In this issue we’re featuring KMi’s work on Blockchains, which is investigating “distributed ledger” platforms, which have the potential to provide secure and verifiable access to data in many domains in a distributed and trustless environment. KMi is pioneering techniques in the use of blockchains in education, data integrity and the Semantic Web.

The BlockChain Revolution

Over the last 18 months, KMi has built up an active research and development group focusing on blockchain and distributed ledger technologies.

Members of KMi are working on the use of blockchains to create a trustable, decentralised repository for educational certification, ePortfolios and datasets with privacy concerns or which could be subject to tampering.

We are also working on connecting blockchains with Linked Data.

The best-known use of blockchains is the Bitcoin cryptocurrency – a form of electronic money which does not rely on any central bank or authority. The blockchain provides the ledger (record of all transactions) for Bitcoin, and is what allows Bitcoins to be spent without the worry that money will be
double-spent; that is, that an unscrupulous person would be able to spend the same money twice.

Despite its origins, the blockchain concept is not, however, restricted to currency. Data can be stored in transaction records, and can therefore be held as permanently and immutably as financial transactions, which is useful in all kinds of scenario. KMi has been working with the Ethereum blockchain\(^1\), which is designed as a blockchain-based application platform. Ethereum’s big innovation is the use of smart contracts: blobs of compiled code which are stored on the blockchain and which can be executed by nodes in the Ethereum network.

The Open Blockchain project in KMi is exploring how blockchains may be used in a number of educational scenarios.

*Certification* is one of the most important. The traditional model of educational certification involves a student undertaking learning activities, accompanied by assessment. If the assessment performance meets criteria specified by an educational institution, then it may issue a certificate recognising that student’s academic achievement. Students may then present all their certificates to employers or other educational institutions as evidence of their learning.

\(^1\) http://www.ethereum.org

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Michelle Bachler
Project Officer

I am a Project Officer in KMi working primarily on collective intelligence and knowledge mapping softwares and was the lead developer for Compendium and am currently the lead developer for, Cohere, Evidence Hub, Debate Hub and LiteMap. At present, I am experimenting with the Ethereum blockchain to see how it might be used in a number of Educational scenarios.

http://kmi.open.ac.uk/
Recent innovations in digital and informal learning have led to the concept of OpenBadges\(^2\), which anyone can issue to anyone else to recognise achievements in informal learning. The Open University's OpenLearn platform\(^3\) awards OpenBadges for learners studying informally.

There are several points of failure in the traditional model. Certificates on paper and in digital form are, in general, easily faked, and it can be difficult to identify fraudulent qualifications\(^4\). Genuine certificates may become impossible to validate if the issuing institution no longer exist or cannot be contacted. And verification of paper certificates and identity can be slow and hard to do, particularly with a global workforce.

We instead envision a world where Open Badges and other more formal types of accreditation are stored directly on the blockchain, and students, their peers, educational institutions and employers can all access and verify, with permission, certificates via smart contracts and cryptographic signatures. We have been working on placing OpenBadge data from OpenLearn on Ethereum, and are currently adapting to the recently published OpenBadge 2.0 specification. Verification is fast and easy, certificates are extremely difficult to fake or alter, and, because every node in a blockchain network always holds the full contents of the chain, there is no reliance on an awarding institution or individual to verify.

Beyond this, certificates from multiple sources are all stored in the same place and can be associated with the same individual in a standard way.

As well as certification, we are also working on ePortfolio models using blockchains. ePortfolios are collections of work which can be used to showcase what a student has learned or created. An ePortfolio stored on and accessed through a smart contract can be access-restricted to both particular people and for limited times, for example to allow a prospective employer to see a curated subset of a portfolio in order to assess suitability for a job.

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\(^2\) [https://openbadgespec.org](https://openbadgespec.org)

\(^3\) [http://www.open.edu/openlearn/](http://www.open.edu/openlearn/)

We are collaborating with JISC as well as other UK universities to explore a UK Higher Education blockchain for certification and ePortfolio uses.

Beyond education, blockchains are being tested in other ways in KMi. The GreenDATA project collects data from energy generation installations, such as domestic solar power systems, for use in renewable energy education. There are scenarios where this, and similar, data would need to be recorded in a trustworthy manner, such as in a consumer-to-consumer energy market, or in an environment with a political regime hostile to, e.g., climate science or climate data. We are also developing Linked Data indexing tools, to allow blockchain data to be connected to the Linked Open Data cloud, as well as to permit more straightforward searching; a task which is not currently well supported in blockchains in general.

If you want to know more about our blockchain work, contact John Domingue (john.domingue@open.ac.uk), the Director of KMi, or Allan Third (allan.third@open.ac.uk). The KMi Blockchain group also includes Michelle Bachler, Kevin Quick, Chris Valentine and Umar Mir.
And in other news…

OU receives new grant to make education more inclusive

The Open University (OU) is leading a £480,050 project funded by the Higher Education Funding Council in England, to address barriers to student success.

In collaboration with the University of Leeds and Plymouth University, Dr Trevor Collins, Research Fellow in the OU’s Knowledge Media Institute, is initiating the ‘Embedding and sustaining inclusive STEM practices’ project. This two-year collaboration aims to share and promote inclusive educational practices in Science, Technology, Engineering and Maths (STEM) disciplines across UK universities.

The project, which began on 1 March 2017, will focus on disability as a key factor affecting the outcomes of STEM students across Higher Education (HE), particularly in relation to academic performance and professional employment.

The proportion of OU students with disabilities has increased year-on-year since 2011, reaching 16% by May 2016 (14% in STEM). STEM is consistent with the rest of the OU and HE sector in seeing a rise in the proportion of students declaring mental health disabilities (22% of STEM declarations) and specific learning difficulties (16% of STEM declarations). This presents a significant proportion of OU students for whom access to learning resources and social inclusion within group learning activities is critical for their success.

Building on both previous collaborations and expertise unique to each institution, the cross-institutional team will capture, evaluate, apply and disseminate inclusive educational practices. Specifically, the project will focus on enabling Higher Education institutions to:

- Embed inclusive educational resources and design practices.
- Sustain inclusive module and curriculum delivery practices.
- Develop inclusive career pathways for students and graduates.

This project unifies the institutional priorities of the partners, notably: the OU’s mission to be open to people, places, methods and ideas’ and its values of inclusivity, innovation and
responsiveness; the University of Leeds’ remit to provide ‘fair and equal treatment, active engagement with a variety of learning opportunities, and recognition and celebration of diversity’; and Plymouth University’s objective to ‘advance knowledge and transform lives through education and research’.

Using the successful and innovative developments in fieldwork, lab work and online learning that already exist at each institution, the project will work in partnership with staff and students to further embed the values and practices of inclusive education. Key outcomes will include case studies on STEM-specific pedagogies that evidence the impact of inclusive design, and cross-institutional recommendations and principles developed in consultation with the wider HE sector and professional associations.

### KMi Researchers participated in a case study for an ADBU's Text and Data Mining in Research Report

In January the French Association of Directors and Officers of University Libraries and Documentation (ADBU) released a report entitled “Text and Data Mining in Higher Education and Public Research”, which mainly explores the UK and French copyright exceptions for text and data mining (TDM). In more detail, the report lists the benefits of text and data mining in scientific research, defines the primary threats in the adoption and practice of TDM, i.e. legal and technical, presents the need for the development of a technical infrastructure, and demonstrates the motivation barriers and the necessary developments in the field.

In an effort to understand the level of the TDM adoption and the lack of thereof, the report presents various case studies, one of which is the CORE project. CORE, an aggregation service currently holding around 4.5 million of full-text and 66 million metadata records, has been providing infrastructure for TDM via its main services, namely the CORE API and the CORE Datasets. As the report puts it: “Text-mining at scale cannot take place without infrastructure. Investment is needed in the technologies used to aggregate, normalise, interrogate and preserve TDM materials”. CORE’s services offer open access content and are provided to everyone free of cost. In addition, CORE is participating at the EU-funded project OpenMinTeD, which aims to create a TDM infrastructure, focusing on legal, technical, policy and interoperability issues, while its role is to act as an open access scientific content provider.

Additional to the technical challenges, there are also legal requirements that are creating obstacles and limit the incentives to TDM. Even though there have been amendments both in the UK and the French copyright law, there are still grey areas that prohibit the application of TDM
practices among researchers. Furthermore, the legal framework is not harmonised in all countries, while in some of them it does not even exist. The report states that "changes to copyright law must be accompanied by improvements in access, infrastructure, skills and incentives for TDM". In that context, and while CORE is already technically participating in the promotion of TDM, it welcomes all efforts for the advancement of TDM and is open to provide assistantship with the development of new and improvement of existing policies based on its own TDM experience.

Health and Wellbeing Priority Research Area Website Launched

KMi’s development team helped to launch the Open University’s new website for the Health & Wellbeing Priority Research Area. This priority research area brings together the impressive expertise of Open University researchers with their extensive network of local, national and international partners and collaborators across government, industry, policy, practice and the wider academic field. Research in health and wellbeing is strategically important within all of the University’s Faculties, cutting across various disciplines including healthcare management, ageing studies, reproductive and sexual rights, assistive technologies, patient data management, mental health and biological health sciences. The scope of University expertise ranges from the science underpinning health and disease through to the medical humanities. The Open University is committed to working towards social justice specialising in participative and inclusive research methods with marginalised and vulnerable communities.

Where are they now? The Our Story App

KMi has a long track record of co-designing innovative demonstrators and it’s always rewarding when we hear back from our collaborators about how our prototypes have evolved and continue to influence practice. In a recent article on the whitefox blog, Natalia Kucirkova, a Senior Research Fellow at University College London, talks about the challenges of designing the Our Story app for iPad, the original version of which was the outcome of one such KMi collaboration in 2011. Natalia says she is particularly grateful to KMi’s Paul Hogan for his contribution to creating the app. The latest version of the app, which enables young children to create and read digital picture books on handheld devices, was redeveloped by a commercial developer in 2015 and is available on the iTunes store.

http://kmi.open.ac.uk/
KMi at the latest Show and TEL

The Open Technology Enhanced Learning (openTEL) is a priority research area, bringing together researchers from across the Open University. The group runs regular Show and TEL events to share expertise among its members. The latest such event took place on February 9th.

Alexander Mikroyannidis from the Knowledge Media Institute (KMi) joined the event and presented some of the latest KMi TEL projects focusing on rich interactive learning resources. In particular, he presented the FORGE project on remote labs and online experimentation, the EDSA project that bridges the data science skills gap across Europe, and the SlideWiki project that offers solutions for collaborative open courseware authoring.

CORE listed Number 1 in the list of top 21 free online journal and research database

An online editing and proofreading company, Scribendi, has recently put together a list of top 21 freely available online databases. It is a pleasure to see CORE listed as Number 1 resource in this list. CORE has been included in this list thanks to its large volume of open access and free of cost content, offering 66 million of bibliographic metadata records and 5 million of full-text research outputs. Our content originates from open access journals and repositories, both institutional and disciplinary, and can be accessed via our search engine. In addition, we also offer an API and Datasets for programmable access to this content, enabling the development of new artificial intelligence-based applications for scientists and for carrying out text and data mining of scientific literature.

http://kmi.open.ac.uk/
COMRADES goes to Nepal

COMRADES project, along with the Nepalese Centre for Integrated Emergency Management (CIEM), organised a very successful workshop in Kathmandu, attended by local community leaders, NGOs, government officials, and even the Prime Minister of Nepal, Mr Pushpa Kamal Dahal. The workshop was on "Collective Awareness Platforms for Sustainability and Social Innovation for Making Crises Resilient Community", and was aimed at connecting with stakeholder communities, to better understand their socio-technical requirements for disaster communication and management tools and processes. Kenny Meesters from the University of Agder, who led the COMRADES workshop, says that "Our task is to capture and build on the best practices in the communities rather than deliver a technological platform with no connection to their own practices". Focus groups and interviews were organised with over 150 people in Kathmandu and in remote areas of Nepal. The event was well covered by the media in Nepal, constituting an excellent dissemination activity for the project, and a unique opportunity to ensure that the technologies developed in COMRADES fit the needs of the local end-user communities.

COMRADES is a €2 million European H2020 project, co-ordinated by Prof Harith Alani from the Open University, and involves the University of Sheffield, University of Agder (Norway), iHub (Kenya), and Gov2U (Belgium).

Up2U kicks off in Amsterdam

On February 27th, the Up2University project held its face-to-face kick-off meeting in Amsterdam, the Netherlands, hosted by the project coordinator Géant. KMi and the Open University were represented by Allan Third. Up2U is a Horizon 2020 project seeking to bridge the gap between secondary and higher education by developing innovative and flexible tools for learning which can be accessed by students using their own devices while remaining integrated with their formal schoolwork. The focus is on the development of flexible learning paths taking advantage of the wealth of Open Educational Resources which are now available.
CARRE rated ‘Excellent’ in final review

The CARRE project received its final written review, and was rated “Excellent” by the Project Officer and the review panel. The final review meeting took place in December and was attended by representatives of all CARRE partners. CARRE was a 3-year FP7 project, working on a personalised risk prediction and planning tool for patients with, or at risk of, chronic cardiac and renal conditions and associated comorbidities. Patients using low-cost monitoring devices, such as activity trackers and body analysis scales, can see visualisations of their health risks, based directly on their personal data connected with an up-to-date semantic repository of clinical knowledge extracted from the medical literature. KMi contributed to the project by developing ontologies for both personal sensor data and clinical risk modelling, and developing and maintaining the two semantic repositories at the heart of the project; a private repository for patient-specific sensor and health record data and a public repository containing knowledge of clinical risks. The risk factor repository in particular was identified by the reviewers as a significant contribution of the project to the state of the art.

BigDat2017

Angelo, one of our postgraduate students, was recently in Bari (Italy) to attend the 3rd International Winter School on Big Data - BigDat2017. The winter school was organised by the University of Bari (IT) and Universitat Rovira i Virgili (ES).

Big Data has recently gained a lot of interest in research and many believe that it will still play a leading role for many years. Nowadays, we live in a world in which all information seems to be available, we are surrounded by data-driven applications (Google, Facebook, Twitter, Spotify, just to name a few), which gather data and try to provide tailor-made solutions for their users. To this end, having an
event like BigDat2017 with its clear mission ‘to introduce and update new researchers into this fast advancing research area’, is really important.

Throughout the week, BigDat2017 offered 22 classes covering a wide variety of aspects and applications centred around the Big Data such as modelling, management, verification, security, sentiment analysis, recommended systems, signal processing and so forth.

With the combination of both the relevance of the subject and the quality of the speakers, the school reached an audience of more than 350 participants including graduate students, postgraduates, postdocs and companies.

The winter school accomplished its mission. All the professors did a wonderful job in delivering their courses. Many students had the chance to acquire new perspectives on Big Data and prepare themselves for the next few years coming.

First European Ethereum Development Conference

John Domingue and Michelle Bachelor attended the first European Ethereum Development conference. Over 400 developers and researchers gathered in Paris at the Ecole Supérieure de Commerce de Paris on 17-18 February 2017, to hear about the latest developments in Ethereum technology and research including proof of stake, Scalability and Privacy as well as to see demonstrations of Ethereum-based applications. The event was hosted by LinkTime, a startup that develops Ethereum applications and was supported by the Ethereum Foundation, ADETIF, Asseth- a French Ethereum non-profit and La ChainTech (a French Blockchain non-profit).

Vitalik Buterin, Ethereums creator, gave an introductory talk on Cryptoeconomics which was followed by an in-depth talk from Vlad Zamfir about Casper, Ethereum’s new proof of stake consensus system which they hope may be ready as soon as the end of this year. The benefit for proof of stake over proof of work is associated with the reduced need to use excessive computational resources and therefore electricity to sustain consensus and security.

There was encouraging update from Status a project that is developing a Mobile Ethereum operating system which will provide, as they put it, “a browser, messenger and gateway to a decentralised world”. The Status mobile app will allow users send, receive and store Ether, browse decentralised apps and discover nearby Status users to exchange goods and services. There was
also a presentation from Mihai Alisie the founder of AKASHA who demoed their new social networking platform based on Ethereum and IPFS which publicly launching in January this year. John and Michelle were impressed with his presentation that we are considering the possibilities of using the AKASHA social networking platform to create an educational platform where educators can easily host learning materials and build learning pathways and The OU blockchain team will be exploring this further in the coming months.

Lastly, a presentation relevant for KMi semantics and data analytics researchers - EthOn: Introducing Semantic Ethereum which outlined a multi-purpose Ethereum ontology. We will be looking at this ontology closely for our work on semantically indexing the Ethereum blockchain led by Allan Third.

KMi at the Open Education Global conference

The Open Education Global conference took place in the first week of March in the beautiful city of Cape Town. KMi was represented by Alexander Mikroyannidis, who presented a paper on the European Data Science Academy (EDSA) project and delivered a workshop related to the SlideWiki project.

Alexander’s paper on the EDSA project describes the project’s approach in using open courseware in order to bridge the Data Science skills gap across Europe. The European Data Science Academy is looking to bridge the data science skills gap by developing multimodal open courseware tailored to the real needs of data practitioners. The EDSA courseware is implemented as a combination of living learning materials and activities (eBook, online courses, webinars, face-to-face training), produced via a rigorous process and validated by the data science community through continuous feedback.

Alexander’s workshop on the SlideWiki project is part of the project’s initiative in developing a collaborative open courseware authoring platform and collecting feedback from the Open Education community. This hands-on workshop offered the opportunity for participants to get acquainted with the redesigned SlideWiki platform and its functionalities for the collaborative authoring of open courseware, crowdsourced translation of educational content, as well as social networking.

This year’s Open Education Global conference marks the 10-year anniversary of the Cape Town Open Education Declaration. 2017 also marks several important milestones in Open Education, including the 15-year anniversary of the term Open Educational Resources (OER) and the 5 year anniversary of the Paris OER Declaration.
An inspiring conference for the majority of science educators

The ENGAGE project conference, at the Open University on March 11th, was a unique event designed to launch a community of innovative science teachers. Funded by the European Commission (EC), this event brought together more than 80 Science teachers from right across England, as well as Russia and Brazil.

The conference themes were chosen by the teachers themselves, who presented their innovative classroom practice on curriculum, assessment and teaching methods. “Overall the event was excellent, inspiring and very informative. I enjoyed presenting. I would be happy to present again next year. I enjoyed networking with colleagues from around the country.” Rowan Mangier, Science Teacher.

“Teachers were so very grateful to have the opportunity to discuss ideas and strategies with other teachers and hear solutions to the problems they are encountering” Jude Sanders, facilitator.

Ale Okada the legacy and technical coordinator of ENGAGE, opened the conference with the key outcomes of this European project: an open science education portal, including OER and MOOC in 10 languages for equipping students to make decisions using science; a relevant framework to foster 10 inquiry skills for Responsible Research and Innovation (RRI); and an international community of science teachers with 18,043 members interested in topical science. She highlighted that RRI is one of the key areas created by the EC for promoting science with and for society. “This is exactly our aim: to empower students supported by teachers to take an active role and voice their informed views and concerns on socio-scientific issues that are relevant for their lives and society.”

The keynotes Tony Sherborne, scientific leader of ENGAGE and Stella Paes, Head of science at AQA presented important questions and reflections on Science Education: “How can the Science Education curriculum be reshaped so that it’s more fit for purpose?” and “How can an approach focussed on examination success still lead to an enlightened science education?”

The workshops on 5 year plan and assessment including ENGAGE resources – several teachers mentioned that there was a sense of relief that they could finally see ‘proof’ that their hunch that there was just not enough teaching time was a valid criticism to take to senior leadership. There was too much content to teach across the 5 years so teachers should focus on teaching the core well rather than covering everything badly.

“ENGAGE project is very relevant to attract teachers and students across the world. Its content and strategies are very relevant for secondary schools and it should be also extended to primary education” Marianne Cuttler - the head of Association for Science Education in the UK.
“It was very useful to talk to teachers in the UK to know how they used ENGAGE. Our students in Bahia were really engaged with topical socio-scientific dilemmas including innovative resources to develop scientific argumentation”. Ana Karine Rocha, Sonia Pinto and Silvar Ribeiro - Teachers from Salvador Brazil.

“I came away from the conference very proud of the work we have done over the years! It was great to meet so many teachers who like what we do and want more.” Gemma Young ENGAGE resources developer and KMi research visitor.

Indeed, it is really significant for us to see the impact of ENGAGE in the UK and across the world.

5 contributions from KMi presented LAK 2017

As every year, KMi presented the current results at the top-level Learning Analytics conference, Learning Analytics and Knowledge (LAK17). This year, the conference was held in Vancouver, Canada (13-17 March) and co-organised with ex-KMier Marek Hatala. Even though the acceptance rate was quite low, KMi was proud to have 5 papers accepted: 1 full paper, 3 short papers and 1 poster in the research sections and one also in the practitioners track.

On the first day of the conference, Martin Hlosta presented the novel model that is used at The Open University for identifying at-risk students, when no historical data are available for learning the model.

Michal Huptych showed an early version of our study materials recommender, which is based on analysing the information about successful students in the previous presentation of the same course.

The joint paper between KMi, IET and LTS, introduced by Thea Herodotou, showed the teachers perspective of learning analytics at large scale. This research is based on the results and interviews with tutors from the previous year.

Moreover, in the practitioner track, organised together with the poster section, we shared our results in scaling up the OUAnalyse from various perspectives: both with the focus on including as many courses and as many users at OU.
Tracie Farrell Frey, one KMi’s PhD students, participated in the poster section with her contribution about Seeking Relevance: Affordances of Learning Analytics for Self-Regulated Learning.

Still fresh from the conference, the OU Analyse team hope to come back to present their new results next year down under in Sydney.
KMi’s World Stage and Closer to Home

John Domingue visited Brussels, Belgium for the HUB4FIRE kick-off meeting (18-10 Jan).

John Domingue travelled to Paris, France for EDSA & BIG Data meeting (24 Jan).

Carlo Allocca travelled to Luxembourg for Information and Networking Days on Horizon 2020 (16-18 Feb).

Kay Dave & Alessandro Adamou attended AFEL project meeting in Germany (31 Jan - 2 Feb).

John Domingue and Michelle Bachelor attended in Paris, France for the EDCON conference (16-18 Feb).

Angelo Salatino travelled to Bari to participate in the Big Data Winter School (10-18 Feb).

Allan Third attended the Slidewiki Hackathon project meeting in Amsterdam, Netherlands (21-24 Feb).

Allan Third travelled to Amsterdam, Netherlands to attend UP2U project meeting (27 Feb -1 March).

John Domingue travelled to Germany to attend a Dagstuhl seminar (12 Feb-15 March).

KMi Future

Events Coming Soon...

• John Domingue will be travelling to Reading to attend a Council of Professor and Heads of Computer Conference (24-25 April).

• Shuangyan Liu will be travelling to Athens, Greece to present a paper at EDUCON 2017 Conference (25 -30 April).

• Allan Third and Umar Mir will attend a plenary meeting for Slidewiki in Madrid, Spain (25 -28 April).

• Allan Third will be travelling to Porto, Portugal to participate in UP2U Technical Workshop (08-10 April)

• John Domingue, Ilaria Tiddi and Emanuele Bastianelli will be travelling to Portorož, Slovenia to attend the ESWC Conference and organise a workshop (28 May-01 June).