

BIOMEDICAL CAMPUS CITY DIGITAL TWIN EXPERIMENT

STAKEHOLDER ENGAGEMENT
REPORT



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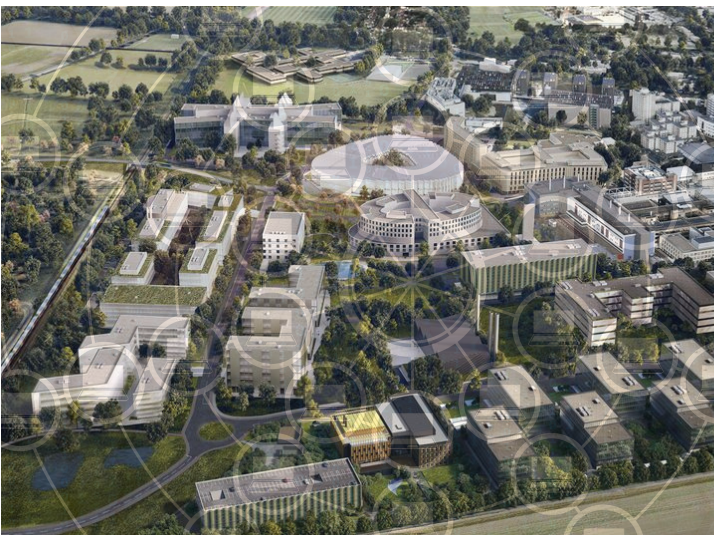
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1. BACKGROUND

Transport and mobility to/from the Cambridge Biomedical Campus site

The Smart Cambridge programme is a workstream within the Greater Cambridge Partnership (GCP) focused on understanding how data and emerging technologies can be used to support some of the challenges the region faces.

The programme is keen to understand what value the concept of a digital twin could bring to a local authority. In order to gain a greater understanding of this, a piece of work combining the knowledge of the team with the expertise of the Centre for Smart Infrastructure and Construction (CSIC) was undertaken last year. The work focused on what local authority partners would need from, and could contribute to, a digital twin (DT) type model. A number of findings arose from that work and can be read in the [summary report](#).



Cambridge Biomedical Campus site

Following on from that work, this second study has been undertaken focusing on the mobility challenges around the Cambridge Biomedical Campus (CBC) and their effect on a range of different stakeholder groups

The CBC was chosen as it represents a microcosm of the wider challenges experienced in Greater Cambridge, across policy areas such as Congestion, Air Quality, Energy and Local Planning. The site is home to several multinational companies as well as research institutions and three public hospitals. The campus has an international reputation, making it a desirable location for companies and researchers to locate. As the campus continues to grow, it is expected that 67,500 trips will be made there every day. Infrastructure for Energy, Water and Transport are all needed to not only support this projected growth, but also alleviate the challenges already experienced at the site. It offers an excellent opportunity to understand the value that a digital tool could offer such complex city developments.

2. OBJECTIVES AND METHODS OF THE STUDY

2.1 OBJECTIVES

With the ongoing hype around digital twins (DT), it is increasingly important, especially to local authorities, to establish the benefits that can be gained from the significant investment required to create and support such a tool. This study aimed to achieve this through the following objectives:

- Establish the scenarios in which a DT tool would be helpful in the trial area and to whom;
- Understand whether there are similarities in the use cases suggested by different stakeholder groups;
- If similarities are identified, suggest whether one tool could be tailored to provide relevant solutions, or whether multiple tools are needed;
- Determine the feelings of stakeholders towards data collection, sharing and analysis in several scenarios.

2.2 METHODS

In order to achieve the objectives and understand the need or requirement for a digital twin type model, we asked various groups to participate in interviews aimed at giving us information that can help to guide and influence the type of model and information made available, if indeed it was perceived to be needed at all.

A considerable number of stakeholders were identified by the team in relation to this large and complex site, these were then

grouped together into categories. This meant that our final selection was based on local authority insight as well academic knowledge and previous experience gained from phase one. The stakeholder groups identified were: Residents, Local Authorities, Transport Operators (Service Providers), Employees, Employers and Patients.^[1]

Members of the stakeholder groups were asked to participate in interviews that were scheduled to take between 30 and 60 minutes. The interviews were conducted using the same set of questions to ensure a comparative approach was possible. A list of the questions can be found in Appendix A.

The questions were guided by our findings from the first phase of the digital twin project, as well as the Gemini Principles.^[2] We hoped to understand if there are perceived problems with the growth of the site for each group (offering a 'purpose' for the twin), what stakeholders felt about the use and collection of data (relating to 'trust' of the way the data is collected and used for policy decisions) and whether they have any concerns over the way data is used within the model for assumptions and creating algorithms (or its 'function').

In phase one of the work, we identified that while the evidence provided by digital models affects many, the opportunity to participate in how they are designed or used is limited. By asking each group of stakeholders the same set of questions, our goal was to understand if there may be cases in which a digital twin model would be helpful in solving some of the groups challenges, and further, whether these use cases were common to any sets of stakeholders. Therefore allowing guidance to be provided on the most useful direction of development for the twin.

[1] It should be noted that as a result of the Covid-19 pandemic, we were unable to conduct interviews with patients and those visiting the hospitals on the Cambridge Biomedical Campus (CBC).

[2] The Gemini Principles report was published by the Cambridge Centre for Digital Built Britain. Available online at: www.cdbb.cam.ac.uk/DFTG/GeminiPrinciples.

3. SUMMARY

SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

The results of the interviews were transcribed and have been evaluated and reviewed. From this work a set of detailed results focusing on key themes has been created and can be read in Section 4.0. A summary of the conclusions has been provided here.

Through the interviews, we hoped to determine how a digital modelling tool could be best developed in the future to support the needs of stakeholders. The outcomes included:

- A key concern for local authority stakeholders revolved around the practical usability of the model, e.g. being able to run it in-house to provide high-level projections to different scenarios in a more responsive and dynamic way. This will establish requirements of the architecture of the model e.g. Time to run a scenario, data formats accepted by the model, ease of loading data sources etc.
- If the predictive capacity of the model could be made available to stakeholders in a way that represents benefits to them, this could act as an incentive to develop better data-sharing across the stakeholder landscape.
- The residents seek reassurance that modelling exercises are based on evidence that is representative – rather than demonstrations of the model itself. As such, data collection emerges as a key issue, both in terms of the quality of the data collected and its perceived legitimacy in capturing key problems and context-specific issues. Requirements regarding enhanced transparency in data-driven decision-making focused mainly on demonstrating how model outputs are reflected in policy decisions.
- The interviews confirmed the need for a process and governance structure to be put in place to support the development and running of the DT model and associated data collection. In addition, interviewees in several stakeholder groups also expressed a feeling that a broader governance framework for the site would be beneficial. It was felt that this should have emphasis on strategic leadership, collaborative working across stakeholders and more inclusive, participative processes being used to better integrate the site with its surroundings. A DT could help to facilitate this by providing a visualisation available for all groups to review.
- Despite the negative impacts often reported, it was also acknowledged that the growth of the CBC site may bring positive benefits to the wider area, e.g. increased public transport provision (Cambridge South Railway Station, better bus links), better amenities and local services.
- The already widespread use of technology and data, both in organisational governance and management, as well as in everyday life, led interviewees to accept and acknowledge the potential benefits of data-driven decision-making and associated data collection and monitoring. However, interviews reflected the importance of privacy when collecting and using data – despite different aspects of privacy being emphasised by different stakeholders, a common concern emerged around the identification of individuals.

4. DETAILED RESULTS

4.1 INFORMATION FOR DIGITAL TWIN DEVELOPMENT

Relevant stakeholders' key concerns and interests represent valuable insights to support the place-based development of digital decision-making support tools, such as city-scale digital twins. The information provided by the interviewees is expected to be used to validate the underlying assumptions built into the Cambridge City-scale Digital Twin (CDT) model and to guide its future development, evolution and relationships to other tools and information used by the stakeholders.

Our respondents stressed the importance of three key themes during the interviews:

- Developing an appropriate problem definition to construct a Purpose and baseline for CDT development in an inclusive way;
- Measuring what matters;
- Considering the potential ways of using the model in decision-making processes in conjunction with requirements regarding user interfaces for different stakeholder groups.

In terms of defining the problem to be addressed by the CDT, the issues of transport and mobility were mainly considered an accessibility issue – of the site and residential properties nearby.

However, perspectives vary across stakeholder groups: with a focus on the associated traffic perceived as nuisance for residents; the time, costs and conditions of transport/mobility for employees; sustainability goals and recruitment potential for employers; core business for service providers; and as part of a broader traffic/congestion problem for local councils.

All quotes over the following pages are taken from the stakeholder interviews:

“...we have quite an active health and wellbeing team ... so if we can look at the reductions in ... air pollution in the area as well, things like that play really well.”

“...it's quite difficult for residents to access data that doesn't have any privacy implications at all so, you know, if it was easier to see what that pollution monitoring was generating then potentially that would give us more grounds either for pushing harder for action to be taken or actually it might allay people's concerns but at the moment we don't know.”

Our interviews also highlighted a need for 'measuring what matters' – which may require new approaches to data collection, modelling and communication of information. Beyond the request to collect and model air quality data, interviewees perceived a lack of measuring 'real-world' pedestrian and cycling traffic and public transport use (rather than estimating). A key concern for employees is to consider the possibilities for multi-mode journeys and non-traditional transport forms (e.g. car sharing, micro mobility) in data collection and modelling to improve these.

The focus on better understanding work and home locations and travel between these has been confirmed by the interviews. However, some potentially overlooked aspects were also highlighted such as residents' journeys in/around the site and outward journeys (one interviewee said: "It might be interesting to see if a reasonable proportion of people who live nearby are actually going into the campus for work"); the travel demand and strain on public transport services generated not by employees but school students (sixth form specifically); and the impact of housing, housing provision and affordability on transport and mobility with a special focus on less well-paid commuters, e.g. NHS workers.

"... understanding at a high level some of the strategic impacts of doing things quickly is something that we don't have. But I think the digital twin would be quite helpful for us to be able to... particularly when you are making that strategic case for something - to be able to quickly test out whether it does actually make a big difference if we did 'this big scheme or this big scheme from this place'."

"... pedestrians should be at the top of transport hierarchy, you should design for pedestrians first and then cycles and then motor vehicles, but in terms of counting it's done the other way round always, and everything is justified on vehicle movements."

In terms of data and model uses and associated interfaces, a frequently emphasised requirement is the potential of linking long-term strategic goals and development scenarios to sustainability plans and short and mid-term impact (e.g. on traffic, housing). This way the model could support scrutiny (from citizens) and measuring the viability and compliance with transport pledges of organisations moving into the CBC (councils). There is however a sense that access to the model and model outputs should be different for citizens (transparency), local authorities (operational use) and other stakeholders (access to specific information for specific purposes).

Employers for example are interested in understanding the impact of their transport schemes on traffic, and possibly coordinating and learning from one another on the site.

Understanding the potential use and usefulness of predictive modelling for service providers could be a key priority as these stakeholders currently do not use such methods to improve their services.

4.2 FURTHER ISSUES RELEVANT TO SUCCESSFUL IMPLEMENTATION

Some of the themes and concerns mentioned during the interviews supersede the capabilities of any model or digital decision-making support tool. However, the issues covered seem pertinent to support successful implementation and operationalisation of the CDT and to ensuring its contribution to improving governance processes and outcomes for stakeholders and citizens.

Particular themes frequently mentioned in the interviews include the following:

- The need for a strategic vision and effective leadership in working towards that vision – with the expectation being that this is to be undertaken by a public sector body;
- Building more and better collaboration across the organisations on site and allocating roles and responsibilities (e.g. between private and public sector CBC stakeholders – hospital/NHS vs private companies) to improve distribution of benefits, costs, contributions;
- Allow for more dynamic, inclusive and participative decision-making (with feedback loops incorporated), and improve the integration of the site and its stakeholders with the surrounding communities (one interviewee said: “...the campus thinks of itself as a town, as a spatial entity in its own right”).

“We’re not in the position of being a recognised stakeholder or consistently kept in the loop - we’re always being kind of caught on the hop and so it’s quite difficult sometimes to get proper community views because we’re already reacting to things that have suddenly been sprung on us.”

“So you’ve got the County Council, the Greater Cambridge Partnership and the Combined Authority Mayor all with transport responsibilities and it feels like none of them really quite know where the responsibilities finish and end.”

Interviewees also emphasised a range of deep-rooted structural problems which may contribute to maintaining path dependence and resistance to change. There is an acknowledgement for the need to accommodate growth (of the site, but also of the economy of the broader city region) and a parallel understanding that a siloed organisational context (e.g. across government levels) hinders the development of strategic leadership which would be required to produce appropriate visions, plans and mandate compliance. The dispersed authority and responsibilities are also likely to act as barriers to coordinate large-scale investment (e.g. light rail systems serving the region or dedicated bus lanes throughout congested areas).

On-street parking generated by employees travelling to the site is clearly a concern for local residents – however there is an acknowledgement that this is not an issue any modelling tool could deal with. Instead, concrete actions are suggested – for example outright bans on on-street parking in the broader area driven by safety concerns (residents); flexible working hours (employees); and supporting ‘crowdsourced’ public transport (car sharing) to the extent that corresponds with available parking places on site.

4.3 DATA ETHICS: COLLECTION, SHARING AND UTILISATION

Stakeholders and citizens expressed strong views regarding practices of data collection, sharing and utilisation which has obvious implications for the CDT model and associated data collection needs.

The issue most often mentioned regards privacy concerns, which is a central consideration for all stakeholder groups.

Citizens (residents and employees) are not opposed to data collection – however, they expressed concerns over being (even inadvertently) individually identified through data collection processes. Data classified as sensitive by these groups include number plates, exact home location (town/broader neighbourhood accepted). Similar concerns are voiced by employers regarding the possibility of identifying their employees. In addition, passenger data is also classified as sensitive for commercial reasons by public transport service providers.

The data collected being accurate enough to represent the reality of the problems faced is also an important issue, including the reliability, quality and comparability of data.

There were suggestions that more inclusion (e.g. of residents) in data collection, or gathering feedback on what data should be collected and in what ways, could improve data collection processes and by extension, outcomes.

“I can’t see why just monitoring the numbers in this situation would be an issue... I personally wouldn’t have thought you’d even need number plate recognition or anything like that, just literally looking at the numbers of people coming in at different times of the day would tell you what they are there for.”

According to our interviewees, any data collection must always be driven by a well-defined purpose. As such, stakeholders broadly support data and data-driven decision-making as long as there is a good understanding of, and transparency around, why particular data is collected and how it is used to support decisions and solution options to pressing problems.

“I would say quality and comparability of the data. So especially if it’s travel survey data, making sure it’s been collected for a representative sample of the workforce, because some of these things are elective.”

“...ultimately, if it’s for a common good, it’s hard to argue against that in terms of transport management and putting in solutions that are designed to improve and that’s hopefully what everybody’s working towards, rather than putting in restrictions on people’s liberties or movements and things like that.”

Sharing potentially useful information across stakeholder groups, and opening up non-sensitive data, has also been mentioned by interviewees as having the potential to improve the transport/mobility problem. One specific example regarded the potential of opening up home/work location data (in a non-sensitive, controllable way) to improve ride sharing and other public transport services.

Overall, collecting data and using it to improve policy and practical decisions and decision-making processes is welcomed by all interviewed stakeholder groups in the study area. Needing to make such processes as transparent as possible is however also voiced. Understanding how transparency could be achieved whilst also protecting commercially sensitive data is an important issue to certain stakeholders (e.g. service providers).

However, stakeholders and citizens seem to converge on the view that data streams, available in varying forms to different groups, could assist with more collaborative and inclusive decision-making and can contribute to improving accountability.

“If we can get better governance at the Biomedical Campus, more transparent, accountable governance, people we can talk to, people that can get things done, bang some heads together, it’s not too late ... There’s a lot of enthusiasm and expertise in the people that live in the area and it’s never used.”

INTERVIEW QUESTIONS

The questions below were used as the basis for all interviews carried out - there were some minor adjustments in order to tailor them to the specific stakeholder groups without losing the essence of the question:

1. What aspects of the proposed development matter to you the most and why? (positives/opportunities and negatives/nuisances)
2. Of these, what are those that "drive you nuts"? What are those which you can cope with, and what impact does this have on your daily life?
3. Do you expect the current situation to change in the future? If so, in what direction?
4. Do you already use information/data in some way to better utilise the opportunities (positives) and deal with the problems (negatives)?
5. Is there any additional information/data which you currently do not have access to but could assist you to better utilise the opportunities (positives) and deal with the problems (negatives)?
6. Do you know how to access this information/data? Is there any other factor that prevents you from utilising the information/data?
7. Do you have any specific concerns regarding data collection on/around the site?
8. Do you have any specific concerns regarding the use of the data collected in supporting decisions related to the CBC development?