In this issue we are featuring Augmented Reality, (AR) and Virtual Reality, (VR) for use in education. It seems that not a week goes by without the media covering how both AR and VR are being used for medical, industrial and publishing applications as well in the staple area of gaming.

So what is Augmented Reality and Virtual Reality?

In the context of this article and how it is applied by KMI, Augmented Reality uses mobile devices such as smart phones and tablets to superimpose information onto the world we see through a device’s camera, giving us an enhanced version of reality.

Most people surely have heard of Pokemon Go, the sensational app released during 2016 that smashed AR into the hands of millions of people all over the world.

This screenshot is a perfect example of one use of AR where the user is able to see 3D models, text, images etc known as augmentations overlaid in the view finder of their mobile device.

There are numerous ways to add augmentations in this manner, from the use of trigger images to GPS location markers.

Pokemon Go makes use of the GPS approach whereas, for the most part, KMi is using trigger images to facilitate the placement of augmentations.

Other articles in this issue

FORGE - Officially Excellent!

KMi Blockchain technology featured in Times Higher Education

Beyond Learning Analytics
Again in the context of this article and how it is applied by KMI, Virtual Reality is a computer-generated environment that allows a user to be immersed into an artificial virtual situation when wearing a VR headset.

VR has the ability to make the user feel they are really inside this virtual environment and are able to interact with objects within it via various means, from gaze, touch or bio-sensor feedback, to name a few.

There are numerous VR headsets currently available that range from the more powerful tethered brands such as Oculus Rift to the more affordable Zeiss VR One Plus or Virtoba X5 Elite both of which make use of the user’s existing smart phone.

Inspired by the Pokemon Go theme, Paul Hogan has developed OU GO; designed to assist staff and visitors to locate the various campus buildings and outdoor artwork on the go via their Android or iOS device. The app aims to add some fun for users while they seek event and building locations around the campus and to update the user’s location in real time to make it easier to find the desired destination.

Along with providing users with a selection of character (avatar) choices the app displays the campus in 3D allowing the user to select the building they are seeking by displaying the OU shield. The user can also switch on the events, outdoor artwork and car or bicycle parking map layers to display interactive icons which when clicked will display details about the selected artwork or parking area.

To install OU Go visit the Google Play Store or the Apple App Store using your mobile device and follow the on-screen instructions.

The ‘events’ feature will be populated with upcoming events in the near future and development of the app will continue over the next few weeks. Please send your feedback to Paul, via the app, regarding ideas for improvements or additional functionalities.

http://kmi.open.ac.uk/
Human Biology App

As part of KMI’s research into the use of AR and VR a prototype mobile application has been developed by Paul using an anatomically correct 3D model of the human heart.

The aim was to explore how the University could use this technology in course modules and the model was demonstrated to the Human Biology (SK299) Module Team.

The team immediately saw the potential to move from traditional textbooks to a digital virtual learning environment that allows the seamless introduction of new teaching technologies that enhance the learning experience for our students.

Through the App students perceive that they are interacting with a real 3D object.

The app enables students to investigate dynamic 3D structures, such as the beating human heart (that are traditionally taught using a series of static images), thus providing a realistic learning experience.

http://kmi.open.ac.uk/
The SK299 mobile app will provide students with the ability to interact with a 3D human heart that provides the following features:

Two model types:
- A normal heart with close atria and open ventricles including the front portion of the ventricles that can be open or closed
- A normal heart with one cut atria and open ventricles to allow viewing of the conduction system

Interactive pin labels
- Areas of interest on the heart are labelled with pins that the student can tap/click to see context sensitive text relating that specific part of the heart, name, function etc

Bluetooth connectivity
- An optional activity where a compatible bluetooth heart rate monitor is available the student will be able to link their own heartbeat to the beating model

Blood flow animation
- Blood flow arrows animate through the heart to show the oxygenation / deoxygenation process

Manual heart beat control
- Students are provided with a control allowing them alter the heart beat animation on a linear basis

ECG
- An ECG that can be viewed when the normal heart beat is in operation
- Additional ECG readouts for Atrial Fibrillation, Ventricle Fibrillation and Myocardial Infarction

Virtual Reality inner heart environment
- An optional activity that takes the student inside a beating heart model allowing them to view from inside the atria and ventricles via a VR headset

The app content has continued to evolve from what started as a single model prototype to what it has become today. It is likely that by the time the app is due for student use in October 2017 even more features will be present.
Other Developments

Two other KMi AR mobile apps currently available on the App Store and Play Store:

**OU Alive**

‘OU Alive’ was developed to bring the University’s 2015/2016 Undergraduate Prospectus to life. Various pages of the prospectus contain trigger images that allow the app to display 3D models relative to the pages content, such as a volcano for Geology, a brain for Science. The concept behind this app was to reach people via word of mouth who may not have necessarily come into contact with the OU.

https://itunes.apple.com/gb/app/ou-alive/id951618889?mt=8

**OU Hunt**

‘OU Hunt’ is an AR mobile application for the Open Media Unit to be used in conjunction with their HUNT poster campaign, that compliments the OU/BBC series ‘The Hunt’ which began broadcasting on on 1st November on BBC 1.

The application brings your poster to life and reveals unseen, extra content; including a 3D augmented reality cube with access to slow-motion clips demonstrating unique cheetah physiology, as well as stand alone exclusive interviews with scientists in the field revealing how making the programmes helped to uncover new animal behaviours and provide insight into ongoing studies.

https://itunes.apple.com/gb/app/ou-hunt/id1026851340?mt=8

Both AR and VR technologies have enormous transformative potential, not just for education, but in industry and business alike. A move from traditional textbooks, technical manuals in the workplace or even a movie giving students a ‘how to guide’ about digital virtual learning environments to highly interactive AR/VR applications will transform the learning experience. This article just gives a taster of what is possible and some of the work that has been undertaken in KMi.

Keep up to date with our AR and VR work by visiting: [http://arvr.kmi.open.ac.uk/](http://arvr.kmi.open.ac.uk/)
And in other news…

KMi at ISWC 2016

The 15th International Semantic Web Conference took place in Kobe, Japan between 17-21 October, and the KMi contingent had a very strong showing at this conference. Ilaria Tiddi and Allan Third presented papers in the highly selective research track, on “Learning to Assess Linked Data Relationships Using Genetic Programming”, and “Integrating Medical Scientific Knowledge with the Semantically Quantified Self”, respectively.

The application track was also well covered by KMi-ers, with Gregoire Burel (“EnergyUse - a Collaborative Semantic Platform for Monitoring and Discussing Energy Consumption”), and Francesco Osborne (“Automatic Classification of Springer Nature Proceedings with Smart Topic Miner”), both presenting in this track.

However, the highlight was probably Hassan Saif winning the highly prestigious SWSA Distinguished Dissertation prize, awarded every year to the best Doctoral Thesis in the field. As the winner of this prize, Hassan gave an invited talk about his doctoral thesis, “Semantic Sentiment Analysis of Microblogs”.

Hassan also presented an expert highlights paper in the workshop on Linked Data for Information Extraction, “A Linked Open Data Approach for Sentiment Lexicon Adaptation” and contributed to the Posters & Demos session, with a poster entitled “On the Role of Semantics for Detecting pro-ISIS Stances on Social Media”. There were also two demos presented by KMi-ers – Gregoire Burel, “Monitoring, Discussing and Publishing Energy Consumption Data using EnergyUse”, and Francesco Osborne, “Smart Topic Miner: Supporting Springer Nature Editors with Semantic Web Technologies”.

Miriam Fernandez chaired the lightning talks session, during which Ilaria Tiddi presented on “Semantic Web and Robotics: Can we work together?”. Other important contributions were provided by Miriam and Enrico Motta, who were part of the tutor group invited to attend the mentoring lunch for PhD students, postdocs and junior faculty members, and Harith Alani, who attended editorial board meetings for the Semantic Web Journal and the Journal of Web Semantics – the latter of which was also attended by Miriam. Next year’s ISWC will be held in Vienna, Austria, and our very own Miriam Fernandez will be one of the Programme Chairs!
KMi’s Blockchain Activity

One of KMi’s key research areas is Blockchains, especially its potential use in education. Take a look at what the KMi team got up to during the last few months.

KMi Blockchain Group visits JISC

KMi’s Blockchain Group visited Jisc’s London offices in November for a workshop on the use of blockchain technology in higher education, specifically in tracking a student’s learning history. After a presentation by KMi Director, John Domingue, demonstrations of some of our research ‘Dapps’ (distributed or decentralised applications) were given by Michelle Bachler (reputation), Kevin Quick (course registration) and Chris Valentine (ePortfolio). Later, Keerthi Thomas and Allan Third joined breakout sessions which focussed on particular areas of interest, including proof of identity, badges, authentication and micro-accreditation. Jisc have recently set up a server as part of a new Ethereum blockchain that will shortly expand to include a number of other leading UK universities.

KMi blockchain technology featured in Times Higher Education

In December, The Times Higher Education published an article by Martin Hall, former vice-chancellor of the University of Salford, which considered how Web 3.0 could revolutionise the way higher education is delivered.

In the article, our Director, John Domingue, explained to Martin why KMi’s “student first” vision for blockchain-enabled provision is good news for those needing access to higher education from middle and low income families in developing economies.

KMi’s blockchain prototype for assembling micro-credentials – or “badges” – has the potential to enhance the learner experience, storing all learning outcomes in an expanding eportfolio for all students.

“We envision a world in which the awarding and validation of qualifications no longer occur exclusively under the management of an education institution or an employer and individual students, teachers, and peers take more ownership of the learning experience and its outcomes without compromising on safety, security, and accessibility” - John Domingue.

http://kmi.open.ac.uk/
Buy Bitcoin now!

"Buy Bitcoins Now!" was one of the main messages from Chandler Guo – who owns one of the world’s largest Bitcoin mines – in the recent Internet of Value workshop held at Clare Hall at the University of Cambridge on 11 November. The event focused on how blockchains can be used to support the transfer of non-financial value. In his talk, Chandler articulated how future citizenship would depend on the ownership of crypto currency funds and how the value of Bitcoin is related to its use in online gambling in China and the fact that it operates as a Distributed Autonomous Organisation (DAO) with no leader.

Other talks at the event covered a wide variety of topics. Maryam Taghiyeva from the Centre for Citizenship, Enterprise and Governance outlined how the Seratio Blockchain can support the transfer of non-financial value using a special representation and consensus mechanism. One application area for this work is the development of a currency for Muslim financial transactions ensuring that the relevant rules for financial processes are followed. Ashish Gadnis, Chair of Financial Inclusion at the Wall Street Blockchain Alliance and CEO of BanQu talked about BanQu’s blockchain based identity platform that enables a secure and immutable solution redefining financial inclusion by enabling economic opportunities for people living in extreme poverty. He reported on case studies of how citizens living in poverty and refugees were able to access credit and insurance for the first time through blockchain representations of assets such as land and income.

John Domingue discussed KMi’s work on using blockchains for badging, ePortfolios and crowdsourced accreditation in an adult learning context. The presentation was very well received with future collaborations with the Centre for Citizenship, Enterprise and Governance currently being explored. The general consensus at the end of the event was that although we are at the beginning there exist a wealth of opportunities in the intersection between non-financial value and blockchain technology.

ePIC 2016

KMi’ers John Domingue and Michelle Bacheler attended ePIC, the 14th conference on ePortfolios, Open Badges, Personal Ledgers, Identities, Trust and Blockchains, Bologna 26-27-28 October 2016.

Bologna is home to the oldest university in the world, founded in 1088, so it was a
fitting place for the Open Badge and ePortfolio communities to come together and discuss the future of Open Badges and “to think deeply about technology - not just its surface and trends but its newest ideas and applications - and technology to be the key to open up educational and social innovation: open it up to new viewpoints and new paths.” (http://www.epforum.eu/)

The conference was held at the Palazzo Gnudi whose building has its origins in the first half of the 1500s. The room the conference was held in was the beautiful Galleria degli Stucchi, decorated in 1789 by Giacomo Rossi with high-relief panels and niches with pairs of figures inspired by Greek classicism. It was a breathtaking setting and somehow lent additional gravitas to the proceedings.

The Open University was there to talk about how we see the future of Open Badges integrating with Blockchain technology. John gave a well-received presentation on “Open Blockchain: Experiments In Using Blockchains to Support Adult Education”. John also had a constructive workshop brainstorming how blockchains might be used for badges and ePortfolio data.

Later during a pleasant walk through the cobbled streets of Bologna John had productive discussions with Phil Long, the Chief Innovation Officer at the University of Texas in Austin who is experimenting with blockchains along similar lines to KMi. Phil went on to give an inspiring presentation of the work they have been doing setting up multiple blockchains within various departments at his university onto which they have then been putting their open badges.

Of the many other thought provoking talks given, one notable speaker was David Leaser from IBM presenting on ‘How Open Badges deepen professional engagement’. IBM are currently offering 8 badges to their employees for gaining credentials from the IBM Business Unit. Many of these badges are also open to anyone to earn through the IBM Professional Certification Program.

Leila Topic from LRNG gave an interesting talk about their work on the ‘Cities of Learning’ project. This project works in partnership with “schools, businesses, cities, and community institutions such as libraries and museums, nationwide and around the globe, to create a 21st century learning experience for learners everywhere” (https://www.lrng.org). LRNG works with young people and tries to connect their passions to their learning, leveraging mobile technology to engage and support the development of real-world and employable skills.

One of the outcomes of the ePIC conference was the Bologna Open Recognition Declaration (BORD). This declaration is “a call for a universal open architecture for the recognition of lifelong and lifewide learning achievements”. Participants were asked to support the declaration and where issued an open badge for showing their support. The image on the right shows John’s Open Badge for supporting BORD: It was an enjoyable and stimulating event where the overall consensus was that a combination of blockchains, ePortfolios and badges have the potential to radically transform education for student and societal benefit.
FORGE - Officially Excellent!

The FORGE project has been rated "Excellent" by the Project Officer and the review panel during the final project review, which took place in Brussels on week commencing November 28th. The review was attended by representatives from all project partners, plus external partners that have joined the project through its Open Call series. FORGE has been a 3-year FP7 project, led by John Domingue from the Open University.

The project has promoted online learning using Future Internet Research and Experimentation (FIRE) facilities and has developed a number of sustainable educational artefacts, including a variety of FIRE courses and widgets, an interactive eBook, and more.

The project has extended its outreach beyond the project consortium and the European borders by attracting several external partners that have deployed the FORGE educational artefacts in their teaching practices and have also contributed their own courses and widgets to the FORGE community.

Zdenek’s 25 years at the OU

At KMi’s Town Meeting in November, KMi staff celebrated Prof. Zdenek Zdrahal’s 25 years’ working at the Open University, 21 years within KMi.

Dr Petr Knoth led a tribute from Zdenek’s team, after which we commemorated the occasion in epicurean style, including a personalised giant cookie and an edible pie-chart made by the Analyse team. We reflected that Zdenek has led some great work at the Open University and 25 years marks an incredible achievement.

Throughout his time here, Zdenek has contributed to the fields of Artificial Intelligence, Case Based Reasoning, Design, Knowledge Sharing, Machine Learning and Predictive Modelling. KMi is sure that Zdenek will continue doing great work (hopefully for another 25 years) at the Open University!
SlideWiki meets in Genoa

The third plenary meeting of the SlideWiki project took place on November 17th-18th in Genoa, Italy. The meeting was hosted by CNR-IEIIT/School of Robotics.

Alexander Mikroyannidis and Allan Third represented the KMi team and joined more than 30 representatives from 17 partner organisations.

SlideWiki is aiming at increasing the efficiency, effectiveness and quality of education in Europe via widely available, accessible, multilingual, timely, engaging and high-quality educational material (i.e. OpenCourseWare).

In this large-scale trial project, we are further maturing the SlideWiki technology platform (available at SlideWiki.org), integrating it with state-of-the-art educational platforms and performing large-scale trials in secondary education, vocational and professional training, higher education, as well as community-driven open-education.

The new SlideWiki platform has just been released bringing enhancements both in the back-end and front-end of the platform. The project is now focusing on the preparation and launch of the trials of the SlideWiki platform targeting a wide range of pedagogical contexts. KMi is leading the trials with informal learners using OpenLearn and iTunes.

Best Demo Award at EKAW!

KMi’ers won the Best Demo Award for their paper ‘DKA-robo: dynamically updating time-invalid knowledge bases using robots’ at EKAW (The 20th International Conference on Knowledge Engineering and Knowledge Management) in Bologna, Italy in November 2016. Their paper focused on information gathered from the real world and how it can tend to vary in time. For example, the temperature of a room, the number of people in a bar or even the strength of a wi-fi signal are affected by a large number of factors. Indeed, managing such dynamic information constitutes a key issue in real-world scenarios. The KMi team, Ilaria Tiddi, Emanuele Bastianelli, Enrico Daga and Mathieu d’Aquin, chose to use Semantic Web technologies to represent and manage the time-validity of information. These, combined with an agent acting as a mobile sensor, update the outdated statements in the knowledge base, thus guaranteeing time-valid results against user queries. Conference attendees were shown the demo, called DKA-robo (Dynamic Knowledge Acquisition with a Robot) where a robot is instructed to move and sense information, and how the evaluated plan is executed to preserve the time-validity of the knowledge base.
Responsible Research and Innovation in Action

The conference “Responsible Research and Innovation (RRI) IN ACTION” organised by the RRI Tools project and supported by the European Commission was held in Brussels on the 21st - 22nd of November 2016. This event brought together 200 experts in the field to discuss open science and innovation systems that tackle the societal challenges of our world. RRI IN ACTION engaged a wide range of R&I stakeholders, including researchers and research organisations, policy makers at global, European, national and regional level, business and industry representatives, science education members, and civil society organisations.

During this event, various relevant questions were discussed: What are the key impacts of RRI projects for academia, business and society? What have RRI projects achieved so far? Is our research work addressing social-scientific issues that are significant for society? What are the consequences of projectification? How are we equipping the next generation for RRI? How are the RRI best practices influencing policy? What are the international perspectives on responsibility and innovation? What is next? What is beyond H2020?

Ale Okada, technical coordinator of the European project ENGAGE, invited as a speaker, presented various outcomes of the project and its impact in education. She informed the audience that ENGAGE has developed a wide community of more than 12,000 teachers in 80 countries, 30 Open Educational resources on topical science and 3 MOOCs translated into 10 languages, a significant RRI curriculum that connects science with societal issues, needs and concerns, 10 inquiry skills for equipping youth for RRI linked to AQA national exam board, 6 pedagogical tools for educators to embed RRI in the classroom, and various best practices at local, national and transnational level.

During the conference, Okada also discussed with the participants the outcomes of the research on KMi’s mapping technology “*LiteMap*” for RRI, which has been used by the ENGAGE community (researchers, teachers and students) during the two year study in Europe and Brazil.

The event was a fantastic opportunity to envision collaboratively the next steps of Responsible Research and Innovation in Education and ended with a nice proverb: “If you want to go fast - go alone, if you want to go far - go together”.

*LiteMap gives online communities a place to map out visually a debate that may be happening in other forums or Websites. For more information, visit: http://maptesting.kmi.open.ac.uk/*
Beyond Learning Analytics

Data is now seen in many sectors as a platform for the provision of operational services. For example, Admiral announced that they would price car insurance based on Facebook post data.

Within the UK Higher Education sector, learning analytics – the application of data analytics to student data – is beginning to have an impact and is attracting widespread interest across the HE sector. So, what is next for HE and data technologies?

On 3 November KMi co-chaired with Jisc - a workshop containing many of the research leaders and practitioners in HE who are interested in this question. Following on from the basic principles of ‘open’ data, and linking datasets together to increase value, the main focus for the event was how higher and further education institutions can collaborate with data.

The day began with an overview of the issues, challenges and opportunities of a collaboratively formed ‘Education Dataspaces’ from John Domingue, followed by Phil Richards, Jisc’s Chief Innovation Officer, who outlined their work on a shared data and analytics architecture. This was followed by a number of short presentations from attendees on a variety of data and HE topics. Mark Stubbs, from Manchester Metropolitan University, revealed how his university has radically transformed their student data infrastructure by connecting disparate databases through a common naming scheme and data quality and data cleaning processes. After lunch three groups focused on: current and future datasets in use; the technical infrastructure required to support data sharing including shared vocabularies and standards; and cultural inhibitors. The day finished with a number of agreed actions all related to enhancing the sharing of HE data across the sector. There was consensus that this workshop represents the beginning of a journey and regular follow-on events are being planned.
A successful first year review for EDSA!

EDSA had a very successful first review 6 October 2016 in Luxembourg.

Professor John Domingue and Keyur Dave represented the KMi team at the review and were also responsible for the overall project presentation as KMi is the project coordinator and were very happy with the work carried out in mapping out the landscape related to data science.

EDSA is a three year long project funded by the European Commission under The EU Horizon 2020 Framework for Research and Innovation with a budget of almost €3 million. The overall objective of EDSA is to establish a virtuous learning production cycle.

The curricula and learning resources will be continuously evaluated by pedagogical and data science experts during both development and deployment. All the international reviewers were very impressed with what has been achieved with the project so far, and were excited by the potential value of the EDSA for designing a curricula for data science training and data science education across the European Union.

MK:Smart featured at global broadband event!

KMi’s Business Development Manager, Alan Fletcher, attended the Broadband World Forum at London’s Excel conference centre in October where he introduced the conference audience to the MK:Smart Story and the need for technical and cultural connectivity in a city environment. Alan focused on the need to connect not just things, but also people and places. The main feature of the presentation was the MK Data Hub and the story of how delivery of innovation in the data environment can shape the way a city grows. The connectivity of things, people and places with the exploration of data-driven services in MK was highlighted as a unique feature of the MK future city landscape that can be replicated to deliver innovation in cities across the world.

Greenwich and Cardiff were also showcased at the event, and Alan’s session explored synergies between them and Milton Keynes, recognising that there are common issues in smart city thinking with local context. Both Greenwich and MK are on the verge of deploying autonomous vehicles to help address aspects of mobility, yet both have individual needs and user profiles and both are developing independent solutions to address their needs. Follow the MK:Smart project on www.mksmart.org and @mksmartproject for the latest news.
KMIs World Stage and Closer to Home

Keyur Dave, Mathieu d’Aquin & Alessandro Adamou travelled to Graz, Austria for the EU funded AFEL project (23 - 25 Oct).

Prashant Khare attended the EU funded COMRADES general meeting in Brussels, Belgium (01 - 03 Nov).

Damian Dadswell, Harriett Cornish & Chris Sanders visited London, UK to attend the Frontier Conference (16 Nov).

Tom Dickinson participated in the ICWI Conference, which took place in Mannheim, Germany (28 - 30 Oct).

Trevor Collins attended the HEFCE Workshop in Bristol (06 - 08 Nov).

Carlo Allocca travelled to Brussels, Belgium for FEAP (the Federation of European Aquaculture Producers) (06 - 07 Dec).

Harith Alani, Miriam Fernandez and Keyur Dave are travelling to Brussels, Belgium to attend the EU funded DecarboNet Project Review Meeting (10 - 12 January).

John Domingue & Alex Mikroyannidis attended the HUB4FIRE Kick Off Meeting, being held in Brussels, Belgium (18 - 19 January).

KMi Future

Events Coming Soon...

• Angelo Salatino will be travelling to Bari, Italy to participate in the Big Data Winter School (10 - 18 February).

• John Domingue will be travelling to Portoroz, Slovenia to chair a workshop on ‘Semantics and Distributed Ledgers’ at ESWC Conference (28 May - 01 June).

• John Domingue & Michelle Bachler are attending EDCON conference in Paris (17-18 February 2017).

• Zdenek Zdrahal, Martin Hlosta, Michael Huptych are attending LAK 17 Conference in Vancouver after having 4 papers accepted. (13-17 March).

• John Domingue will be chairing a workshop on ‘Linked Data & Distributed Ledgers’ at WWW Conference in Perth, Western Australia (03-07 April).