9th Annual Graduate Research Symposium

Event Programme

10.30 – 11.00 Registration

11.00 – 11.15 Welcome to the 9th Annual Graduate Research Symposium
Professor Brian O’Neill, Director of Research,
Enterprise & Innovation Services

11.15 – 12.15 Research Theme: Environment, Energy and Health
Chair: Professor Mary McNamara,
Head of the Graduate Research School

Oluwasegun Oluwaseyi Seriki, Dublin Institute of Technology
Keeping up with the Joneses: social contagion and knowledge acquisition in Irish construction professional service firms

Michael Chesser, Dublin Institute of Technology
The Positive Feedback Cycle in the Electricity Market: Residential Solar PV Adoption, Electricity Demand and Prices

Brian Henderson, Dublin Institute of Technology
Aptamers are Awesome

12.15 – 13.00 Lunch

13.00 – 13.40 Research Theme: Information, Communications and Media Technologies
Chair: Professor Brian O’Neill, Director of Research,
Enterprise & Innovation Services

Lucas Rizzo, Dublin Institute of Technology
On Demonstrating the Impact of Defeasible Reasoning via a multi-Layer Argument-based Framework

Mariana Rocha, Dublin Institute of Technology
Playing in the classroom: the development of an educational videogame for Mathematics learning
13.40 – 14.40  Research Theme: Society, Culture & Enterprise

Chair: Dr Matt Bowden, Head of Research, College of Arts & Tourism

Miriam O’Regan, Dublin Institute of Technology
Understanding Childminding as an Ecocultural Niche: a Tale of Two Studies

Sinead Hewson, Dublin Institute of Technology
Communication at the Core: Assessing decision-making and resource allocation where communication is at the heart of an organisation’s strategy development

Alan Kirby, Institute of Technology Tallaght
Program Theory / Logic Model conducting an evaluation process

14.40 – 15.00  Coffee Break

15.00 – 16.00  Research Theme: New Materials & Devices

Chair: Professor Hugh Byrne, Head of FOCAS Research Institute

Megan O’Shaughnessy, Dublin Institute of Technology
Antibacterial activity of metal complexes incorporating 1,10-phenanthroline and dicarboxylate ligands: activity against problematic resistant clinical isolates

Muhammad Irfan, Dublin Institute of Technology
Temperature responsive diffractive structures

Kangze Liu, Dublin Institute of Technology
A novel bottom-up in situ synthesis method of shape and size controllable gold nanoparticles and their applications

16.00 – 16.30  Prize Giving and Close
Abstracts of Oral Presentations

Environment, Energy & Health
Oluwasegun Oluwaseyi Seriki

**Title:** Keeping up with the Joneses: social contagion and knowledge acquisition in Irish construction professional service firms.

**Authors:** Oluwasegun Seriki; Roisin Murphy

Abstract

The high knowledge intensity of professional service firms (PSFs) has been extensively researched in industries such as manufacturing; however, lesser attention has been given to construction. As the construction sector in Ireland continues in its path of sustained growth, knowledge acquisition is becoming a central issue for strategy researchers within the sector. While several authors have explored aspects of the strategy in construction PSFs, knowledge acquisition as a tool for driving strategy remains largely unexplored. Previous studies have applied the theoretical underpinnings of social contagion (SC) to sectors such as healthcare, however, research into SC theory is lacking within construction. This paper therefore, examines the significance of social contagion in the knowledge acquisition process of quantity surveying (QS) firms in Ireland. The aim of this study is to shine new light on whether knowledge acquisition in PSFs is deliberate, emergent or driven by social contagion. By employing a quantitative method of enquiry, the study further illuminates the latent effect of social contagion in driving knowledge acquisition in PSFs. The study provides an important opportunity to advance the understanding of social contagion theory in construction by demonstrating firms acquire knowledge spontaneously to keep up with trends in the industry, rather than in a planned, deliberate sequence.
Michael Chesser

**Title:** The Positive Feedback Cycle in the Electricity Market: Residential Solar PV Adoption, Electricity Demand and Prices

**Authors:** Michael Chesser, Jim Hanly, Damien Cassells, Nicholas Apergis

Abstract

Micro renewable energy systems (MRES) such as Photovoltaic (PV) are an increasingly important element of National energy strategies. However, the success of these installations has given rise to a positive feedback cycle whereby increased customer adoption results in reduced demand from Utility providers. This leads to price increases and further incentives customers to adopt MRES. This paper investigates the existence of a positive feedback cycle by developing a theoretical model based on simultaneous equations and estimating it using the three stage least squares approach using data from the UK, Australian and Irish Markets. Results indicate strong support for the idea of a positive feedback cycle. This reinforces the need for stakeholders to consider this issue in framing future energy policies to ensure that the adoption of solar PV is supported in a sustainable way, while not punishing non-adopters with higher electricity rates.
Title: Aptamers are Awesome

Authors: Brian David Henderson, Niamh Gilmartin

Abstract

Nucleic Acids are fascinating molecules, they are well known for their ability to store and transport genetic information but what is less known is their structural diversity, and in the world of the microscopic, structure is function. Aptamers, as they are known, are one type of functional nucleic acid, they are short single stranded sequences of DNA or RNA which bind with high affinity and specificity to a target molecule. Each aptamer is selected from a pool of many hundreds of billions of nucleic acids by a process of guided evolution. In the same way that over billions of years life arranged every combination of amino acids to form the highly specific proteins and enzymes which make up our world today, so to can we artificially construct every combination of nucleotides possible and select from it an aptamer with application specific characteristics. This selection process is known as Systematic Evolution of Ligands by Exponential Enrichment or SELEX for short. Using this process it is possible to select aptamers to virtually any target be it a protein, peptide, small molecule, whole cell or even single atoms. These qualities make aptamers an attractive molecular recognition element for the development of novel biosensors.
Abstracts of Oral Presentations

Information, Communication and Media Technologies
Title: On Demonstrating the Impact of Defeasible Reasoning via a multi-Layer Argument-based Framework

Authors: Lucas Rizzo, Luca Longo

Abstract

Argumentation theory (AT) is an important area of logic-based artificial intelligence, which provides the basis for computational models of defeasible reasoning. Despite promising progresses have been made in several areas, demonstrating AT as a solid theoretical research discipline for implementing defeasible reasoning in practice, there are issues for applied research. State-of-the-art models of AT are usually domain dependent, not often built upon all the layers of an argumentative process. Due to this diversity, a clear structure that can be replicated and that allows models to be designed, built, evaluated and compared has not emerged yet. The aim of this research is to design an argument-based framework (ABF), from the construction of arguments, to the resolution of possible inconsistencies arising from their interactions and the computation of a justifiable conclusion or claim. This ABF is proposed to be evaluated across practical applications in the fields of knowledge representation and decision-making. In this study it is believed that since AT is a relatively new field the proposal of a more generally applicable solution, in the form of a computational framework, might facilitate comparisons across applications and enable the demonstration of the impact of defeasible reasoning.
Title: Playing in the classroom: the development of an educational videogame for Mathematics learning

Authors: Mariana Rocha, Brendan Tangney, Pierpaolo Dondio

Abstract

Educational videogames can improve student’s motivation to learn and provide higher cognitive gain. This project aims to deliver a videogame to be implemented in primary school Mathematics classes. The first step of the study was to comprehend what factors influence teachers to adopt games. Data was collected through a survey answered by 714 school teachers and evaluated using Logistic Regression and Decision Tree models. The results suggest that the adoption of videogames is influenced by students’ primary language, game’s curriculum coverage and pedagogical underpinnings. Teachers that do not adopt games indicated they face barriers like the lack of time and technological resources. We also collected the names of 66 games used by the teachers and confronted with a taxonomy that classifies classroom videogames. Results suggest that most games are very similar to traditional learning methods, such as paper exercises, and do not connect the classroom to the real-world context. We propose an adventure point-and-click game where the player learns through the history of Mathematics. The student visits virtual lands and it is challenged by characters from ancient times to solve Mathematics puzzles. The game intends to be a web-based adaptive environment with simple graphics, played in low specifications computers.
Abstracts of Oral Presentations

Society, Culture and Enterprise
Title: Understanding Childminding as an Ecocultural Niche: a Tale of Two Studies

Authors: Miriam O'Regan

Abstract

Childminding in Ireland has been neglected in mainstream ECEC policy, yet it continues to flourish. A relatively under-researched field in Europe (Ang, Brooker, & Stephen, 2016), this research aims to reconceptualise childminding in its distinctive nurturing pedagogy (Hayes & Kernan, 2008) from an ecocultural perspective. It is underpinned predominantly by Ecocultural Theory (Weisner, 2002), while also referencing Attachment Theory (Bowlby, 2007) and Bronfenbrenner’s Bio-ecological Model of Human Development (Rosa & Tudge, 2013).

Following an online survey and world café forum with childminders focussed on professionalisation, this research shifted paradigm to use the qualitative Ecocultural Family Interview (EFI) (Weisner & Bernheimer, 2004) specifically adapted for childminding (Tonyan, Nuttall, Torres, & Bridgewater, 2017). The EFI focusses on daily routine to narrate the complex world of childminding, with <10 photos, taken by the childminder, used to further explore childminders’ cultural models.

Initial findings suggest some distinctive characteristics of Irish childminding: long term close relationships; individualized, nurturing pedagogy; mixed age groups; and a unique career path. This cultural model seems to be share by childminders and parents alike. New regulations and support systems (DCYA Working Group, 2018) well aligned with this cultural model are more likely to be sustainable long term.
Sinead Hewson

**Title:** Communication at the Core: Assessing decision-making and resource allocation where communication is at the heart of an organisation’s strategy development

**Authors:** Sinead Hewson

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**Abstract**

This investigation explores the link between the communications function and the creation and development of strategy in organisations. It considers whether the position, territory and scope of the public relations function influences strategic decisions, tactics and in turn results. Scholars argue that communication (public relations) is an important strategic management function (Grunig, 1992) and has a strategic role to play (Kitchen, 1997). Yet, in spite of multiple recommendations published by academia, no profound nor universal step change in the status of communications and communication professionals in organisational, leadership and strategy development has occurred.
Title: Program Theory / Logic Model conducting an evaluation process.

Authors: Alan Kirby

Abstract

This research seeks to evaluate the outcome of the measures introduced in the 2012 stimulus package, ostensible the success of the amendments made to the Public Private Partnership policy. The measures were introduced to rejuvenate the Construction and PPP sector, following the effects of the financial crisis. To demonstrate this, this study engages Program Theory and Logic Model as a Theoretical Framework. There are two key elements that make up program theory, a change model, relating to the causal process and an action model relating to the activities and interventions. The study acknowledges the co-relationship that exists between program theory and logic model, logic model is a visual aid, an associate of program theory. Logic model adopts a linear causal path to determine the criteria relating to, Inputs, Outputs, and Outcomes that are necessary to steer an evaluation.

Program theory can address both complicated and simple interventions. The study notes the presence of the black box syndrome, being the relationship between the initial input and the determined outcome of the logic model process. Program theory is a realist method of intervention, limitations associated with program theory, pertain to the selection process of intervention factors, political interference, bias, and espoused theory.
Abstracts of Oral Presentations

New Materials and Devices
**Megan O’Shaughnessy**

**Title:** Antibacterial activity of metal complexes incorporating 1,10-phenanthroline and dicarboxylate ligands: activity against problematic resistant clinical isolates

**Authors:** Megan O’Shaughnessy, Celine Herra, Pauraic McCarron, Sarah Fereira, Malachy McCann, Michael Devereux and Orla Howe

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**Abstract**

Antimicrobial resistance (AMR) has been called one of the major health challenges of our time by all 193 member states of the UN and is referred to as the next great global challenge. In Europe alone, it is estimated that 390,000 deaths will be attributable to AMR every year by 2050. There is an urgent need to develop novel therapeutic agents that can overcome antibiotic resistance preferably through alternative mechanistic pathways.

1,10-phenanthroline (phen) is a heterocyclic organic compound which is known to exert in vitro antimicrobial activity against a broad-spectrum of bacteria. The coordination of metal ions with phen can increase their bioavailability through improved cell membrane permeability yielding significant improvements in activity when compared to the free ions. The antibacterial activity of metal-phen complexes (metal = Cu2+, Mn2+ and Ag+) incorporating various dicarboxylate ligands has been investigated against common AMR pathogens. Antimicrobial susceptibility testing in accordance with EUCAST standards, were performed against a panel of ATCC susceptible isolates and clinical multidrug resistant Methicillin-Resistant Staphylococcus aureus (MRSA, N=5), Vancomycin-Resistant Enterococci (VRE, N=6), Carabapenem-Resistant Enterobacteriaceae (CRE, N=3), and resistant P. aeruginosa (N=4) collected from a range of Irish hospitals.

Overall, a superior toxicity was observed in compounds which incorporate the phen ligand when compared to the activities of their simple dicarboxylate salts. Furthermore the chelates incorporating 3,6,9-trioxaundecanedioic acid (3,6,9-tddaH2) were the most effective and toxicity varied depending on the metal centre, Cu2+ > Ag+ > Mn2+. 
Title: Temperature responsive diffractive structures

Authors: M. Irfan, S. Martin, I. Naydenova

Abstract

Among the recording media used in holography, smart materials that have hologram recording capability and additionally show response to environmental changes (e.g. temperature) are extensively studied due to their possible application as holographic sensors. Research indicates that both pure photopolymers and nanocomposites (photopolymer doped with nanoparticles) can be used for this purpose.

NIPA-based photopolymer (PNIPA) that is recently optimized for holographic recording is prominent for its temperature sensitivity due to its phase transition occurring at lower critical solution temperature at 32 oC for pure PNIPA. Although its temperature sensitivity is studied and reported in the literature, further research is required to fully understand and effectively control the temperature response of holographic diffractive gratings recorded in PNIPA.

In the present work, temperature response of volume transmission grating recorded with 532 nm in PNIPA was investigated in the range of 18-60 oC by monitoring the diffracted and transmitted intensity of probe beam 633 nm. Using the temperature controlled stage (Linkam THMS600), samples were exposed to temperature with different rates and exposure time. Results indicate that the observed response may be utilised to design a sensor/indicator for packaging, showing that the content of the package has been exposed to a predetermined temperature limit.
Title: A novel bottom-up in situ synthesis method of shape and size controllable gold nanoparticles and their applications

Authors: Kangze Liu, Furong Tian

Abstract

In the flourishing field of nanotechnology, the unique physical and chemical properties of noble metal nanoparticles with special electronic structures different from atoms or bulk states, have long been of interest and widely exploited in diversiform areas such as electronics, chemistry, optics, biomedicine. Among these materials, gold nanoparticles (GNPs) have received lots of attention particularly due to potential applications in bio-related areas, and therefore continued refinement of synthesis methods which can control the size and shape of GNPs is desirable. In our study:

- We have developed a novel bottom-up in situ synthesis method of GNPs that can control the size and shape of particles synthesized, which includes nanospheres sizing from 2.5-70 nm, nanoplates with widths of 30-1000 nm, and most importantly, ultra-small nanoflowers down to 0.5-60 nm.
- The characteristics of these novel particles synthesized have been studied and compared to current state of art. The toxicities of these GNPs on fungi have also been screened, aiming to be applied in environment protection.
- A water microbe pollution detection system was developed based on this synthesis protocol, which was colorimetric, rapid and user-friendly.
- Other potential applications include the design of chemical pollution detection, GNP-based SERS enhancing, GNP-based drug delivery and so on.
Poster Competition

RESEARCH THEME: Environment, Energy and Health

1. An evaluation into the safety of cycling in Dublin city and measures to reduce risk to cyclist by Niamh O Reilly, PhD Student, School of Surveying and Construction Management, Dublin Institute of Technology.

2. Vegetation mapping of a coastal dune complex using multispectral imagery acquired from an unmanned aerial system by Chen Suo, PhD Student, School of Surveying and Construction Management, Dublin Institute of Technology.

3. Raman Microspectroscopy for in vitro monitoring Mesenchymal Stem cell differentiation into different lineages and the effect of Nanoparticles on differentiation process by Francesca Ravera, PhD Student, School of Physics & Clinical & Optometric Sciences, Dublin Institute of Technology.

4. Comparison of Quality Indices for Sediment Assessment in Ireland by Tayyaba BiBi, PhD Student, School of Physics & Clinical & Optometric Sciences, Dublin Institute of Technology.

5. ICT-enabled Change & Innovation in Healthcare Organisations: Examining Implementation Practice by Selma Furtado, PhD Student, School of Management, Dublin Institute of Technology.

6. Review on the current designs and optimization possibilities regarding influent distribution in uasb reactors by Camila D’ Bastiani, PhD Student, School of Mechanical and Design Engineering, Dublin Institute of Technology.


8. Development of Novel Anticancer Agents Targeting Glioblastoma Multiforme by Kate Byrne, PhD Student, School of Food Science and Environmental Health, Dublin Institute of Technology.

9. Hydrology in practice - anthropogenic effects on water quality by Vivien Pohl, PhD Student, School of Transport Engineering, Environment and Planning, Dublin Institute of Technology.

10. Fostering stakeholder collaboration and knowledge transfer in private well risk communication: A qualitative interview study of national and international experts by Simon Mooney, PhD Student, School of Management, Dublin Institute of Technology.

11. Bio-refinery of macroalgae: Exploiting dairy processing platform technologies for enrichment of protein and value added components by Jack O’Connor, MPhil Student, School of Biological Sciences, Dublin Institute of Technology.
12. What is the current provision and access to medically necessary contact lenses in Ireland? By Sean Keady, MPhil Student, School of Physics & Clinical & Optometric Sciences, Dublin Institute of Technology.

13. The Application of Energy Dispersive X-ray Fluorescence Spectroscopy for the Rapid Determination of the Five Major Minerals (Na, Mg, K, P and Ca) in Skim Milk Powders – A Pilot Study by William McCarthy, PhD Student, School of Biological Sciences, Dublin Institute of Technology.

14. Value in healthcare: comparing traditional and virtual clinic care pathways of Rheumatoid Arthritis in Ireland by Christina Kenny, PhD Student, School of Accounting and Finance, Dublin Institute of Technology.

15. Food Allergy in Ireland and Saudi Arabia by Maha Alrashedy, MPhil Student, School of Food Science and Environmental Health, Dublin Institute of Technology.

16. Understanding the differences between antimicrobial and cytotoxic properties of plasma activated liquids by Evanthia Tsoukou, PhD Student, School of Food Science and Environmental Health, Dublin Institute of Technology.
RESEARCH THEME: Information, Communication and Media Technologies

17. Social Influence: A 21st Century Threat by Julie Murphy, MPhil Student, School of Informatics and Engineering, Institute of Technology Blanchardstown.

18. The Terror Network industrial Complex by James Usher, PhD Student, School of Computing, Dublin Institute of Technology.

19. Exploring Long Distance Dependencies by Abhijit Mahalunkar, MPhil Student, School of Computing, Dublin Institute of Technology.

20. Entity-Grounded Image Captioning by Annika Lindh, PhD Student, School of Computing, Dublin Institute of Technology.

21. Testbed design for measuring presence in Virtual Reality by Krzysztof Szczurowski, PhD Student, School of Informatics and Engineering, Institute of Technology Blanchardstown.

22. Collaborative web-based tagger for named entities in the task of information extraction by David Efrain Muñoz Morales, MPhil student, School of Science and Computing, Institute of Technology Tallaght.

23. A visual language for Augmented Reality by Nina (Katherina) Lyons, MPhil Student, School of Informatics and Engineering, Institute of Technology Blanchardstown.
RESEARCH THEME: New Materials and Devices

24. Capture of bacterial cells using microcontact printing by Megan Swan, PhD Student, School of Mechanical and Design Engineering, Dublin Institute of Technology.

25. Study of mm-Wave microstrip patch array on curved substrate by Zeeshan Ahmed, PhD Student, School of Electrical and Electronic Engineering, Dublin Institute of Technology.

26. Ka-band Vivaldi Antenna with Novel Core Element for High-Gain by Manh-Ha Hoang, PhD Student, School of Electrical and Electronic Engineering, Dublin Institute of Technology.
RESEARCH THEME: Society, Culture and Enterprise

27. Compliance and appropriateness of driver vision regulations in Ireland by Ciara McHugh, MPhil Student, School of Physics & Clinical & Optometric Sciences, Dublin Institute of Technology.


29. Interest Rate Calibration and Parameter Estimation of Affine Term Structure Models by Samyukta Venkataramanan, PhD Student, School of Mathematical Sciences, Dublin Institute of Technology.

30. Community Development Through an Effectual Lens by Norah Cussen, PhD Student, School of Marketing, Dublin Institute of Technology.

31. Factors Affecting the Progression of Access Foundation Students into Undergraduates Studies at Dublin Institute of Technology by Annette Forster, PhD Student, School of Hospitality Management and Tourism, Dublin Institute of Technology.