MK:SMART

mksmart.org

The Open University

HIGHER EDUCATION FUNDING COUNCIL FOR ENGLAND hefce

MK:SMART IN CONTEXT

The number of people who live in cities is increasing rapidly. By 2030, an estimated 60 per cent of the world's population will live in urban areas.

As citizens continue to migrate to cities, these urban areas face a broad range of challenges. Milton Keynes is no exception and, as the fastest growing city in the UK, faces serious challenges in several areas, including transport, energy and water, housing, health, and education. For example, according to an analysis by Milton Keynes Council, given the current rate of growth, by 2026 there will be a 57% increase in travel demand at peak times, including a 25% increase in car journeys. Engineering solutions to do with the redesign of the grid network in the city will only be able to address half of this increase in demand.

MK:Smart is a large collaborative initiative, partly funded by HEFCE (the Higher Education Funding Council for England) and led by The Open University, which has put in place a comprehensive R&D programme aimed at both prototyping new innovative solutions to address the challenges facing the city in the energy, water and transport sectors, as well as, more broadly, stimulating innovation through an ambitious programme of infrastructure development and leading edge educational and business and citizen engagement initiatives. Three years after the start of the project, MK:Smart has achieved its key objectives, shaped the smart city agenda not just in Milton Keynes but at international level as well, and established Milton Keynes has one of the leading smart cities in the world.

WELCOME

By Professor Enrico Motta, The Open University

MK:Smart is a very special project for me. Not just because of the ambition and scale of the project, and the quality of the MK:Smart team, but also because, having lived in Milton Keynes for over 30 years, it is extremely exciting to be in a position to contribute to such an important initiative, which is helping to shape the future city agenda in Milton Keynes.

An essential element of the design of the project was defined by its broad agenda. While this addresses key demand issues in the energy, water and transport sectors, with the development of the MK Data Hub, it also covers the computational infrastructure, which is needed to support smart city solutions.

In addition, the MK:Smart programme of work also includes ambitious educational initiatives, which target a broad range of learners, such as local schoolchildren, international MOOC students and the business community.

Finally, it also includes innovative business and citizen engagement activities, both to maximise impact in these key local constituencies and also to ensure that MK:Smart could benefit from a bottom-up generation of ideas, to complement the top-down planning of the project. As a result we have established a fruitful collaboration with dozens of SMEs and it is very exciting to see that some of the results of these collaborations are now reaching the market.

It is even more exciting to report on the work carried out in our award-winning citizen engagement work package, which has resulted in MK:Smart funding 13 projects proposed by members of the local community. These projects cover a wide range of issues and testify to the commitment and creativity of the local community.

While MK:Smart is reaching its conclusion, of course the work continues. Pretty much every work package in the project has spun-off new exciting initiatives, which build on the work in MK:Smart to progress the smart city agenda in Milton Keynes.

In conclusion, while much has been achieved in the past few years, the future promises to bring many new exciting developments. We are looking forward to continuing our collaboration with Milton Keynes Council and the various other partners and continuing to contribute to "making a great city greater".

CONTENTS

TRANSPORT

The vision for future intelligent mobility in Milton Keynes, as outlined in the Milton Keynes Futures 2050 Commission Report, is one of “Smart, Shared, Sustainable Mobility”, where a number of eco-friendly options will provide an integrated multi-modal solution to allow people to travel easily across the city.

A number of elements of this vision are already in place, for example Santander bikes and electric buses, with other innovative additions, such as autonomous pods, coming soon. Key to this vision is the development of a citywide travel integration system, providing smart guidance to travellers, on the basis of real-time information about transport options and conditions.

The work carried out in MK:Smart on the MotionMap app is developing this idea, providing travellers with information on how busy an intended destination is and the transport options available. Based on this information, the traveller can evaluate the options available for walking, taking the bus, taking a bike, or taking the car. The mode of transport may be selected on the basis of the time required to make the journey, the carbon footprint of the journey, or a combination of both.

MotionMap offers bus routes complete with walking times to and from bus stops and car journeys complete with advisory information on the availability of parking spaces and with the walking time from the chosen car park. This rich level of content is designed to influence traveller behaviour, for example discretionary journeys at peak times might be postponed in light of the congestion on the roads or crowding at the destination.

ENERGY

For the past decade, Milton Keynes has been making major strides towards becoming an energy efficient city and reducing carbon emissions and it is on course to achieve highly ambitious targets that go beyond those set by the Government for the UK as a whole.

> **“On course to achieving carbon emission reduction targets”**

Within this context, MK:Smart designed and demonstrated a range of innovative urban energy services that show significant reductions in urban energy consumption and CO2 emissions, especially during periods of peak demand. In particular, this work package produced innovative solutions for households that have a number of energy innovation systems installed, including solar panels, battery storage in the home and electric vehicles. This integration of domestic energy management and sustainable transport is a key innovation delivered by MK:Smart, leading to significant savings in energy consumption for the households involved in the trials.

WATER

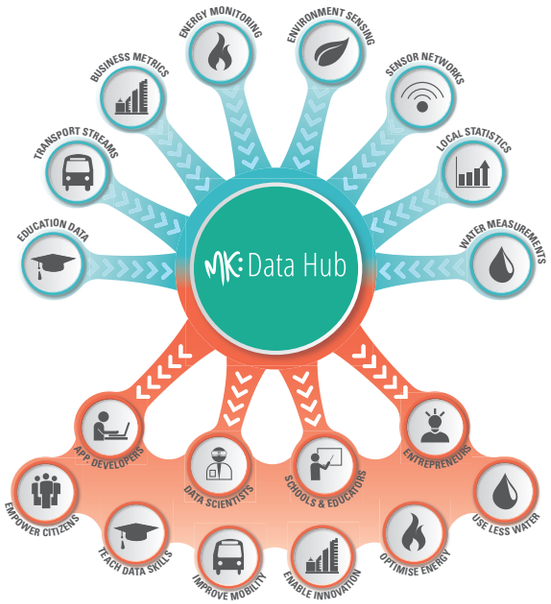
The Water Monitor website was set up by the MK:Smart team to help users to better understand their water use at home. During a trial period, from July to December 2016, it enabled more than 100 participants to monitor their weekly water use. These frequent meter readings not only allowed users to get a better understanding of their water consumption but also enabled leaks to be identified in a fraction of the time the usual biannual meter reading cycle would have taken.

The work on the Garden Monitor focuses on an intelligent app, able to predict the behaviour of a domestic garden with respect to water loss. The app produces a customised calendar telling the user if and when their garden will require water in the next 7-10 days. A formal trial with a number of users in Milton Keynes confirmed both the accuracy of the prediction engine as well as the value of the app to users. The commercial potential of Garden Monitor is currently been investigated.

In the context of the water work package, MK:Smart also produced the Milton Keynes Water Strategy, a document that sets out the principles of sustainable water use and the measures and approaches that would be needed to ensure that Milton Keynes grows in a sustainable way with respect to water consumption.

MK DATA HUB

The award-winning MK Data Hub has been developed in MK:Smart to provide the city with a computational infrastructure to support the acquisition and management of data relevant to city systems. The ultimate goal is to provide a resource for local government, business, and academia that would support, and indeed accelerate, the development of novel applications which take advantage of city data, thus helping to foster economic growth in Milton Keynes.



Built by The Open University in partnership with BT, the MK Data Hub accesses sensor information from its many different data sources, automatically integrating thousands of datasets on specific entities such as buildings, places and topics. This intelligence can be analysed to help solve urban challenges.

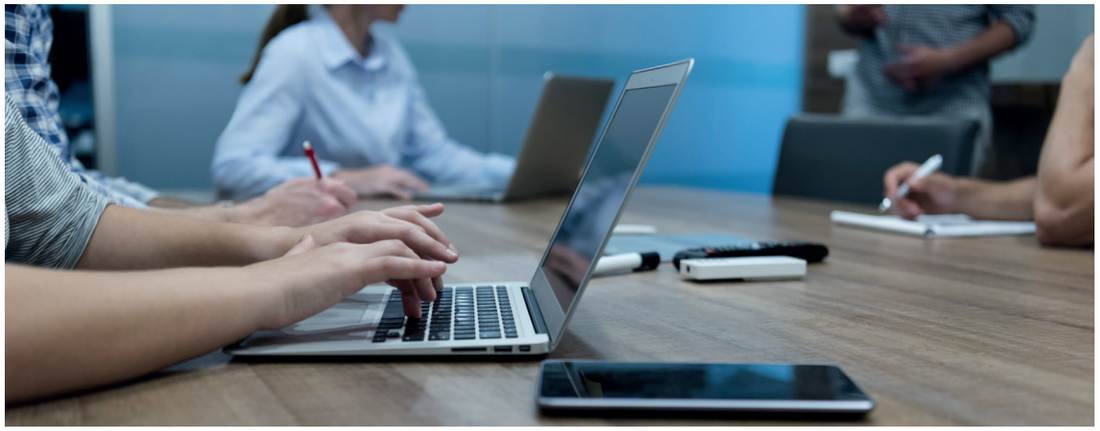
Data sources on the MK Data Hub include local and national statistics; data from key infrastructure networks, including energy, transport and water; data from city sensors, such as weather and pollution data; as well as information that is crowdsourced from social media and mobile applications. This isn't an exhaustive list and, as the data platform for Milton Keynes, the MK Data Hub allows users to upload data with complete control over access permissions and redistribution policies. This is a key difference between the MK Data Hub and the many data releases initiatives that can be found in other cities: the MK Data Hub does not just consider open data but provides a sophisticated data ecosystem where different types of data can coexist – commercial and open data, private and public data.

> **"The MK Data Hub accesses sensor information from many different data sources..."**

The MK Data Hub now has over 3,000 data sets that are accessible to developers wanting to test models and build applications. With so much information available, the ability to make sense of it is vital. Hence the Data Hub also provides sophisticated data analytics support, which makes it possible to explore and extract valuable information from data.

In addition to supporting the various workstreams in MK:Smart, the MK Data Hub is also enabling the development of MK Insights, a portal to be used by both Milton Keynes Council and the wider community, to access and make sense of city data. The Data Hub has also been used to support the Ground Resistance arts installation presented at the Milton Keynes International festival in July 2016. This installation used visual and audio representations to show how a city can be experienced in terms of the information it produces. A number of SMEs are also pioneering application development on the Data Hub, creating solutions in various domains, including education, healthcare and even a community radio.

The MK Data Hub is being replicated in Manchester as part of the Innovate UK City Verve project. Beyond the close of the MK:Smart project, the MK Data Hub will continue to support council services and data-intensive application development as well as providing a resource to support scientific research and business training.



ENTERPRISE

Business engagement is a key focus for MK:Smart. While MK:Smart is a project with a strong technological component, its ultimate goal is to contribute to sustainable growth in Milton Keynes. Successful engagement with business is a key precondition to achieving this objective and therefore much of the work in the project, both in relation to the design of the MK Data Hub and also in the context of the project's training, dissemination and partnership programmes, has focused on the needs of the business community, with particular emphasis on local SMEs.

As a result, we are particularly proud of the work we have done in this area. During the course of the project we have engaged with over 700 companies and many of these initial discussions have led to significant collaborations. In particular, about a dozen SMEs have worked intensively with the project team, acting as early users of the MK Data Hub and helping us to test the effectiveness of the infrastructure. A number of the applications developed by these SMEs are expected to be released commercially later in 2017.

Training has also been an important element of this work package and in the course of the project this has taken a variety of forms, including developer workshops, 'geek girl meet ups', hackathons and short courses on lean startups and design thinking for smart cities.

CITIZENS

All too often, smart city projects focus solely on technical solutions while failing to consider the input and impact on citizens. MK:Smart has turned this on its head and put citizens at the centre of smart city innovation, thus ensuring a bottom-up, community-driven input to the design of the project activities, complementing the top-down specification developed by the project team.

In particular, MK:Smart has developed a unique methodology that combines face-to-face and crowdsourcing activities to support citizen innovation in smart cities. We collected over 6,000 dialogues through face-to-face conversations within communities, and over 7,700 people have visited the award-winning OurMK website, which has been listed as one of the top five crowdfunded initiatives in government affairs by Idox and also won the communications category at the UK Smart City Awards 2017.

We also supported and funded 13 projects, run by citizens, which are creating real change within local communities using Smart City concepts. Notable successes include the MK Food Passport scheme and the gamification of the redways. Full details on all of the projects can be found at ourmk.org/competition.

EDUCATION

In the context of the education work package, we developed a number of initiatives targeting a variety of learners, from local school children, to international online students, to the corporate world. In particular, over 30,000 students from over 100 countries studied The Open University's Smart Cities MOOC, developed by the MK:Smart team, which introduced learners to smart cities and the role of technology and data in addressing urban challenges.

We also teamed up with several Milton Keynes schools to deliver the Urban Data School, an education programme with smart cities at its core. The programme, which was designed to help primary and secondary school children to become urban data literate, is based on a novel enquiry-based pedagogical approach to teaching data skills, which promotes learning in a real-world context. It was delivered in two primary and eleven secondary local schools.

> **Helping a variety of learners to gain awareness and skills relevant to smart cities**

We also developed a training programme for SMEs that gives them the tools to utilise the best startup practices from Silicon Valley and is tightly connected to the urban data generated by the MK Data Hub. The programme, called Urban Startup Lab, has been incorporated into a University of Bedfordshire degree programme on new enterprise creation.

MK:SMART AWARDS

FEBRUARY 2017
Data - MK Data Hub
Data driven solutions
supporting city development

FEBRUARY 2017
Communications - OurMK
Citizens involvement in
creation of Smart Cities

FEBRUARY 2017
Housing - CAPE
Higher Standards and lower
costs for homeowners

JUNE 2016
Best Academic & Business
Research Project

JUNE 2016
Most Innovative Catalyst -
Commercial in Smart X

DECEMBER 2015 (Highly Commended)
Information Technology – IOT
Data Hub

DECEMBER 2015
Business IT Innovation of the Year

NOVEMBER 2015
Data-driven innovation to
address city growth challenges
in Milton Keynes

OCTOBER 2015
Best virtualisation and disaster
recovery project

JUNE 2015
Enabling the Smart City Digital
Ecosystem - Best New Catalyst

JUNE 2015
Storage Solution Data
Protection Project of the Year

MARCH 2014
Environmental and Corporate
Sustainability

MK:SMART WHERE NEXT?

Since its foundation back in 1967, Milton Keynes has always been conceived as a city of the future and MK:Smart is just yet another chapter in a long list of groundbreaking achievements for the city. The project is now reaching its conclusion and the team can be justifiably proud of the results it has achieved.

The MK Data Hub provides a state of the art solution that has already attracted significant post-MK:Smart investment and will continue to be at the heart of the Future City Programme in Milton Keynes. Indeed, it is now clear that the original key strategic decision to create our own data centre was the right one, allowing us not only to maintain total control over the infrastructure and the data, but also ensuring the sustainability of the adopted solution.

We plan to intensify our work with SMEs, capitalising on two new ERDF grants that will support collaboration between the MK:Smart team and SMEs in the SEMLEP region, allowing these to engage with complex data technologies and bring new products to the market. These exciting new initiatives will leverage the work in MK:Smart not only on the MK Data Hub infrastructure but also in the business engagement and education work packages. The aim is to deliver an innovative, integrated approach to business training covering both the data science element as well as innovative startup practices, which have been tailored to the contexts defined by data-intensive applications and smart cities.

Analogously, new exciting initiatives are planned for the sector work packages (transport, energy and water), aimed at scaling up and consolidating the solutions pioneered by MK:Smart. In particular, the transport work package has produced two new startups and we expect commercial spin-offs of the work carried out in MK:Smart to reach the market before the end of 2017.

Three years after the start of the project, many if not all of the drivers that led to designing and launching MK:Smart still apply. Milton Keynes continues to grow, but this growth needs to be sustainable, and the UK still falls behind other countries with respect to key dimensions such as SME innovation, mobile data connectivity, transport congestion and others.

While MK:Smart has pioneered a variety of innovative solutions, there is still a need to consolidate these and deploy them at scale to make a significant impact in the city. In particular, much more work is needed on the network infrastructure to ensure that this is able to support the deployment of large-scale solutions in the city. Having said that, while there are still major challenges to face, MK:Smart has also been a catalyst for wider innovation in the city, leading to a variety of other initiatives that are bringing investment and innovation in Milton Keynes.

At a time of much political and economic uncertainty, Milton Keynes continues to be the kind of place its original planners wanted to create: a dynamic, progressive and vibrant city at the leading edge of innovation.

MK:SMART

In partnership with

Partners

The Open University

University of Bedfordshire UCMK University Campus Milton Keynes

University of Cambridge

BT

love every drop anglianwater

HR Wallingford Working with water

milton keynes council

community action:mk promote support engage involve

FRONESYS

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CATAPULT Satellite Applications

CATAPULT Transport Systems

playground energy

Associate Partners

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HUAWEI

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