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Digital Twin Hub   BETA

DT Hub
Annual Benchmark report 2020

March 2021

Contributors

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Forewords

When the idea of the DT Hub was first conceived, we had no idea that its launch would coincide with the start of a global pandemic and that virtual communities would become such an integral part of our world. The lockdowns have taught us to adapt quickly to digital ways of working and have shown that digitalisation is really happening. They have also underlined how digital platform-enabled communities, such as the DT Hub, have a vital role to play in fostering collaboration.

It has been exciting to see the DT Hub become an essential part of our collective journey towards the National Digital Twin (NDT), and it's a tremendous achievement to have grown to be a community of over 1,400 members in such a short time. This success is testament to the hard-work and dedication of all those involved and I want to take this opportunity to thank them for going the extra mile in such a difficult year.

It is also great to see the strong interest from those who are embarking on their own digital twin journeys. The DT Hub has been built on the motto, 'learning by doing and progressing through sharing' and it has been very encouraging to see this in action as members pool knowledge and learn from one another.

As well as fostering collaboration, we have also been able to develop a number of practical resources for our members through the Gemini Programme – our key means of engaging with those who want to contribute to the NDT programme. The launch of the Digital Twin Toolkit is a fantastic example of members coming together to produce great materials for the benefit of the whole community.

Innovation and investment in infrastructure will be a crucial component of our economic recovery, and connected digital twins can play an important role in that development. I'm really looking forward to seeing this reflected in the DT Hub's progress over the next year as we build on the pioneering work that has already been done; I know the team is brimming with ideas to further engage the community and bring tangible value. I'm also looking forward to hearing more from our members – your time and expertise has been absolutely invaluable this last year and I want to end by thanking you all.

Mark Enzer
Head of the National Digital Twin Programme

Anglian Water delivers water and water recycling services across a region that stretches from the Humber estuary to the Thames estuary, and from Buckinghamshire to Lowestoft on the east coast. We know that exploiting digital capabilities, digital twins and data sharing are essential to continually delivering high quality services to more than six million customers whose expectations around performance and online service is constantly increasing.

We were an ambitious early adopter of digital twins of our water infrastructure and started working on these just before the Centre for Digital Built Britain's Digital Twin (DT) Hub came into existence in March 2020. At that time we had little understanding of what others in similar situations had already attempted, what worked for them or what didn't. A year after the DT Hub's inception we have found it to be an always available space where we can find relevant resources such as articles, publications, case studies and toolkits all about digital twins and how to develop them. Just as importantly it is becoming the place where we can connect with like-minded individuals within other companies, share our progress and work, and learn from others in return.
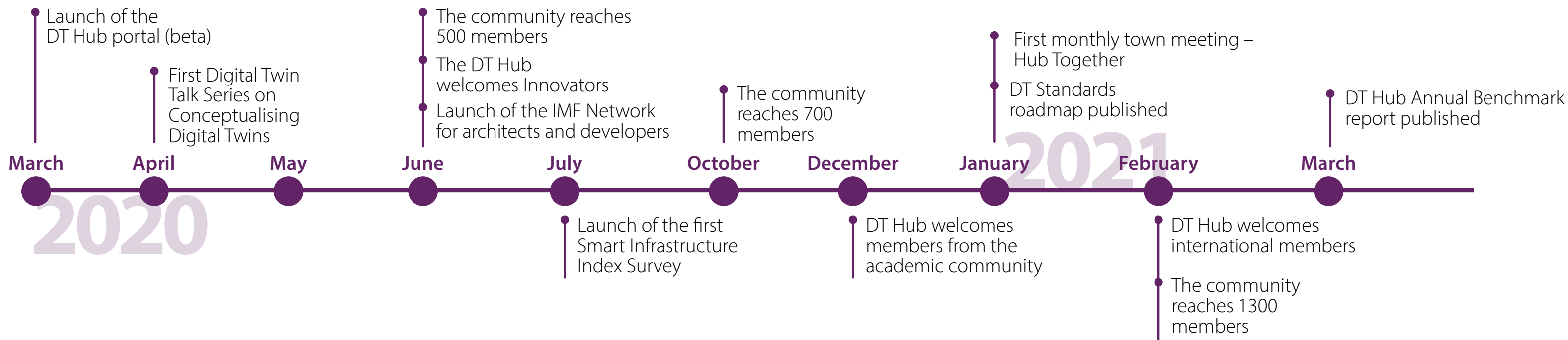
It is in every Asset Owner's interest that everyone in National Infrastructure engages with the DT Hub. As infrastructure owners and operators we must show leadership and equally promote the common learning through our supply chains and partners. We need the DT Hub to be the independent 'go-to' space where learning and sharing takes place. It is incredibly encouraging to see the Hub's scale and speed of growth, and how the plans for the future are centred around the needs of all our digital communities. For the DT Hub's second year we welcome enhanced learning regarding the development of National Data Standards and the Information Management Framework, we must all build our digital futures on solid interoperable data foundations.

Anglian Water also welcomed the opportunity to further contribute to the Smart Infrastructure Index which contained specific questions on digital twins and their role in digital transformation. We would urge all Asset Owners and Operators to engage with the annual benchmarking to not only understand their own progress, but also to guide the focus of the DT Hub and National Digital Twin programme. Only through contributing can we all exploit and shape the opportunities presented to us by CDBB and DT Hub. The prize is not only for our own organisations, but also for the supply chains that support us all, and most importantly for the customers, communities, and natural environment that we all share and value.

Matt Edwards
Chief Data Officer, Head of Enterprise Data

Introduction

2020

- **March** — Launch of the DT Hub portal (beta)
- **April** — First Digital Twin Talk Series on Conceptualising Digital Twins
- **May**
- **June** — The community reaches 500 members; The DT Hub welcomes Innovators; Launch of the IMF Network for architects and developers
- **July** — Launch of the first Smart Infrastructure Index Survey
- **October** — The community reaches 700 members
- **December** — DT Hub welcomes members from the academic community

2021

- **January** — First monthly town meeting – Hub Together; DT Standards roadmap published
- **February** — DT Hub welcomes international members; The community reaches 1300 members
- **March** — DT Hub Annual Benchmark report published

The launch of the Centre for Digital Built Britain (CDBB)'s Digital Twin (DT) Hub in March 2020, marked a key milestone on the journey towards enabling a National Digital Twin. As part of the National Digital Twin (NDT) Programme, the DT Hub was created as a space for everyone, both nationally and internationally, to collaboratively get involved in the creation, innovation and progression of digital twins.

As we approach our one-year anniversary, we want to share the progress and learnings we have made as we've grown from six members to over 1400.

In the first of our annual reports, we aim to provide the community with an update on the current state of digital twins amongst our members. We will document the various assets we have provided to our members and provide a record of how the Hub has developed into an inclusive and diverse community.

These summaries will allow us and our members to see a retrospective analysis of each year and act as a record in its continued development. It will be a chance to define a set of objectives and recommendations going in to 2021, based on careful reflection. These will play a crucial role in defining an evolutionary direction for the Hub and ensure that we are providing the best possible capability to the community.

Following on from the completion of the report, we will be inviting a group of independent community members to validate the recommendations and findings and supplement where appropriate. These will be included as an addendum to the main document.

Community

It's been clear from the start of the NDT programme, that to accelerate progress we need to learn from each other and share best practice. The DT Hub was created in response, with the vision of establishing a community of members from across the spectrum of industry, academia and policy to pool knowledge and collaborate.

Where we've come from

The DT Hub officially launched on the 31st March 2020, with six founding members, who had already made significant progress in creating digital twins. They formed the core group and set the tone of 'learning by doing and progress through sharing.'

From the very start, there was a strong interest in being part of a digital community, but we wanted to pace growth in order to learn the needs of each new community that joined. It was important that we phased in new groups by stages so that relationships, trust and engagement could be established.

Thanks to the enthusiasm of all involved, we now not only have a diverse community of over a thousand members in less than a year, but also one which is setting industry standards and is being emulated in other parts of the world.

The portal

As the community has developed so has the place where we meet. We have taken on board feedback and the needs of a growing community and adapted the platform accordingly.

Phase one was a focus on the forums area of the Hub. Three themes were identified by our founding members as key areas to explore and develop: digital twin concepts and definitions, skills and competencies and a pathway to value.

Our next phase came in mid-2020, when we focused on gathering feedback from across the community to understand what was working and areas for improvement.

Those changes were implemented and by December, we were ready to trial our new website. The focus of the improvements was on user experience and accessibility. Key changes include:

- Simplified registration process
- Improved search and organisation of content
- Better navigation and accessibility
- Better interaction between members

"The DT Hub has been incredibly useful, we've pointed many other organisations to it. In an asset management journey, the DT Hub is a reference."

Daniel Braund
DT Hub Steering Group meeting 19.01.21

Community

Gemini programme

The Gemini Programme was created as a way of communicating the work that is being done within the NDTp to our DT Hub members, as well as supporting those interested in getting more involved and being able to practically contribute to the community through the development of resources.

Currently the Gemini programme consists of two main activities:

- **A weekly call which takes place on Tuesdays.** This is a chance to report on the latest activity across the programme, as well as highlight any areas in which the programme requires support and help.

- **The Gemini projects.** Each project will develop resources for use by the DT Hub community on various subject matters, such as a toolkit for businesses that enables them to build their own digital twin business case.

Looking forward

With the community having reached a point of critical mass, the vision for the next year is to enable and facilitate more opportunities for members of the community to share their expertise, learning and experience. The hope is that the bulk of the content on the DT Hub will be generated by the community for the community.

To achieve this, we will be developing community leaders to drive the digital twin agenda and discussion within the forums. There is also a new monthly series called 'Hub Together', which is a town hall style event created to keep members up-to-date and able to ask questions.

Another key event is the Hub Insights series. In this series we will interview members of the community to learn more about them and where they are on their digital twin journey.

Knowledge

Evaluation of last year

During 2020, a diverse range of assets were created for the DT Hub in order to create, store and share knowledge. Features include registers, resource repositories and interactive tools, such as the glossary.
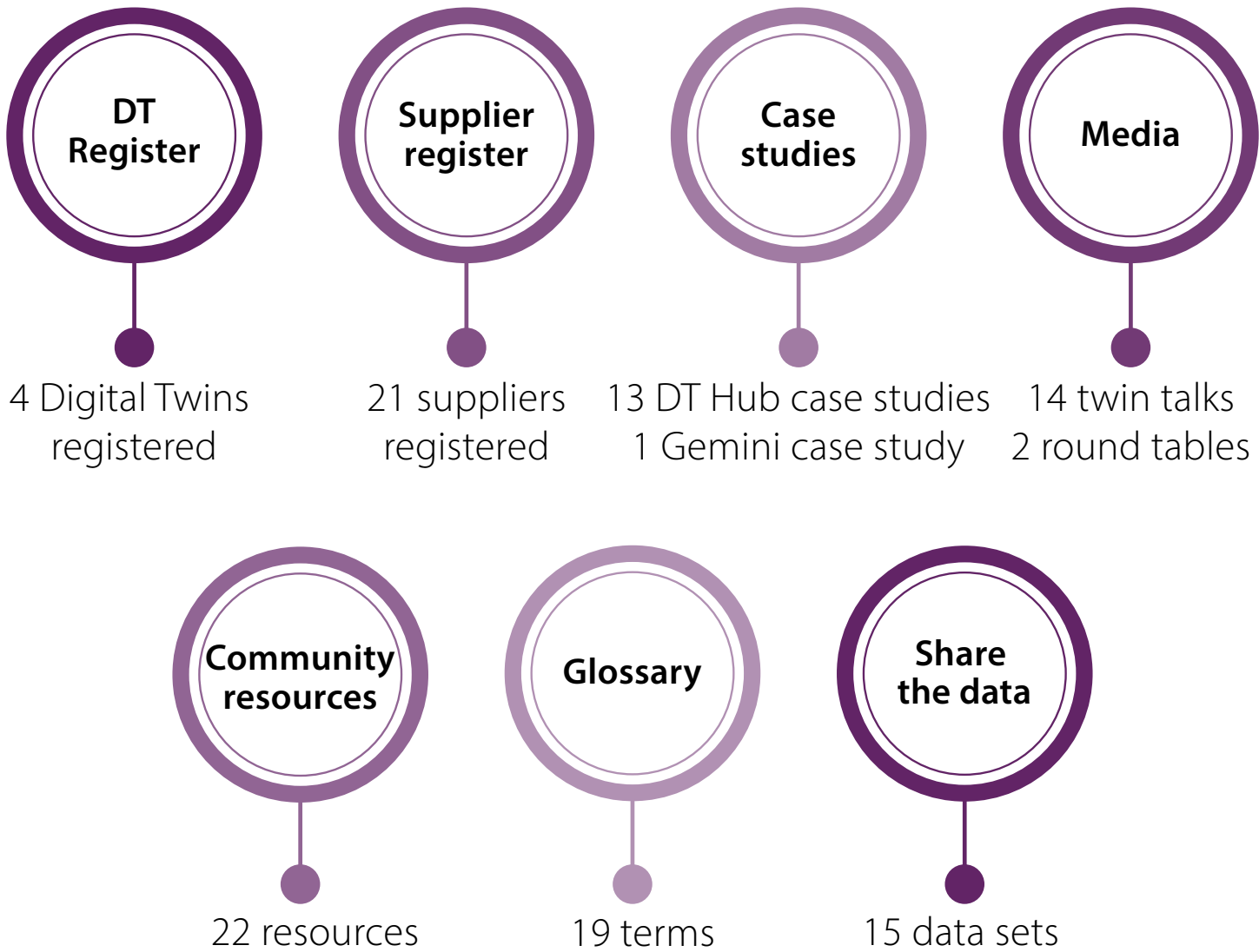
Each feature has been created to be user friendly, ensuring that the DT Hub community can easily feed their learnings directly into the collective knowledge pool. Democratising the ability to share knowledge ensures that we are operating in an inclusive way and supports the vision of being a virtual campus for the NDTp.

The social features within the DT Hub create further opportunities for members to react and add commentary to shared knowledge.

Member feedback

Matt Edwards, Chief Data Officer at Anglian Water:

"The resources are excellent in quality, engaging for our people and allow them to learn and develop their knowledge, all while giving them confidence in sharing their own advancements."

DT Register	Supplier register	Case studies	Media
4 Digital Twins registered	21 suppliers registered	13 DT Hub case studies 1 Gemini case study	14 twin talks 2 round tables

| Community resources	Glossary	Share the data
22 resources	19 terms	15 data sets

Knowledge

Going forward

A key focus for 2021 will be increasing the overall volume of knowledge created and ensuring it is relevant to the community's interests and needs. We aim to increase the number of case studies and digital twins registered, as well as increase engagement with our continued talk series.

We will encourage interaction by recognising and praising knowledge creators. We will make the connection that growing the volume of inputs by members increases the value for the whole community.

Another focus will be to continue the development of a knowledge taxonomy as part of the implementation of knowledge management practices into our processes to make it easier for all users to create, manage and share knowledge.
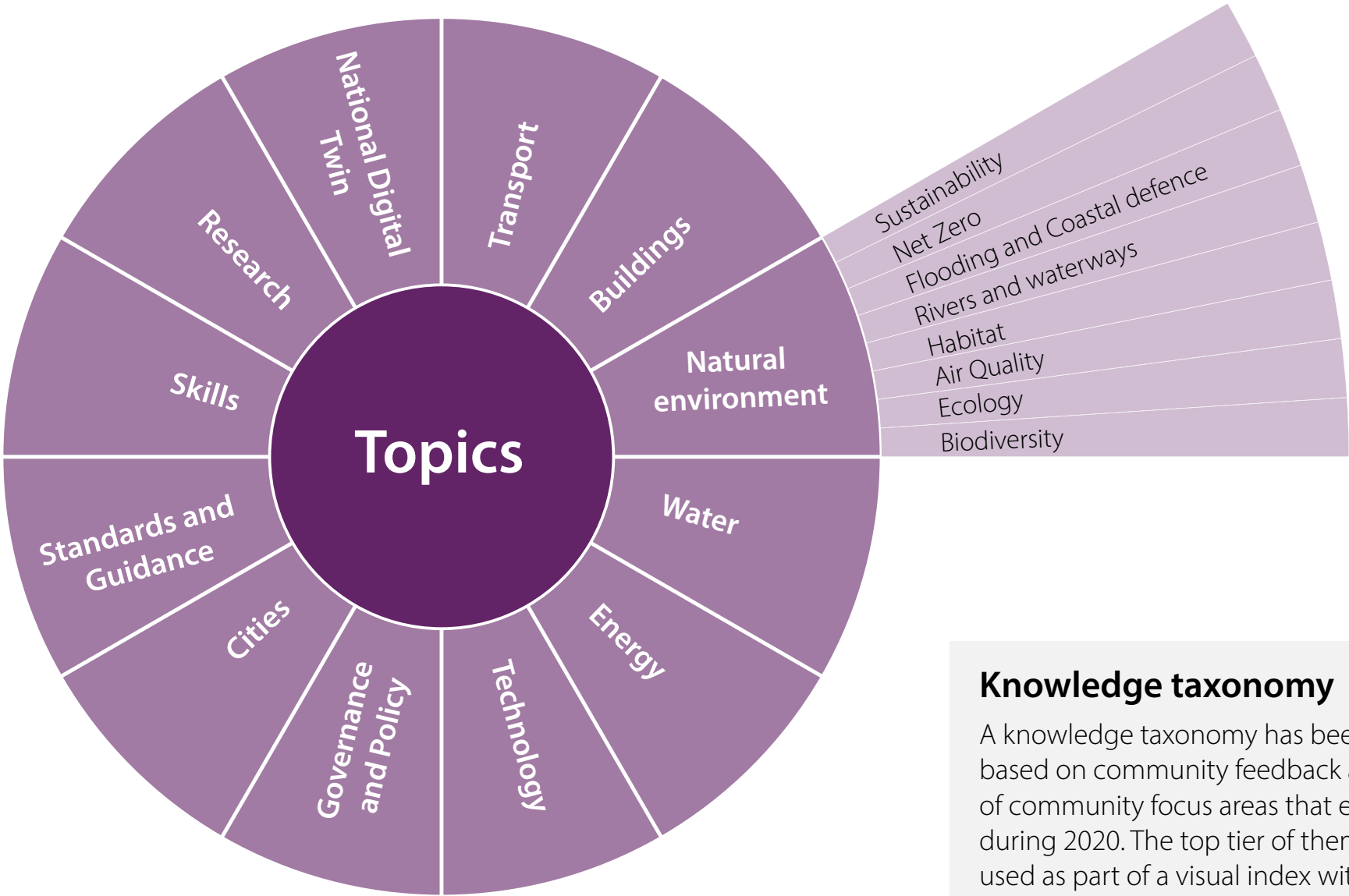
Knowledge taxonomy

A knowledge taxonomy has been developed based on community feedback and a review of community focus areas that emerged during 2020. The top tier of themes will be used as part of a visual index within the DT Hub, making it easier for community members to find content across a wide range of knowledge assets. This will replace the free tags used in the first year of the DT Hub as a more mature approach to knowledge management. It is seen as a significant enabler to allow community knowledge to grow and be used.

Smart Infrastructure Index survey

Work summary

DT Hub Asset Owner and Operator community members were invited to complete an extended version of the Smart Infrastructure Index (SII) during Q3 2020.

This version included core SII questions to analyse digital transformation maturity, as well as an extension to focus specifically on digital twins in the context of the National Digital Twin programme (NDTp).

The objectives were to:

• Better understand the maturity of our members in relation to both digital transformation and digital twins

• Explore relationships between digital transformation and digital twins

• Compare and contrast DT Hub members with boarder SII metrics

• Inform future areas of focus for the DT Hub and the NDTp.

Observation summary

1. There is no significant evidence of leaders emerging within the DT Hub, yet. Most members are at similar levels of maturity, which highlights the ongoing value of collaboration, collective learning and sharing of experiences.

2. Digital transformation maturity may not the best predictor of maturity towards digital twins. Organisational maturity in; asset management, customer focus and continental improvement are better predictors of maturity towards digital twins.

3. The biggest risks are in communication. A range of indicators predict that expectations are high, but potentially disconnected from the here and now challenges and current outcomes.

4. Answering "true" to the following questions may be the first steps to advancing digital twins.

   a) Does your organisation value its data?

   b) Does your executive board believe that the creation of Digital Twins is fundamental to the success of your business?

   c) Does your organisation use technology to measure the performance of its asset?

Evaluation of 2020

The hierarchical yes/no methodology within the SII is imperfect, but still has merit. While it is not able to ask specific details beyond a yes/no answer, the approach reduces the input required from respondents. The ability to look across and baseline against the core SII question set also added value to the results.

While the response rate was sufficient to provide an initial analysis of maturity within our membership, a greater response rate would have increased the level of insight and confidence that the result is representative of the community. Increasing the rate of response will be a key focus going forward.

The question set was developed with input from the NDTp core team, the DT Hub steering group, and SII consultants. Revision to the question set, if required, should be done in advance of any 2021 survey, as this will minimise the loss of direct comparison for subsequent years.

Going forward

We aim to repeat the community survey in 2021. Our intention is that as well as surveying our Asset owner and Operators members, we will add complementary question sets for other groups within the DT Hub community. This will allow cross community insights to be developed as we move forward.
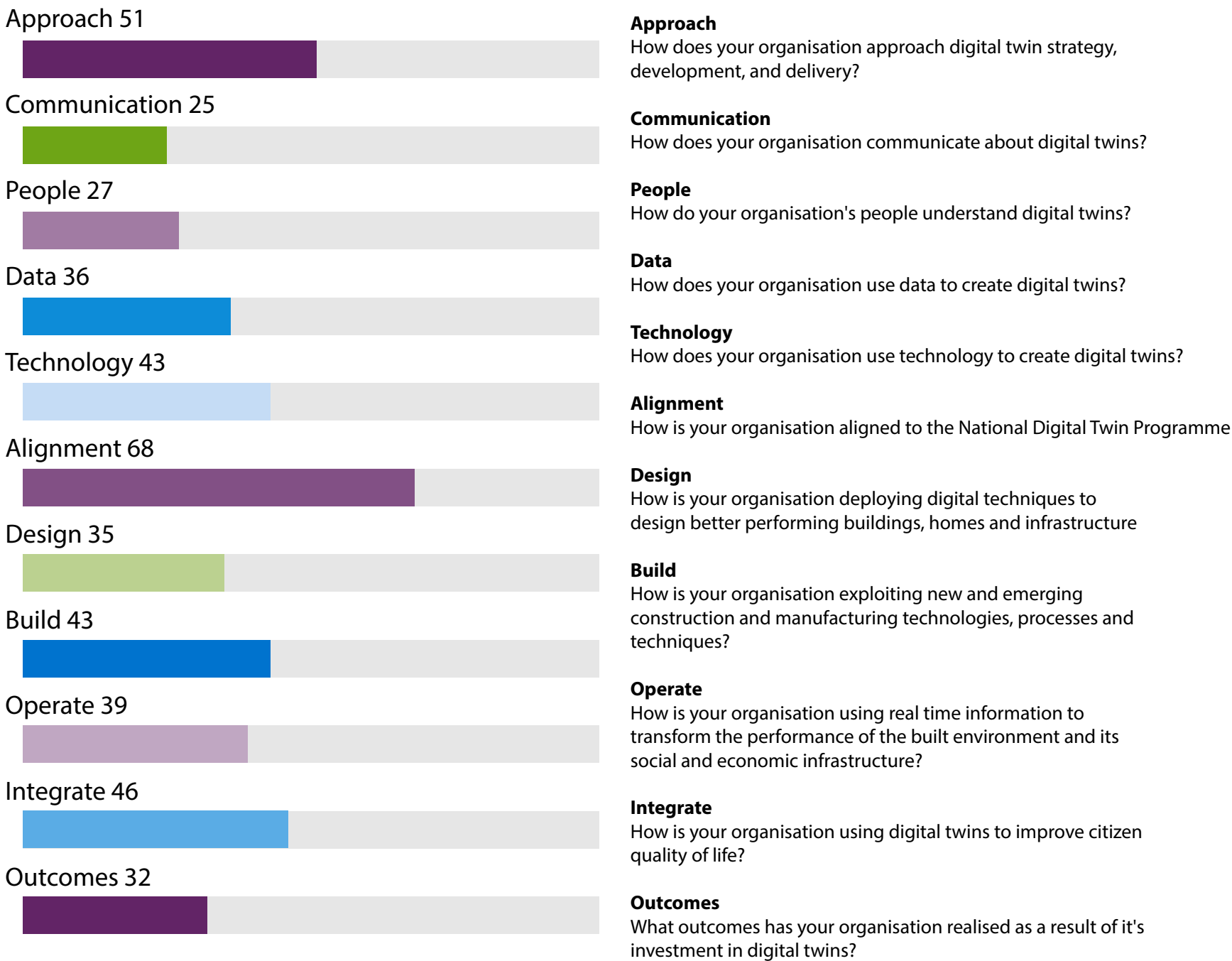
Smart Infrastructure Index survey

Comparing the DT Hub community to the baseline SII measures
Subcategory (out of 100)

Best practice

DT Hub community average

Sector average

Comparing the DT Hub community to the baseline SII measures
Focus (out of 100)

Approach 51

Communication 25

People 27

Data 36

Technology 43

Alignment 68

Design 35

Build 43

Operate 39

Integrate 46

Outcomes 32

Approach
How does your organisation approach digital twin strategy, development, and delivery?

Communication
How does your organisation communicate about digital twins?

People
How do your organisation's people understand digital twins?

Data
How does your organisation use data to create digital twins?

Technology
How does your organisation use technology to create digital twins?

Alignment
How is your organisation aligned to the National Digital Twin Programme

Design
How is your organisation deploying digital techniques to design better performing buildings, homes and infrastructure

Build
How is your organisation exploiting new and emerging construction and manufacturing technologies, processes and techniques?

Operate
How is your organisation using real time information to transform the performance of the built environment and its social and economic infrastructure?

Integrate
How is your organisation using digital twins to improve citizen quality of life?

Outcomes
What outcomes has your organisation realised as a result of it's investment in digital twins?

Standards roadmap

One of the core objectives of the NDT Programme and by extension the DT Hub has been to support the development of standards to encourage and enable consistency and compatibility in approach within the built environment sector.

This is an essential step to enable an Information Management Framework (IMF) and can subsequently also increase the capability, cost-effectiveness and re-usability of solutions developed by the supply chain as a consequence of consistent user requirements. To commence this process the NDTp commissioned the British Standards Institute (BSI) to develop a standards roadmap that would both explore the existing standards landscape and define a roadmap charting the subsequent standards opportunities.

Having considered the existing standards landscape relating to digital twins as identified within BSI's Standards Landscape Report, this standards roadmap makes several recommendations (below) for the development of additional standards to support the consistent adoption of, and interoperability between, digital twins for the built environment.

In doing so this standards roadmap recommends the development of four 'core' digital twin standards which will represent a key priority for the Digital Twin Hub as we move in 2021/2022.

Digital Twin framework for the built environment:

- **DT01** (Overview and general principles)
- **DT02** (Reference architecture)
- **DT03** (Digital representation of built environment elements)
- **DT04** (Information exchange)
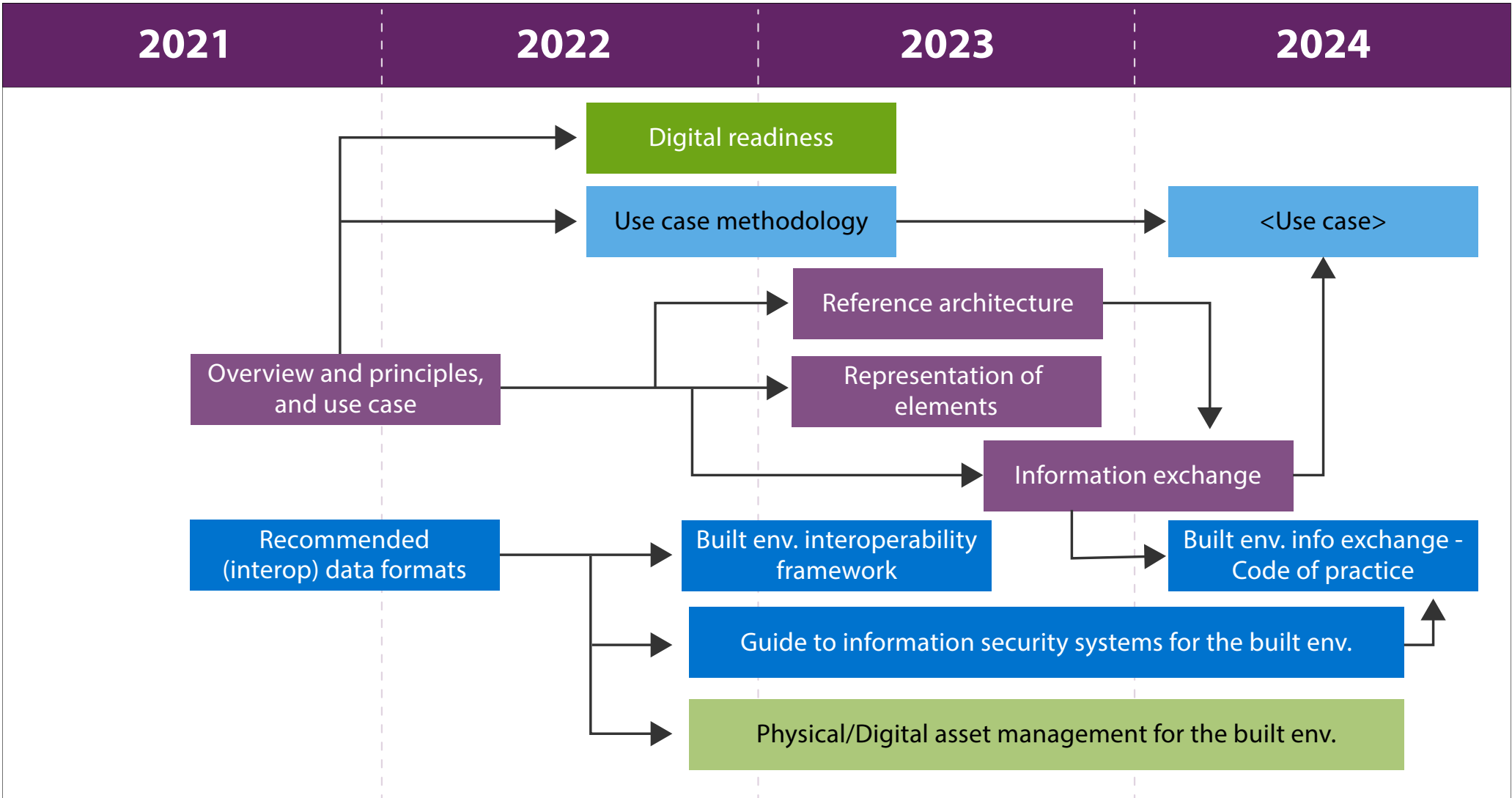
Retrospective

Although 2020 has been a unique and challenging year, due in part to the huge impact of COVID-19 on all our lives, it hasn't had the detrimental effect one might have assumed would exist when establishing a new community. We're thrilled about the progress we've made this year as we transition from individual digital twins, to an ecosystem of connected digital twins.
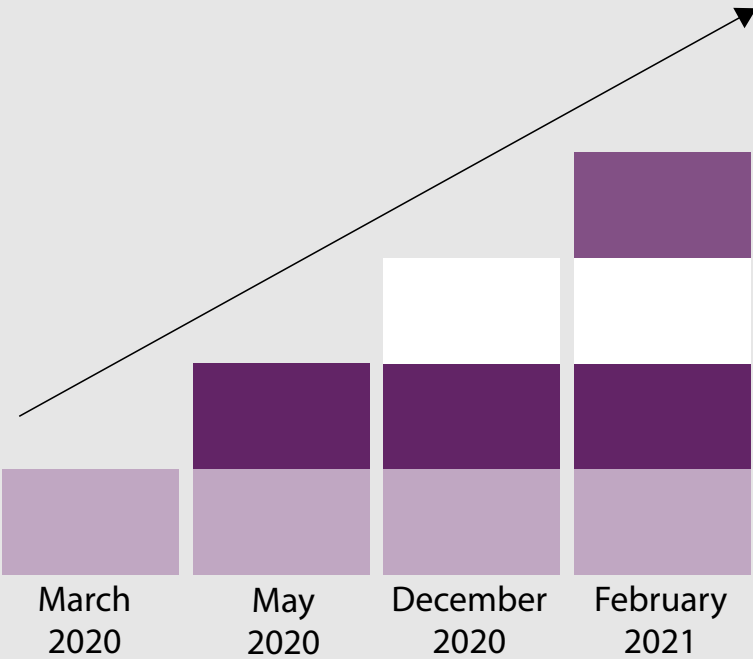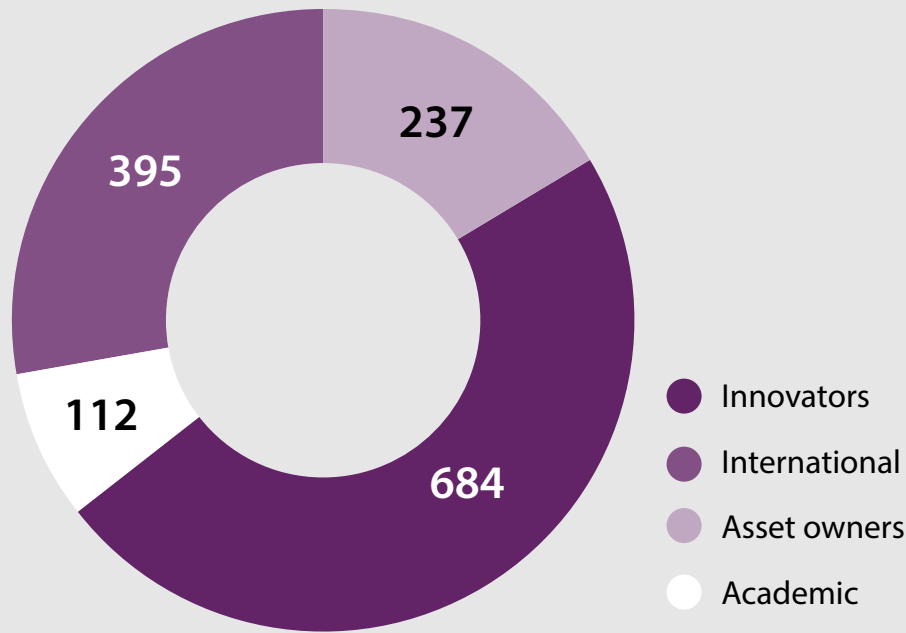
At the heart of that success has been the launch of the DT Hub. We started with six founding members and aimed to have between 200-300 by the end of 2020. Instead, we ended the year with a community of over 1400 members from across the spectrum of asset owners, innovators, academia and international members.

This huge growth validates the emphasis we have placed on engagement, sharing knowledge and networking, and demonstrates the appetite that exists for working collaboratively. We also continue to be supported by government, who have commended the progress we've made, allowing us to be hopeful as we wait for the next round of funding.

There are, however, ongoing challenges as we continue in to 2021. We have had difficulty in harnessing the community's enthusiasm in contributing content and recognise there is a need to embed a sense of ownership.

Our next step is transitioning the role of the Hub team from generating content to facilitating content. We will need to enable our members to share their learnings and take more of a leading role in driving the topics they wish to discuss. We will also need to look carefully at understanding the needs of our members, so we can provide them with the platform they need to fully engage.

Distribution of membership and growth

Donut chart values: 237, 395, 112, 684

Legend:
- Innovators
- International
- Asset owners
- Academic

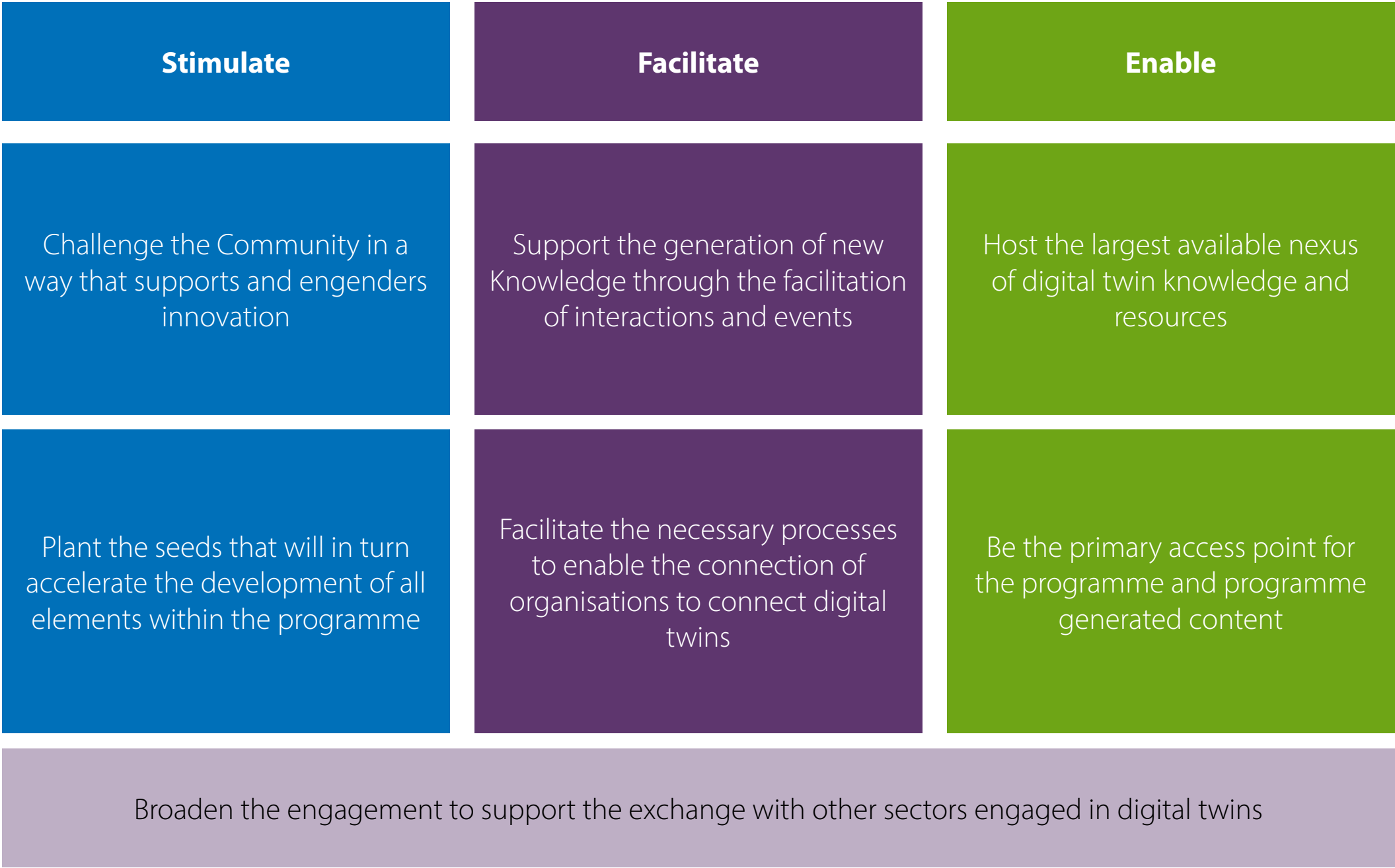Bar chart categories: March 2020, May 2020, December 2020, February 2021

Looking forward

2020 has unequivocally been a success for the Hub. However, for it to realise its full potential and value offering to the community the Hub must become the simplest and most effective mechanism through which to find out (Knowledge) about digital twins, get involved (Community), see the Information Management Framework demonstrated and innovate around digital twins.

As we progress into a new phase, we - as a team - looked at how to address some of the underpinning questions that will drive the growth of the Community and help us to shape the next stage of the DT Hub.

- How do we keep the Community engaged and **stimulate** a good level of activity?

- If our role is to **facilitate**, how do we make sure that the Hub is the right environment and the easiest place to access information, to facilitate networking and to support cross fertilisation with other sectors to see if there are any lessons that can be learnt? What can be developed to make this happen?

- How do we make sure we **enable** the community to derive tangible value from both the Hub and the NDTp and how can we demonstrate this?

Stimulate	Facilitate	Enable
Challenge the Community in a way that supports and engenders innovation	Support the generation of new Knowledge through the facilitation of interactions and events	Host the largest available nexus of digital twin knowledge and resources
Plant the seeds that will in turn accelerate the development of all elements within the programme	Facilitate the necessary processes to enable the connection of organisations to connect digital twins	Be the primary access point for the programme and programme generated content

Broaden the engagement to support the exchange with other sectors engaged in digital twins

Looking forward

From the Community point of view, we intend to focus our attention on:

- **Consolidating the community**. Asset owner members of the DT Hub currently represent 5% of all UK infrastructure asset owners. Our goal for next year is to prioritise the engagement of asset owners to increase the coverage of our addressable market and to create a solid base of organisations willing to take an active part in progressing the state of the art of digital twins. The DT Hub Community will play a vital role in setting the foundations for the deployment of DTs through the development of knowledge (case studies, best practices, guidance documents and sources of data), the participation to the development of standards and ultimately though their involvement in the process to implement the IMF.

- **Empowering the community.** A series of initiatives where members will be asked to play an active role and bring their own voice to share their advance on digital twins (Hub Insights; Hub Together and the start-up of a DT Hub County Council)

- **Nexus of digital twin knowledge.** The DT Hub will be the primary point of access for information and programme generated content. It will act as a catalyst to enable everyone interested in digital twins to interact with other organisations on the same journey.

- **Broadening the landscape.** The DT Hub will facilitate the exchange of learnings from other sectors but also ensure the work done to implement the IMF is aligned and recognised by the rest of the industry, in order to enable the creation of an ecosystem of connected digital twins – a National Digital Twin.

Our aim is to evolve the DT Hub in to a one stop shop for the digital twin community; an open and inclusive virtual space where members share and collaborate; have access to curated contents and knowledge (IMF process, case studies, tool kit); take an active part in the NDTp and in the development of important milestones such as the adoption of digital twins and the IMF (standards); meet other organisations and showcase their work ('permanent conference') and find partners for demonstration and collaborations. A gateway that will enable multiple communities to connect, collaborate, share knowledge to collectively progress the state of the art and prepare the change needed for the adoption of the IMF.

The DT Hub platform will support this process and its functionality will be extended by:

- Creating specific features to enable an active engagement (e.g. social media, mobile access, app).

- Enhancing user interfaces to facilitate the access of information (taxonomy and tagging system; visual index to access contents on specific topics).

- Developing new features to give members a sense of a community of people (hosting an annual conference; community council, hub togethers).

- Creating dedicated spaces/events and platforms to allow members to connect and network.

- Implementing tools to facilitate the sharing of knowledge and information and encourage links between the different sub-communities within the DT Hub (Asset owners, Innovators and Academia).

Conclusion and recommendations

Following on from a successful year, the next step for the DT Hub is to cement its position as the go to place for the digital twin community. It needs to bring together, in one place, the very best knowledge, people and tools in relation to digital twins and the National Digital Twin.

To do this, the DT Hub identified a number of actions that could be taken forward next year:

1. Demonstrate the value of the DT Hub Community

Recent trends have shown a rapid growth of the community. A market analysis would be beneficial to better understand our market and to have a focused approach in targeting new members.

The focus for next year should be incrementally growing the depth and breadth of asset owners and governmental involvement. Asset owners currently represent 21% of the whole community. We aim to increase this percentage and reinforce the DT Hub as being the supporter and advocator of Asset owners in their journey towards the adoption of the IMF. As a starting point, the DT Hub would like to strengthen the interactions with the Cabinet Office on the NUAR programme to attract more asset owners and create synergies across the initiatives. A second goal would be to reinforce the academic community and strengthen the connection between industry and academia.

2. Establish the DT Hub as a knowledge centre

The DT Hub should integrate knowledge coming from the NDTp and from the community in a unique and collaborative shared space. Our next step is transitioning the role of the Hub team from generating content to facilitating content. We will need to encourage our members to share their learnings and take more of a leading role in driving the topics they wish to discuss. To achieve this, we will establish a community council to drive the digital twin agenda and discussion within the forums. In parallel, the DT Hub team will focus on the further development of a knowledge taxonomy to support the creation, management and sharing of knowledge. This task will enable the DT Hub on one hand to identify best practice and standardise the processes; and on the other hand to increase the overall volume of knowledge created and ensure its relevancy to the community's needs. The knowledge management activity will also ensure the DT Hub enables and supports members in the adoption of the IMF.

3. Adapt the platform to respond to the needs of a growing community.

The development of the platform will need to adapt as the community grows. It's important that we look carefully at understanding the changing needs of our members, so we can provide them with a platform they can fully engage in. The focus for next year will be to improve and enhance user experience based on community feedback, and adjust the platform accordingly.
The platform must also increase its capacity to develop and establish relations amongst community members. Those relationships will be essential for the connecting of digital twins and for resolving any emerging issues around the development of the twin's themselves.

4. Establish processes that will enable manageable community growth

As the DT Hub begins to increase its value offering to members, we expect to see a growth in scale and need to manage that in a way that doesn't damage the quality of the existing member base. It is therefore strongly recommended that the DT Hub implement a scaling plan that can put in appropriate controls to ensure growth happens in a controlled and manageable fashion.

"I engage with you because I feel that there is a real sense of the "greater good" and because also I "like" engaging with you :-)"

Holger Kessler, Geospatial Commission
Hub Insight 02.02.21

Appendix 1 – Community response

We asked the community to conduct an independent review of the DT Hub, evaluating its focus and activities over the past year. This response was gathered through an online Miro workshop facilitated by Simon Evans from Arup.

The workshop was held on the 12 March 2021, and was attended by 32 members of the community. The attendees represented the various communities within the DT Hub including asset owners, innovators, and academia. All attendees are active members of the DT Hub and so the response is considered to be a fair representation from the DT Hub community.

The attendees were asked to comment on the positive outcomes and areas for improvement for the DT Hub, its community, knowledge, and software platform.

What was good

- **Growth.** The community has grown steadily and brings together varied knowledge and experience. Members have diverse views from across industry (client, consultant, supply chain) and academia, and it is a useful forum for connecting people and experts from a range of sectors in an open and visible way.

- **Content.** The presentations and topics have been thought provoking, and generate interesting discussion that members feel able to participate in or observe. The platform's modern look and reasonable user experience has made it accessible.

- **Organisation.** The organisation and steering of the community by the DT Hub team has been appreciated, as have the communications and outreach into the community.

- **The DT Hub**. Overall, the DT Hub has really helped start the conversation about digital twins, and a useful resource to inform and educate. It has formed a sense of community which is geographically spread and aligned around a common subject/purpose.

What could have been done better

- **Volume of active members.** Whilst ~1,500 members is undoubtably an achievement, it is also quite a small number in relation to the built environment sector, and only a small proportion of these members are actively engaging. This is evident from content having lots of views but receiving few comments or reactions.

- **International membership and collaboration.** The DT Hub is very UK-centric and was only recently opened to international registration. Now that it has, the DT Hub should encourage greater international representation and participation. Additionally, stronger and more explicit links should be made with other international digital twin communities, such as the Digital Twin Consortium.

- **Curation, navigation, and accessibility of content.** The DT Hub would benefit from easier navigation or searching to find relevant content, especially as the community and content grows. The visual index has partly addressed this need. There would also be a benefit in providing members with tailored content or digests based on their preferences and areas of interest, as navigating all content to find relevant information is time consuming. Additionally, the curation and highlighting of accurate content should be improved. The reputation score is a way of ascertaining the popular messages, but that does not necessarily provide an indication of who are the knowledge leaders.

- **Clearer articulation of the DT Hub purpose, scope, and how to engage.** Provide clearer guidance to the members on how and why to engage, and the scope of the DT Hub. Additionally, the DT Hub has potentially struggled with the appropriate tone of voice and the balance between informal/fun and professional.
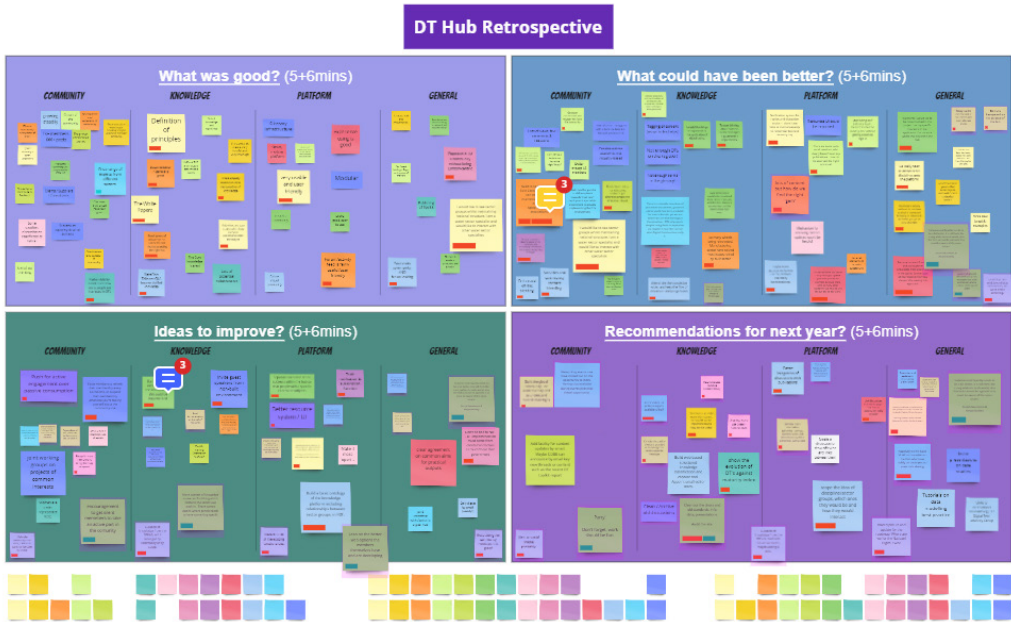
Appendix 1 – Community response

Ideas to improve

- **Volume of relevant content in the DT register, glossary, and case studies**. The DT Hub would benefit from referencing a greater number of tangible examples of digital twins being implemented, having greater focus on practical steps for deploying digital twins, and including further resources that are not produced by CDBB.

- **Greater diversity amongst members.** The DT Hub would benefit from a greater diversity of its membership, and wider representation across demographics, disciplines, and sectors. This could be assisted by a greater range of groups or communities of practice within the DT Hub.

- **Openness.** The DT Hub should consider providing greater 'open-access' material (where registration is not required) as a means of providing greater visibility and transparency. Additionally, provide greater visibility of activities and progress within the National Digital Twin programme and how members can contribute and get involved for example, working groups, giving talks and presentations, and partaking in Gemini projects.

- **Onboarding of new members.** As the community grows and matures, continue to recognise that many new members will be less knowledgeable and may require guidance and greater attention to become engaged.

Recommendations for next year

- **Community meetups.** The DT Hub would benefit from a greater number of community meetups and networking events, online or in-person when permitted, and increasing the engagement and participation from across the globe. This would increase active participation from the community, and move to greater contribution over passive consumption.

- **Content creation and clean-up.** As the DT Hub grows it will be necessary to "clean up" legacy content and less relevant topics. The DT Hub would also benefit from greater curation of knowledge, for example providing recommended literature or content. Additionally, the community could be asked more about what they would like from the DT Hub in terms of content, events, and direction.

- **Practical digital twin examples.** The DT Hub should continue to build out, and focus on, knowledge and content on practical digital twin applications, examples, and case studies. Additionally, The DT Hub should consider introducing further discipline or sector groups, and invite more presentations and talks from the community to generate dynamic and thought provoking content.

- **Continual improvement.** There should be continual improvement of the platform, based on user needs and feedback from the community. For example, email digests/newsletter, provide members with customised experiences, greater 'open-access' content, and improving the resources system on the DT Hub.