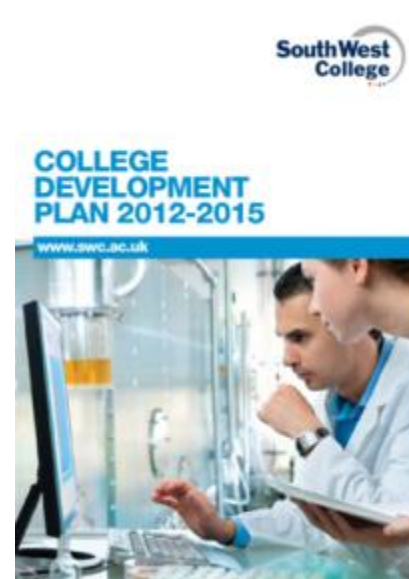
- Knowledge and skills transfer
- Support industrial economic activity in priority areas
- Stimulate interest in and enthusiasm for STEM
- Support manufacturing and private services productivity
- Skills and Jobs in Low Carbon Economy
- Increase capacity for R&D and Innovation
- Interact with collaborative networks
- To work in partnership with other Departments, primarily DETI



***Innovation R&D Creativity Skills Employability Business Growth
Competing Globally Economic Infrastructure***

College Development Plan

AT THE SOUTH WEST COLLEGE WE BELIEVE THAT WE HAVE THE CAPACITY TO MAKE A MAJOR CONTRIBUTION TO THE SOCIAL AND ECONOMIC WELLBEING OF THIS REGION IN A PERIOD OF UNPRECEDENTED TURBULENCE AND CHALLENGE



1. A **service to business and industry** that is **bespoke innovative** and increases both the business stock and economic wealth of the region;
2. An **outward** and **forward** looking **College** within a **globally focused region**;
3. An **intelligent** and **industry facing** curriculum;
4. A **College** that is **entrepreneurial in its spirit** balanced against the **risks** of the challenge;

Economic Engagement Activity

- R&D Support for SMEs
- Technical and business mentoring
- Training for business
- Industry Focussed Foundation Degrees
- Into employment programmes
- Staff and student innovation support
- EU funded Technology R&D



Stakeholders



Knowledge
Transfer
Partnerships



InnoTech Centre



SUSTAINABILITY

Solutions for environmental & renewable technologies



DESIGN

Design skills for any industry

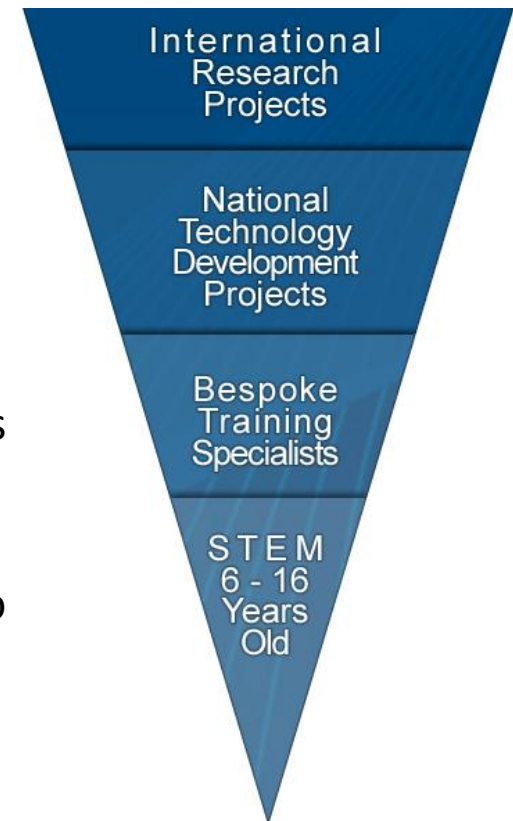


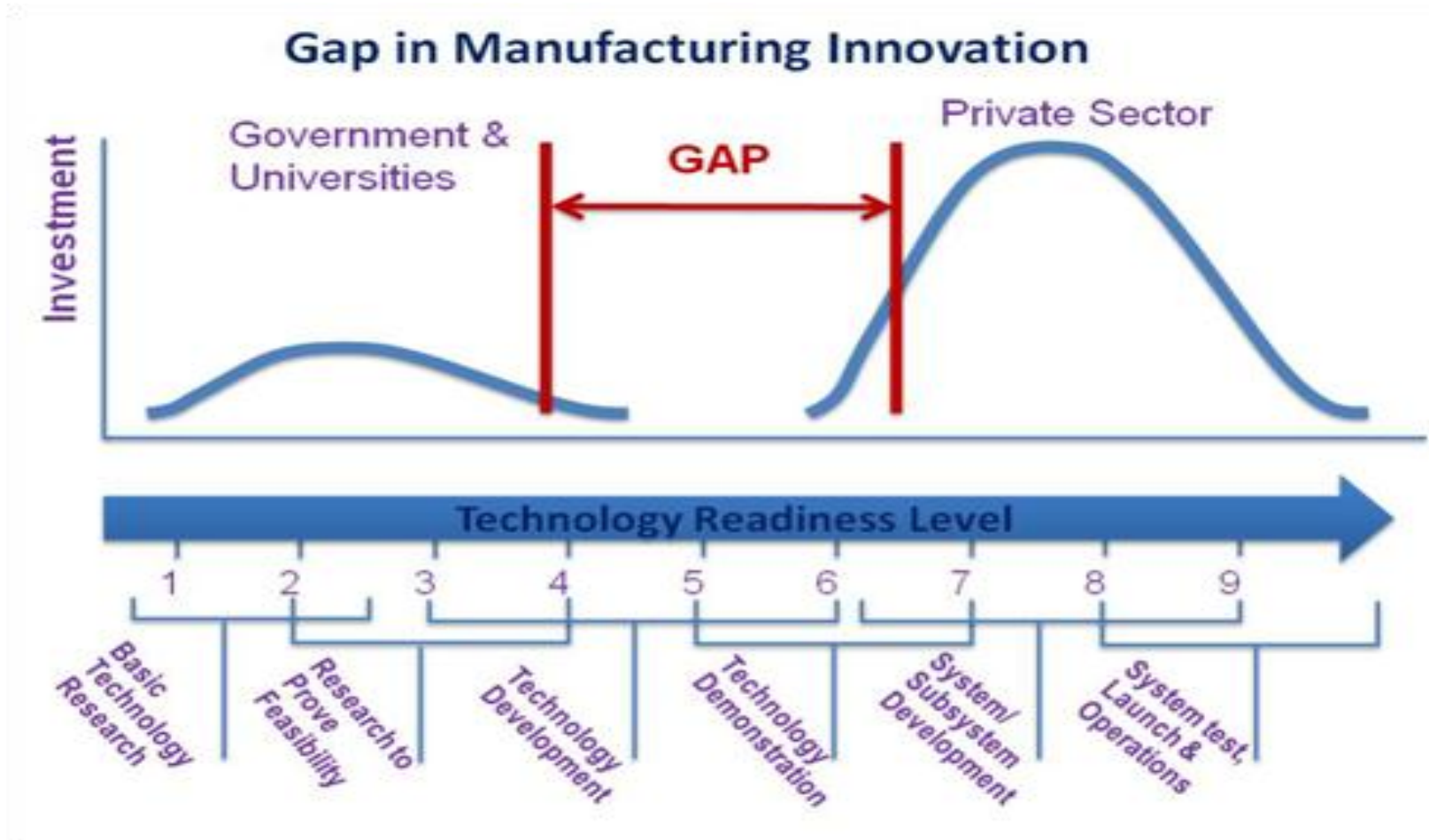
ELECTRONICS

Innovation in Electronics, Software & ICT

InnoTech Centre Context

- Broaden the **international reach** of the College
- Develop capacity to deliver high quality **industrial knowledge transfer and technology development**
- Extend the capability of the College to deliver **bespoke training** and technical mentoring to industry in priority skills areas
- Increase the number of students in South West College who are studying courses in the area of **Science, Technology, Engineering and Mathematics (STEM)**



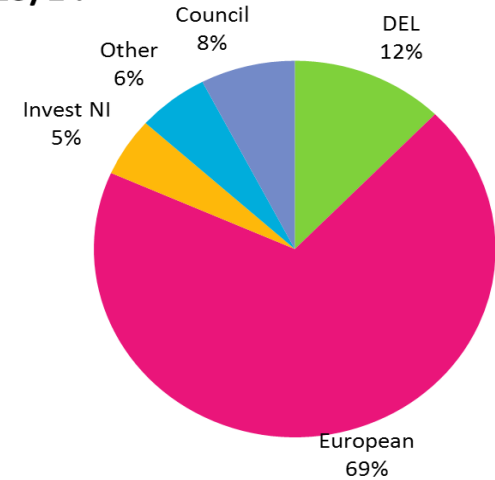


- Leading delivery agent for r&D with SMEs within the region ?

The InnoTech Centre

- [Established in January 2009](#)
- Key Activities
 - Industry r&D
 - 120 R&D projects Per year
 - Offices in Cookstown & Enniskillen – 14 Staff
- InnoTech Centre self-sustaining - 6 years
 - Industrial R&D funded work
 - Regional development tenders
 - EU project applications
- Budget £3,million

2013/14



SUSTAINABILITY

Solutions for environmental & renewable technologies



DESIGN

Design skills for any industry



ELECTRONICS

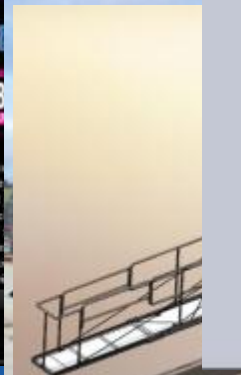
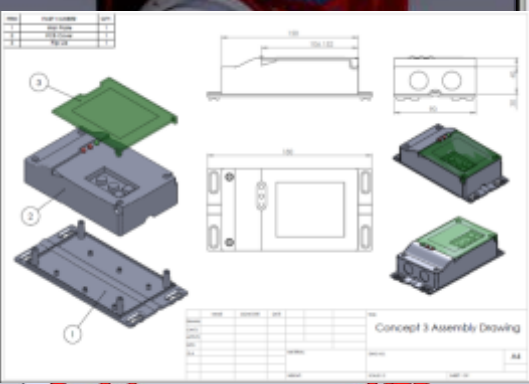
Innovation in Electronics, Software & ICT

New Ideas on R&D and Economic Development

Conventional	Progressive
The idea that invention, rather than imitation, is the major source of innovation and economic development.	In fact, 'creative imitation' and exploitation of the existing stock of knowledge accounts for most economic development
The idea that basic science is the ultimate source of innovation and therefore of economic development (the so-called 'linear model' of innovation).	From the perspective of economic innovation, science is generally more interesting as a source of trained people than as a source of new and commercially relevant knowledge
The neo-classical model of the firm as a well-informed, rational robot.	Real firms are fallible, have variable capabilities, lack information and make progress through learning

InnoTech Case Studies

- Tourism iPhone App
- Cow Cubicle Design
- Casing Design & Prototype
- Winch System Design
- Access Bridge Engineering Design
- Type Approval Consultancy



InnovateUs



The diagram features a central white circle labeled "Renewable Energy & Sustainable Technologies" connected by lines to five surrounding white circles: "Creative & Digital Media", "Life & Health Sciences", "ICT", "Advanced Engineering, Manufacturing & Advanced Materials", and "Food, Drink & Tourism".

Speak to our
Innovation Genius



SERC
nrc
Southern Regional College
north west regional college
belfast met
South West College



A collage of four images: a woman using a tablet, a wind turbine, a man in a lab coat working at a computer, and a black box with the text "Need some help with innovation?".

Need some help with innovation?

INNOVATEUS
Let's Do Business

Activities



Outcome and Impact

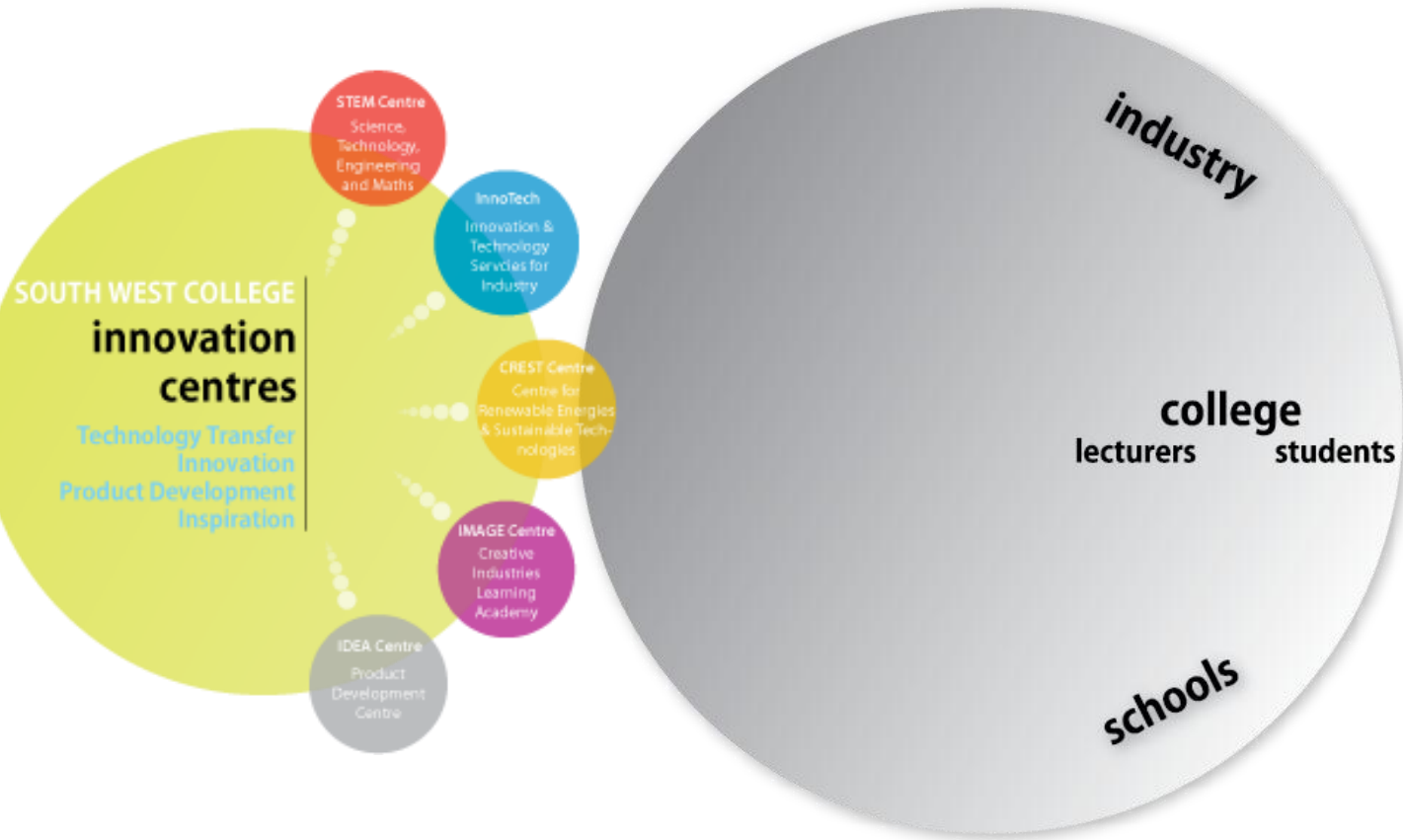
- Create 70 new jobs
- Sustain 250 existing jobs
- Sales in 160 companies increasing by 10%
- 80 companies to enter new markets
- Value of project to local economy £6,720,000



Internationalisation

- 5 EU projects live
 - income £4,820,869
- 41 partners across 11 countries
- Projects in
 - Renewable energy
 - Green Transport
 - Mobile Technologies
 - Sustainable Agriculture
- First FP7 project for any College in Northern Ireland







- High quality approved Teaching & Learning
- Innovation as an ethos in curriculum development
- Strong Student centred philosophy
- Unit Based Industry Researched Curriculum
- Embedded Entrepreneurship
- National & International Staff - Student & Knowledge Exchange
- An International Physical Learning Centre

Physical College

Centre for People & Workforce Development

- Strong, embedded leadership philosophy and practice
- A "Highly Skilled" flexible workforce
- All staff adopting a "business focused" philosophy
- Strong "Change Management" culture
- Transnational workforce philosophy
- Delegated managerial decision making at all levels.

Staff Students Industry

- Innovation as an ethos in curriculum development
- Unit Based Industry Researched Curriculum
- National & International E-Learning Projects
- An International Virtual Learning Centre

Virtual College

Innovation & Development Centres

- International standard Innovation Centres
- Industry standard demonstration models
- Some contribution to academic research
- Technology transfer Initiatives
- Product Development Initiatives
- National & International commercial activities and partnerships.

Innovation Centres

It is essential that the work & development taking place within the Innovation centres adds value to;

- Staff
- Students
- Curriculum
- Industry



Duration (1 - 2 hrs) WORKSHOPS

Laser Cutting

This one-hour session is a hands-on workshop that guides participants through the safe use and operation of the G503 X5008 Laser Cutter. The master class will cover an in-depth introduction into laser cutting showing how the technology works while also covering best practices in file preparation, machine operation and maintenance. Following this master class participants will be capable of setting up a part on for CNC machine and use the Roland MDX 540.

3D printing

This workshop gives a background in 3D printing outlining the various types available. Participants will be shown how to ensure files are set up correctly in various software packages such as SolidWorks and Rhino 3D. Participants will learn how to use the various 3D printers in the IDEA Centre, and their corresponding software packages. Participants will gain an understanding of how 3D printing works, the positive and negative set up files for 3D printing and best practices in file preparation.

CNC Machining

This one-hour session will guide participants through the use of the Roland MDX 540 CNC machine. This course will cover all aspects of file setup, machine setup, tool selection and part cutting on the Roland MDX 540. Following this master class participants will be capable of setting up a part on a CNC machine and will also be signed off to use the Roland MDX 540 in the IDEA Centre.



STEM Centre - Beacon Award Winner



The UK's only dedicated Science, Technology, Engineering and Maths Centre



Led by a team of dedicated STEM experts, the centre encourages excitement for scientific investigation and enthusiasm for discovery.

Reaching ...

4000 STUDENTS

120 TEACHERS



 young innovators



60 SCHOOLS



 Commercial Awareness Programme

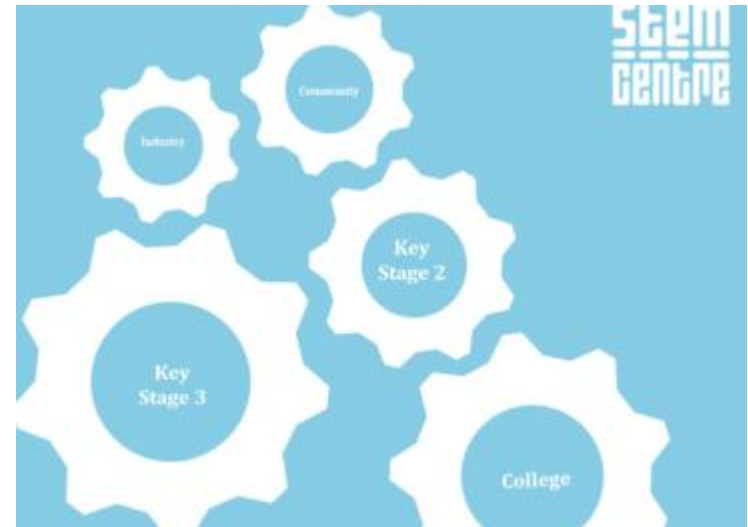
Impactful learning -
Feedback from participants indicates that **96%** are more likely to select STEM subjects for further study following a visit to the STEM Centre.



The ultra-stylish learning environment is packed with the very latest technology and is specially designed to spark the imaginations of budding scientists, technologists, engineers and mathematicians.

Curriculum ...

- Developing Key Skills
- Introduce students to the importance of STEM
- Impact on GCSE subject choice
- Develop T-Shaped Learner qualities
- Contextualising Theory
- Specific curriculum development



Three parallel, diagonal magenta lines of varying lengths, located in the top-left corner of the dark grey background.

idea

Creativity Suite

A faint, light grey watermark of a gear or cogwheel is visible in the background of the bottom half of the slide.

IDEA Centre Omagh

Product design and development studio

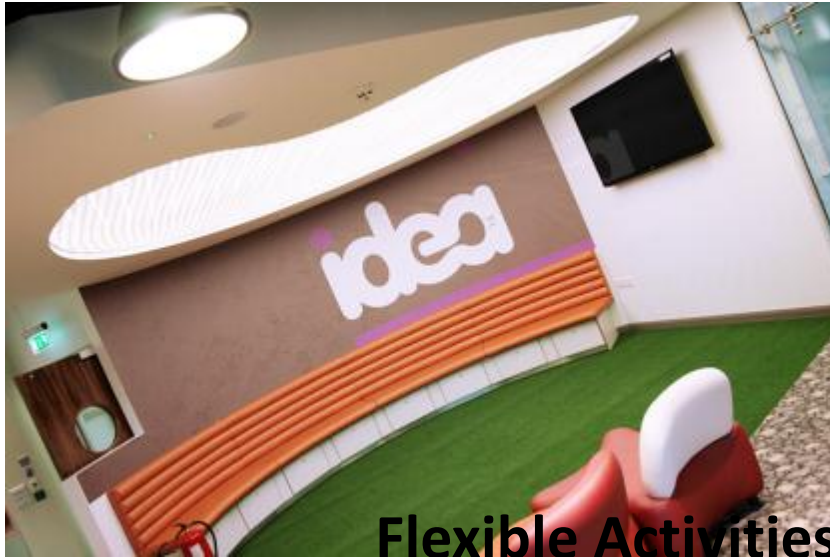


- Interactive learning and exhibition space
- Encourage students, companies & community ...
-to participate in creative process of generating ideas and creating own prototypes
- 'Studio' learning – focussing on innovation, creativity and enterprise
- Proof of concept prototypes



IDEA Centre Omagh

Product design and development studio



Flexible Activities



Boardroom



Concept Development



Group Brainstorming

IDEA Centre Omagh

Product design and development studio



- Investment of almost £1 million
- Industry standard equipment
- Rapid prototyping – 3D printing
- Laser cutting equipment
- Workshop machines linked to College workshops
- CAD & Graphics facilities
- 3D projection & touch screen
- Follow on from InnoTech Centre work
- Focus on bringing products to the market
- Students, Industry





crest

centre for
renewable energy &
sustainable technologies



Overview of CREST

- Centre for Renewable Energy and Sustainable Technologies
- Interreg Funding - £2.9 million
- R&D Support for SMEs in renewable energy and sustainable technologies
- 9 Staff+ 2 placement students

- Partners

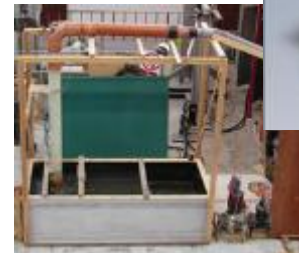
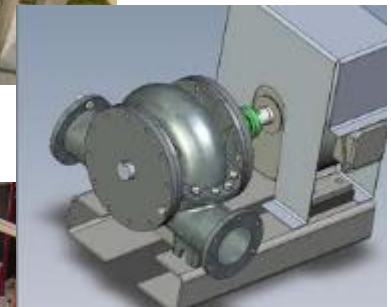
- SWC
- IT Sligo
- Dumfries & Galloway College
- Cavan IT





Technology areas of focus

- Biomass – production & drying
- Biofuel – crops and processing
- Biogas – feedstocks & system design
- Sustainable & Passive Construction
- Waste – product re-use
- Recycling equipment
- Energy use and conservation
- Modification / adaptation of renewables
- Environmental Management
- Energy Storage and grid optimisation
- New product development and testing



Extensive Living Roofs - these incorporate low-lying plants from 2 to 6 inches high. They require only a few inches of soil to support them, and only need a low weight-loading roof. They are low maintenance and can be used for any kind of roof.

Triple glazed windows - Windows are oriented and installed to take advantage of passive-solar heat gain.

Structural insulated panels (or structural insulating panels), SIPs, are a composite building material. They consist of an insulating layer of rigid polymer foam sandwiched between two layers of structural board.

Glued laminated timber, also called Glulam, is a type of structural timber product comprising a number of layers of dimensioned timber bonded together with durable, moisture-resistant structural adhesives.

Impact

- Innovation experience accessible for all students
- Academic staff
 - Focus for involvement in industry projects
- Seminars and Conferences
- Specialist lectures
- Site visits, tours & international trips
- Student placements
- Access to specialist equipment
- Course team involvement for project staff



Key Strengths – Economic Engagement

- Stakeholder Engagement
 - Regional basis – Innovation Vouchers, Fusion & KTPs
 - Enhanced linkages with UK Colleges
 - Internationally – Interreg, Atlantic Area & NPP
 - EU FP7 application approved & Scoping Horizon 2020
- 3 Beacon Awards 2012 for Innovation Centres and strategy
 - Overall presidents award for STEM Centre
- Lead College for NI FE Sector Initiatives – InnoTech NI, Carbon Zero, ‘InnovateUs’
- ETI Grade one for Innovation in Employer Engagement
 - “outstanding” provision in the area of industry innovation.



Leading delivery agent for r&D with SMEs within the region





Questions

An EU perspective
Dr Jill Cush