

SW14 ABSTRACTS

Papers, Posters and Vendors

Session 1: Simulation Methodology 1

Session Chair: Cathal Heavey (*University of Limerick*)

Model building in system dynamics and discrete-event simulation: A comparison of analysts' language

Roger McHaney (*Kansas State University*), Antuela Tako (*Loughborough University*) and Stewart Robinson (*Loughborough University*)

This article presents an analysis derived from empirical data collected during a study on the differences in System Dynamics (SD) and Discrete-event Simulation (DES) model building. The language usage of 10 expert modellers (5 SD and 5 DES), who provided a narrative of their actions while building prison simulation models, formed the study's basis. The transcripts were analysed using Linguistic Inquiry and Word Count (LIWC), a text analysis software program which calculates the degree to which people use different word categories across a wide array of areas, and then loads the results on more than 70 different dimensions. The purpose of this study was to determine whether distinctive features of language could be discerned in the language usage of SD and DES experts. Theoretical differences were hypothesized based on prior studies. Results indicated language usage was consistent with hypothesized characteristics of SD and DES and further validated earlier studies.

Towards a methodology for building large-scale distributed hybrid agent-based and discrete-event simulations: The case of emergency medical services

Anastasia Anagnostou and Simon J E Taylor (*Brunel University*)

How do we build large-scale models? Can large-scale models be built from models from different simulation paradigms? Can existing simulation modelling methodologies guide the development of large-scale models? Distributed simulation (DS) offers the possibility for large-scale simulations to be developed that can be composed of models based on different world views and different simulation packages. Based on experiences in developing a large-scale Emergency Medical Service simulation that consists of distributed agent-based and discrete-event simulations, this paper proposes an emerging methodology for building large-scale distributed hybrid simulations.

Session 2: Practitioners Case Study 1

Session Chair: Durk-Jouke van der Zee (*University of Groningen*)

How Simulation is making a difference to British Airways

Andrew Beck (*British Airways*)

Simulation is being used across British Airways (BA) to solve business problems and provide valuable insights. This case study will provide details of several successful applications of simulation at BA. This will include work on airport passenger flows, and in particular how it was used before and after the opening of Heathrow Terminal 5, as well as work that has help solve complex challenges relating

to baggage. The case study will also cover how the simulation group at BA is organised and work is resourced, as well as where simulation at BA might go next.

Unlocking Airport Capacity: Airport Simulation at NATS

Simon Martin (*NATS*)

This presentation will provide a brief introduction to NATS and the work of the NATS Operational Analysis department, focusing on the area of airport simulation. We will discuss the range of problems for which simulation modelling of airport airside operations has successfully been applied at NATS. These include determining the impact of taxiway closures, selecting the best options for airport development and maximising the capacity of existing and planned assets such as stands and runways. We will cover the simulation methods used and give examples of the range of results and outputs that can be generated. We will highlight the impact and benefits of NATS simulation projects that have been carried out around the world.

Session 3: Simulation Methodology 2

Session Chair: Bhakti Stephan Onggo (*Lancaster University*)

Towards automated simulation input data

Panagiotis Barlas and Cathal Heavey (*University of Limerick*)

Discrete Event Simulation (DES) has proved itself to be an effective tool for complex processes analysis. The drawback of using DES is the effort required and costs spent on collecting and processing the input data from different data sources. To address the problem of time consuming pre-coding for DES projects, a tool is currently being developed. The tool will read data from several resources of an organisation; analyse it using statistical analysis and output it in a format that is applicable to simulation purposes. The format that we adopted follows the Core Manufacturing Simulation Data (CMSD) standard in order to describe simulation related data. The CMSD specification is presented as simulation input, in order to achieve the efficient reuse of this data for future DES projects. We present a first prototype and a test implementation of this tool and we draw conclusions about the future steps of our project.

An investigation on test driven discrete event simulation

Shahriar Asta, Ender Ozcan and Peer-Olaf Siebers (*The University of Nottingham*)

This paper deals with the application of modern software development methodologies to the discrete event simulation model development process. In Software Engineering the group of Agile Software Development methodologies enjoys an increasing popularity. One of the techniques belonging to this group is eXtreme Programming, a software development methodology which improves software quality and responsiveness of software projects through introducing short development cycles and a Test Driven Development (TDD) philosophy throughout the development. In this paper, we pay particular attention to the application of the TDD by approaching the simulation development from a test-first perspective. We conduct a feasibility study in which we apply TDD principles to the development of a simulation model at different levels of aggregation: we consider acceptance testing and unit testing. The case study consists of the development of a hypothetical surgical ward discrete event simulation model using the AnyLogic IDE for the design and implementation of the model. Our study differs from the mainstream in many ways. It addresses the feasibility of test-driven simulation development in visual interactive modelling and simulation environments as well as

providing an insight into how the test-first concept can further help with the choice of components and acceptance testing.

Session 4: Simulation in Operations Management

Session Chair: Benny Tjahjono (*Cranfield University*)

A Discrete Event Simulation for the Analysis of the Harvesting, Transportation and Processing Systems of a Seasonal Vegetable Production Operation

Nicky Yates (*Cranfield University*)

This paper describes the development of a discrete event simulation model of a vegetable production operation from harvesting to bulk freezing of the product. The operation is complex and time pressured, the harvesting season is only a matter of weeks and the time from harvesting to freezing is measured in hours. Ensuring a smooth flow of product to the processing lines and maximising availability of the lines is therefore vital. The model aimed to provide a low risk environment for improving understanding of the current process and testing potential improvements. The results lead to significant improvements in the understanding of the impact of field moves, breakdowns and processing different varieties on the operation and lead to a number of recommendations which have increased the efficiency and reliability of the operation. In addition a three day model was built to facilitate decision support during the season.

A Framework for Developing Simulation-based Serious Games for Operations Management Education

Durk-Jouke van der Zee and Steffan Sloot (*University of Groningen*)

Allowing operations management students to practice their skills in realistic type of environments may imply great help for them in preparing for their future careers. In many cases such practicing is not possible or desirable in a real-life setting. Many authors show how simulation-based serious games may be successfully used instead. Unfortunately, modelling methodology for developing suchlike games is fragmented along disciplinary lines, i.e., teaching design, serious game design and simulation modelling. To address this gap we propose a framework for developing simulation-based serious games. It structures design activities by acknowledging three aggregation levels, the teaching method, the serious game, and the simulation model. Contributions made by simulation are linked to elementary design decisions. Framework use is illustrated by a case example. The example concerns the development of a simulation-based serious game allowing students to play the role of the operations manager of an emergency department.

Session 5: Simulation Software

Session Chair: Peer-Olaf Siebers (*The University of Nottingham*)

"JaamSim" described in three simple examples

Harry King, Harvey Harrison and Matt Chudleigh (*Ausenco*)

This paper introduces JaamSim, a free, open-source simulation software package that includes a modern graphical user interface, drag-and-drop model building, and 3D graphics. Three simple examples are used to demonstrate the features of the software.

Extending an open-source discrete event simulation platform with new objects

Georgios Dagkakis, Ioannis Papagiannopoulos and Cathal Heavey (*University of Limerick*)

Lack of flexibility and high cost of Commercial-Off-The-Shelf (COTS) Discrete Event Simulation (DES) software, are two of the main factors that deter organizations from using DES in their decision support. Open Source (OS) simulation tools can provide an adequate solution, since the user has full access to the source code and thus gets the chance to make modifications at multiple levels. ManPy (Manufacturing in Python) is a new OS library of DES objects implemented in SimPy. ManPy's scope is to provide modellers with generic, highly customizable OS simulation objects that can be connected to form a model in the same fashion of COTS simulation packages. Extensibility is one of the requirements of ManPy. In this paper we present the extension of ManPy objects, in order to be able to model production lines, where the products flow in batches, can be decomposed into sub-batches and reassembled to the original batch.

Session 6: Simulation in Healthcare

Session Chair: Russell Cheng (*University of Southampton*)

Modelling the dental workforce in Sri Lanka

Sally Brailsford (*University of Southampton*) and Dileep De Silva (*Ministry of Health*)

This paper describes a system dynamics model of the dental workforce in Sri Lanka. The model represents the career progression of dentists, from recruitment and training at the university dental school, through different types of employment through to retirement. The aim of this model, after it was augmented with a separate model depicting future demand scenarios for dental care (not presented here), was to allow the Sri Lankan government to plan better provision of state-funded dental care and the future university intake of dental students.

Simulating the surgical booking process

Marion Penn (*University of Southampton*), Chris Potts (*University of Southampton*) and Paul Harper (*University of Cardiff*)

Hospital operating theatres are costly resources and are often needed for patients with long care pathways, so their efficient use is critical to the overall efficiency of the hospital, both financially and in terms of reducing patient waiting times. Even if only a single surgeon's patients are considered, there are variations in arrival rates, expected and actual operation times, and urgency of surgery to consider, as well as the fairness of the process. For patients the ideal time to book their surgery is while they are talking to the surgeon in an outpatient clinic, however the literature suggests that for online scheduling problems it is most efficient to delay booking as late as possible. This paper explores and compares a variety of algorithms for booking patients, using a variety of criteria. It takes inspiration from the literature on scheduling in healthcare, scheduling in general and surgeons suggestions.

Session 7: Cloud-Based and GPGPU Simulation

Session Chair: Shane Kite (*Saker Solutions*)

The need for cloud-based simulation from the perspective of simulation practitioners

Bhakti Stephan Onggo (*Lancaster University*) and Simon J E Taylor (*Brunel University*)

Cloud-based simulation (CBS) is one of the new grand challenges in modelling and simulation (M&S). However, the work on web-enabled M&S is not new. A case in point is web-based simulation (WBS). Given the similarities between WBS and CBS, it is important to learn from WBS. Despite advancements in WBS research, its commercial applicability and adoption by users has not grown to the desired extent. This is partly due to the strong emphasis on WBS as a technological tool instead of a socio-technological tool in which users, their needs and circumstances are considered. To understand the needs and perception from practitioners on CBS, we conducted a survey. The results show that practitioners have a good exposure to web-based applications and mobile gadgets. There also appears to be evidence of a need for CBS that provides fast response time, effective communication tools and functionalities to share, store and retrieve models.

CloudSME: Developing a cloud computing-based platform for simulation in manufacturing and engineering

Simon J E Taylor (*Brunel University*), Tamas Kiss (*University of Westminster*), Peter Kacsuk (*STAK*), Gabor Terstyanszky (*University of Westminster*) and Nicola Fantini (*Scaletools*)

There is a demand from simulation users for speed, the ability to obtain quickly results from simulation runs. Cloud computing offers the potential for scalable, on-demand access to resources that can be used to speed up simulation. However, developing cloud computing solutions for industry is difficult without appropriate expertise. This paper introduces the CloudSME project that is dedicated to developing cloud computing solutions for simulation in industry and presents an overview of the CloudSME Simulation Platform that is being used to support an initial set of Cloud-based versions of Simul8s discrete-event simulation environment, Ascomp's TransAT computational fluid dynamics application, Ingecons 3D Scan Insole Designer tool and 2MORO's Bfly software for aircraft maintenance logistics.

The Use of Massively Parallel Processors in Simulation: An Assessment

Russell Cheng (*University of Southampton*)

In recent years there have been rapid advances in the design and availability of general purpose graphics processing units (GPGPUs) suitable for general purpose programming. Areas where they have been heavily applied include particle physics and financial modelling. However, so far, their use in discrete-event simulation modelling seems more limited. This paper assesses the usefulness of such hardware in OR simulation studies. Our initial conclusion is that their use in discrete simulation is still very limited, but in the more specific areas of input and output analysis in simulation experimentation their use can significantly increase the speed with which calculations can be done, especially when large data samples are involved. Handling "big data" samples has become increasingly important and the use of GPGPUs is likely to become ever more worthwhile. An example is presented showing the improvement in computational speed possible.

Session 8: Practitioners Case Study 2

Session Chair: Andrew Beck (*British Airways*)

Management of Simulation Information

Simon Hughes and Jacqueline Bishop (*Sellafield Ltd.*)

Sellafield Operational Research Group has been in existence for over 15 years; in this time the way data are used, stored and managed has developed. From the mid to late 1990s using Excel and SEE WHY/ Witness software, through the development of a Quality Management System, to 2014 and using Flexsim, Database technology and C#.net and the continued use of Excel. The development of information management tools and techniques has allowed the OR group to align with company/industry requirements and best practice, improving the service it provides to its many customers across the business.

Simulation of Manufacturing Energy Usage and Load Profiles

Alan Arokiam (*University of Greenwich*), Hafid Belaidi (*University of Greenwich*), John Ladbrook (*Ford Motor Company*) and Joel Wilson (*University of Greenwich*)

Until now, manufacturing industry has placed its focus on cycle time and product throughput, whilst energy usage in achieving this throughput has largely been ignored. Energy efficiency in manufacturing is of increasing importance due to escalating energy costs, CO2 emissions penalties, and other drivers such as corporate environmental image. With this in mind, the aim of this project is to improve the energy efficiency of complex manufacturing systems by simulation and optimisation of energy use. Ford Motor Company (FMC) uses WITNESS to build detailed production models of their power-train manufacturing lines based on cycle time and availability information collected from the engine manufacturing machinery. These models do not include energy use; however, there is an opportunity to make cost savings by seamlessly incorporating energy simulation into these existing simulation models. This project aims to simplify the creation of WITNESS energy models, and to take a step forward from the use of average energy data to include machine load profile simulation. This approach has the potential to predict power surges, electrical energy use and aid in electrical capacity planning by the sampling and modelling of machine load profiles.

Managing Customer Needs in Fabric Roll Production

Scott Mason (*Clemson University*), Kasin Ransikarbum (*Clemson University*), Robert Allen (*Clemson University*), Brad Willett (*Glen Raven Custom Fabrics*)
Kevin Taaffe (*Clemson University*)

In this research, we have investigated how changing customer needs are being addressed through manufacturing improvements in the custom fabrics manufacturing process. From raw material to a finished roll of fabric, customer demand is directly impacting the manufacturer's capital project decision making in where and how to increase capacity and throughput. In particular, we have used discrete event simulation to provide decision making support. The modeling approach has also allowed the project team members to explore creative solutions and manufacturing policies that otherwise would be difficult to measure. This case study focuses in particular on the fabric manufacturing processes between yarn production and warped rolls ready for weaving. Detailed simulation models have been developed in both yarn production, as well as the warping area, and we highlight the findings that address warping capacity and scheduling for the machines and labor available. Several scenarios for floating and dedicated resources, as well as order mix, were explored,

and we provided valuable trade-off data from which management can decide the true value to the company of allowing additional order complexity into their product line.

Session 9: Conceptual Modelling

Session Chair: Roger McHaney (*Kansas State University*)

Generating insights: the effectiveness of simulation models in creative problem solving

Anastasia Gogi, Antuela Tako and Stewart Robinson (*Loughborough University*)

The use of simulation models as a means of problem understanding and problem solving by creating new and effective solutions has received little attention. While the discrete event community has not well-developed this philosophy of practice, the system dynamics field uses models more as tools of problem understanding rather than as 'generators' of new and effective solutions. On the other hand, the alternative uses of visual features of simulation models seem not to have been exploited completely. Consequently, the role of models in creative problem solving is difficult to validate. This paper introduces the process of insight from the field of creative cognitive psychology and discusses its relation to creative problem-solving with simulation. We conclude by discussing the methodology that will be employed to provide empirical evidence to support the value of simulation models in creative problem-solving.

Graphical representation of agent-based models in operational research and management science using UML

Peer-Olaf Siebers (*The University of Nottingham*) and Bhakti Stephan Onggo (*Lancaster University*)

Agent-Based Modelling and Simulation (ABM/S) is still struggling to become one of the main stream simulation methods in Operational Research (OR) and Management Science (MS), despite its generally accepted usefulness when it comes to representing human behaviour in human-centric systems. In other fields, as for example Business Studies, Economics, and Social Science, it is flourishing. One of the technical differences between ABM/S and the well-established OR/MS simulation methods System Dynamics Simulation (SDS) and Discrete Event Simulation (DES) is that ABM/S traditionally uses an equation based modelling approach while SDS and DES use a graphical notation for the model description. We believe that having a graphical notation for ABM/S would help establish it in OR/MS. The Unified Modelling Language (UML) is a graphical notation commonly used in software engineering for the purpose of software design. Use case and state machine diagrams, which are part of the UML notation seem to lend themselves particularly well to ABM/S. In this paper we introduce UML to the OR/MS community. First we explain step-by-step how to use UML for developing ABM/S models. Then we demonstrate the application of this graphical notation by presenting two conceptual models we built for real world OR/MS case studies.

Conceptual modelling: Lessons from computer science

Fahim Ahmed, Stewart Robinson and Antuela Tako (*Loughborough University*)

Conceptual modelling (CM) helps to determine the objectives, scope and content of a simulation model. It is widely agreed that CM is the most important phase in any simulation study. Despite its significance, it has only recently been recognized in the area of Modelling and Simulation (M&S). In Computer Science (CS), CM is also a pre-development phase for systems design when the

requirements and objectives are being understood. However, within CS, there exist well-defined objectives, frameworks and quality evaluation methods for CM, and these have been in use for many decades. In this paper, we present a cross-disciplinary review of CM within the major fields of CS (Information Systems, Software Engineering and Databases) and make a comparison with M&S. The major contribution of this work is to highlight the need for a well-defined process for CM within M&S along the lines of that in CS

Session 10: Simulation in Management Decision Making

Session Chair: Kevin Taaffe (*Clemson University*)

Simulation of Competition in Revenue Management

Christine S.M. Currie (*University of Southampton*)

This paper describes the use of simulation to help solve a revenue management problem. In revenue management we aim to maximise the revenue from a fixed set of products either by optimising the prices to be charged for each of the products or by an optimal allocation of inventory to fixed prices. In this project, we consider a competitive market where potential customers use price as their main decision variable. The simulation model is then used to find some key characteristics of the revenue management problem in competitive situations. There has been some research into simulation in revenue management and a brief overview of the literature will also be given.

Developments in the quality assurance of government models used to support business critical decisions

Alan Robinson and Paul Glover (*Defence Science and Technology Laboratory*)

Modelling is essential to the work of government. From providing the evidence to support major investment decisions to predicting the spread of pandemic flu, models underpin decisions which affect people's lives and have major financial implications. It is vital, therefore, that these models are fit-for-purpose. Experience with the Intercity West Coast franchise competition in 2012 underlined inter alia the importance of good quality assurance in the models that underpin government decision-making. One response to the issues arising from this competition was a cross-government review of the quality assurance of government analytical models (the Macpherson review). This paper discusses the Macpherson review and the steps that are being taken cross-government to implement its findings. It concentrates on the key points that the review identified, in particular those with wide applicability across all modelling and analysis; and on the production of a 'Rainbow Book' to capture best practice and guidance across Government.

Considering Volunteer Assignments and Behaviour During Relief Efforts

Abdelwahab Alwahishie and Kevin Taaffe (*Clemson University*)

After a disaster, humanitarian organizations quickly respond by sending volunteers with different skill sets to the affected area in order to serve community's needs. Because these needs are changing over time, and because the number of volunteers arriving to and departing from the affected area is changing over time, inefficiencies in assigning volunteers to tasks arise. Even with well-behaved resources, it is a challenging assignment problem that contains stochastic demand and supply. However, volunteers are human, and their behaviour is influenced by their environment, in particular their work satisfaction. We consider a volunteer's flexibility to work on undesirable tasks and a volunteer's idle time waiting to be assigned as two elements that can reduce their remaining time

on site. In this research, we propose an agent-based simulation model to study volunteer assignment policies based on scenarios that compare community need profiles, volunteer arrival/departure profiles, and volunteer attrition rates.

POSTER PRESENTATIONS

CAST Modelling for Homeland Security

Samantha Shaw and Andrew Wong (*DSTL*)

Dstl has taken a commercially-available simulation modelling toolset, the Comprehensive Airport Simulation Tool (CAST), originally developed to help optimise airport design, and used it innovatively within the Homeland Security arena. CAST has been used to inform a number of high-impact security decisions including the Department for Transport's policy making and cross-Government planning for security at the Olympic Games and the forthcoming Commonwealth Games. It is also helping the UK Border Force to manage immigration control points at airports. As a result of the impact that our analysis has had informing cross-Government decision making, a number of innovative new uses for CAST are currently underway for our military customers, exploiting the benefits of Dstl's position working at the boundaries of defence and security. This poster will present an overview of the CAST simulation modelling toolset, including examples of how this capability has been exploited by UK Government.

How Beneficial is a Generic Facility Throughput Simulation Model?

Maria Kopec, Amy Connor and Ashley Covington (*AWE*)

A Generic Facility Throughput Simulation Model is currently being developed in order to allow facility managers and work planners (of production facilities) to build and use a simulation model in order to test ideas of how to accommodate future demand or product changes. This is being carried out through the use of an MS Excel user interface designed to negate the need for facility managers or work planners to have prior experience of simulation packages. Although the individual facility models and final version of the generic model are still being written, preliminary results of the advantages and disadvantages of using the generic model are presented.

Discrete Event Monte Carlo Simulation for Police Patrol Officer Work Patterns

Hanjing Zhang (*Loughborough University*)

Due to the squeeze on public expenditure, the Police have faced a 20% cut in their budget since 2010 in England and Wales. These reductions provide a great impetus to the investigation about optimizing staff allocation, especially for police patrol officers, with the objective of maintaining (or improving) the service provided to meet the demand from the public within the reduced budget. Patrol force staffing is a complex and serious problem because the cost, service and public safety impacts of poor staffing is substantial. This poster will detail the complexities and constraints of the patrol police officers' work pattern. The concerns of Call Grades and Response Time Targets alongside maximizing the availability of police patrol officers will be presented. Queuing Theory

provides the theoretical basis of building models to solve the problem. Discrete Event Monte Carlo Simulation will be applied to test and modify the existing optimization models.

Application of Hybrid Simulation for Sustainable development Analysis

Masoud Fakhimi and Lampros Stergioulas (*Brunel University*)

Modelling & Simulation (M&S) studies have been broadly used in industry to gain insights into different systems of interest. While sustainability has now become a gradually central consideration in managerial discourse on organisational success, applying simulation and modelling methods to evaluate the "sustainable development" targets in different areas seems to be a holy grail for modellers. Informed by the literature, this research investigates the application hybrid modelling for sustainability analyse the given system at appropriate level of detail. This study also proposes a conceptual framework for application of hybrid modelling aiming to understand and tackle the challenges associated with developing so called Triple Bottom-line based models.

Clinical Capacity Planning with AmbSim

Tom Boness (*ORH Ltd*)

AmbSim is a discrete event simulation model specialised for modelling the response of emergency vehicles to medical incidents and the subsequent transport of patients to hospital. It is in active use in a range of real-world clinical capacity planning projects both in-house at ORH and externally. We focus on two case studies in particular where it has been used to model high call volume regions: the East of England Ambulance Service NHS Trust (EEAST) and New South Wales (NSW) Ambulance. In EEAST AmbSim's ability to report response time and call-to-hospital performance facilitated a review of the service provision for response targets and also the Stroke-60 and STEMI-150 clinical standards. AmbSim's flexibility to accept different resource deployment profiles and dispatch protocols was then harnessed to explore options for improving the service's performance. In NSW, AmbSim is used to assist Service Planning embracing a wide variety of initiatives considered by the Service.

How does competition affect supply chain collaboration? An agent based modelling approach

Niniet Indah Arvitrida, Stewart Robinson and Antuela Tako (*Loughborough University*)

Supply chain collaboration is regarded as the main driving force of supply chain management success. However, the practice of ideal supply chain collaboration is difficult to apply. A factor presumed to hinder supply chain collaboration is competition, but several findings also suggest that competition can improve supply chain performance. This research proposes an agent-based model to study how competition affects supply chain collaboration. It will evaluate to what extent competition impacts on supply chain performance and analyse whether competition enhances or worsens a supply chain. The intended contribution of the work is to provide a basis for recommending an appropriate supply chain collaboration strategy which incorporates business competition. The two key elements of the research are: to understand the impact of competition on supply chain collaboration under different firm characteristics; to explore appropriate supply chain collaboration strategies that incorporate competition both inside the supply chain and between supply chains.

The use of search experimentation in discrete-event simulation practice

Katy Hoad (*University of Warwick*), Thomas Monks (*University of Exeter*) and Frances O'Brien (*University of Warwick*)

Search experimentation is one the largest and most active research areas within discrete-event simulation (DES). However, past studies of DES practice report little transfer of this theory into real world application. We conducted an international survey of over 300 modellers to investigate the extent to which optimisation, meta-modelling and design of experiments are used in practice. Over the last decade there has been substantial growth in the use of optimisation and to a lesser extent design of experiments to tackle practical problems. However, users rarely make use of optimisers bundled with commercial software; opting instead for custom or third party solutions. Outside of academia use of methods is hampered by a lack of application knowledge and a persisting view that such techniques are not necessary. It is clear that academics must not become complacent regarding the dissemination of theory into common practice and continue to reach out to industry users.

Police Demand Modelling and Predictive Positioning for Effective Service Provision

Johanna Leigh, Lisa Jackson and Sarah Dunnett (*Loughborough University*)

With the funding cuts currently being implemented on the police force, improvements in its running efficiency are vital. Hence research has been undertaken into police demand modelling and predictive positioning. The aim is to improve efficiency through locating resources based on crime trends and area coverage. This would result in improved response times, giving officers more time to patrol, and increase their visibility to the public. In this work simulation is used to imitate a period in which incidents are brought to attention, officers are selected and dispatched and the remaining officers are repositioned to optimise the process. The selection of the officers to dispatch will depend on many variables, including location, and a comparison of the different strategies will be made.

VENDOR PRESENTATIONS

AnyLogic 7: New Features Overview

David Buxton (*DSE Consulting*)

This tutorial is intended to present an overview of the new features of AnyLogic 7, the latest version of the most complete simulation and modelling software available. New features include enhanced support for multimethod modelling, Agent inheritance, an improved debugger, decreased need for coding, renewed libraries, and other usability improvements.

For new users, you will learn how to incorporate agents into an environment whose dynamics are defined in SD style, use process diagrams or SD to define internals of agents, etc. We will show how the hybrid modelling concept can for work for various industries such as manufacturing, logistics, healthcare, marketing, business processes, etc. Mixed architecture, of any kind, becomes possible due to flexible object-oriented AnyLogic modelling language has.

We will also be happy to provide you with a trial version of AnyLogic for Windows, Mac and Linux. And will be available in the exhibition space throughout the conference.

Celebrating 20 years of SIMUL8 in 2014

(SIMUL8 Corporation)

In 2014 SIMUL8 Corporation continues to drive the advancement of simulation software. With new features in our latest release to give you more power and control, new projects that will transform the use of simulation across the globe and new products on the horizon, 2014 will be a landmark year to celebrate our 20th anniversary.

Our latest simulation software release, SIMUL8 2014 includes new features and improvements driven by the people that know best, our customers. SIMUL8 2014 gives you more control with improvements to Resources driven by our Contact Centre and Healthcare work. We've also improved our Visual Logic programming language that will delight our expert users and give even the newest user increased access to the full power and flexibility of SIMUL8.

The SIMUL8 team is also a partner in an EU funded project that will develop a cloud-based, one stop shop solution for small or large scale simulations. The CloudSME Project will enable the wider take-up of simulation in manufacturing and engineering SME's. The CloudSME Simulation Platform will support end user SME's to utilize customized simulation applications in the form of Software-as-a-Service (SaaS) based provision. It will also give access to a Platform-as-a-Service (PaaS) solution that enables the creation and delivery of simulations in the cloud.

Join us for our session to find out more about what promises to be an exciting year. Alternatively, you can visit www.SIMUL8.com or follow us on Twitter @SIMUL8 to keep up to date with the team in 2014.