



# Gravity

A Smart Campus

Digital Vision

Fast-track to the future, naturally

[thisisgravity.co.uk](https://thisisgravity.co.uk)

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## Introduction

Gravity is a 616-acre UK enterprise zone that is strategically located at the gateway to the South West of England. The site aspires to become a globally competitive, clean growth-focused smart campus and community that attracts the world's most innovative companies. By attracting companies at the forefront of innovation and sustainability in their respective sectors, Gravity will transform the local economy, lead the UK's transition to clean and inclusive growth and act as a beacon for international inward investment in a post-Brexit world.



In today's increasingly connected world, a robust, resilient and future-proofed digital connectivity infrastructure, brought to life through a suite of innovative and interactive digital services, is a critical component of a cutting-edge smart campus. Digital infrastructure will underpin future energy, mobility and building management systems, and will be integral to the delivery of a seamless and engaging user experience. It has the potential to enable a range of operational efficiency, resource conservation and cost reduction benefits, and can open up a diverse set of new revenue streams.

For these reasons, Gravity have commissioned Arup to produce a Digital Vision for the site. Informed by Arup's extensive knowledge of emerging market, technology and innovation trends, along with a thorough desktop review of existing strategies and a comprehensive set of stakeholder interviews, this Digital Vision sets out an ambitious programme of initiatives that Gravity will implement to realise its ambition of becoming a globally competitive smart campus and a flagship for clean and inclusive growth in the UK.

Digital connectivity and technology will be pervasive and ubiquitous across the site, enabling and enhancing every activity, service and function. Reflecting this, the Gravity Digital Vision has been written to compliment and sit alongside the site's other visions and strategies, including the strategic design code and its transport, energy and clean growth strategies.

### A digital blueprint for a smarter, cleaner, future

Gravity will be a **trailblazing smart campus and community**, a **physical and virtual hub** that **pioneers the use of digital connectivity and data to enhance, streamline and decarbonise every facet of life** for its users.

Enabled by a **flexible, scalable and future-proofed digital infrastructure** foundation, along with an **open and integrated data management layer** and **suite of cutting-edge end-user services**, Gravity will:

- **Catalyse clean growth and high-value innovation** in the UK through the provision of flexible, connected and remote workspaces, low-carbon energy, on-site innovation 'test beds' and a regional digital innovation alliance.
- **Create a vibrant, inclusive and thriving community** by connecting people, incentivising collaborative and sustainable behaviours, showcasing the natural environment and curating a dynamic, health and wellbeing-focused recreational offer.
- **Spearhead the active travel and future mobility agendas** through the promotion of active travel, the creation of a national exemplar integrated mobility hub and the trialling of next-generation transport services.

Gravity's market-leading digital offer will attract the world's most innovative and conscientious businesses, accelerating the UK's transition to clean economic growth and driving widespread transformation in local communities.

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## 2.0 Context

## Market Trends

There are a number of consumer-driven market trends that will have a significant impact on the way people want to work, live and play in the future. Gravity is uniquely positioned to consider and embed these market trends from the beginning of the design, build and operate lifecycle. This will result in Gravity being able to seamlessly meet and exceed the expectations of future generations.

A Need for Convenience	A Preference for Personalisation and Customisation	The Prioritisation of Health and Wellbeing	The Rise of the Sharing Economy	A Drive Towards Clean and Ethical Consumption
<i>Millennials are more likely than other generation to view work-life balance and not enough free time as major career concerns.<sup>1</sup></i>	<i>22% of consumers are happy to share data in return for a more personalised product or service.<sup>2</sup></i>	<i>72% of Generation Z say managing stress and mental health is their most important health and wellness concern.<sup>3</sup></i>	<i>25% of UK adults are already sharing online, and that global sharing economy revenues could rise to £230bn in 2025.<sup>4</sup></i>	<i>49% of those under 24 have avoided a product or service due to its negative environmental impacts.<sup>5</sup></i>
Rising internet penetration, faster paced lifestyles and challenging working hours are adding more and more layers of complexity to peoples' lives. People are feeling more stretched than ever before and are increasingly demanding that products, places, spaces and processes help them overcome everyday obstacles to effortless living. In today's hyperconnected world, convenience is the ultimate currency. Traditionally the key driver of convenience has been physical location, but digital technologies are adding a new dimension, allowing convenience to be cultivated no matter where people are.	It is no longer enough to cater to broad consumer groups or provide a 'one-size fits all' offering. Personalisation is now key to driving interest, engagement, accessibility, satisfaction and retention. Enabled by the vast availability of data, experiences are being transformed from generic and static, to responsive and personalised, providing consumers with a product or service that is better tailored to their specific needs. From a commercial perspective, businesses gain a deeper insight into people's behaviour, and can create a differentiated proposition that may command a price premium.	People are increasingly prioritising their health and wellbeing over other traditional economic drivers like earnings and ownership of material objects. Owning the most expensive or the latest goods has taken a back seat to looking and feeling good. The core definition of health and wellbeing has evolved to no longer refer to a lack of illness, and instead reflecting a more holistic state of being, where one's mental, physical and emotional health are in sync and fulfilled. Technology is enabling greater access to wellness information and has made personal health monitoring readily accessible to everyone.	The sharing economy can be defined as the preference to pay for assets or services by consumption or on-demand, rather than owning assets permanently or signing long-term contracts for services. The rise of collaborative consumption and the proliferation of asset sharing models can deliver a number of benefits to companies and consumers alike. From an organisational perspective, the sharing economy helps maximise the value generated from underutilised assets. From a consumer perspective, the sharing economy gives people the benefits of ownership but with reduced costs and less environmental impact.	In recent years, there has been a growing awareness of environmental issues such as the impact of plastic on the planet and the lack of progress on addressing global warming. People are showing a real appetite to address their own impacts and more people are looking to spend their money and shape their lives in accordance with their values and beliefs. Businesses that fail to acknowledge and adapt to these changing consumer demands will struggle to compete in the future, especially as the younger generation makes up an increasing proportion of the wider population.



## Technology Trends

Technology has the potential to radically change the way people live, work and play, from how organisations manage infrastructure and assets, to how they deliver critical services. Digital technologies, the services they enable, and the skills and connectivity required to use them are beginning to have a significant effect on communities, and on placemaking outcomes such as economic growth, social mobility, community engagement, wellbeing and carbon impact.

These outcomes are traditionally associated with the physical characteristics of the built environment. Developments that do not integrate these previously separate disciplines are unlikely to achieve their short-term objectives, let alone their long-term aspirations. More importantly, the people living within these developments will struggle to thrive in an increasingly digital world.

The Urban Land Institute has grouped current and emerging technology trends into a series of 'waves':

- The **first wave** of digital technology started in the early 1990's and continued to around 2010. This wave is framed by the internet and fixed connectivity in combination with personal computers, content (in the form of music, films, games and books) and e-commerce.
- The **second wave** started in 2005 and is currently peaking. This wave includes the advent of social media, mobile connectivity (including the use of smartphones), big data and cloud computing.
- The **third wave**, currently forming, covers some technologies with great potential for disruption: Internet of Things, smart machines (utilising AI, robots and autonomous systems), additive manufacturing, augmented and virtual reality (and associated wearables) and blockchain.
- **Future waves** become more difficult to predict but are likely to include technological developments in areas such as smart materials, nanotechnology, androids and biomedical interventions throughout the 2020s to 2040, and the emergence of full artificial intelligence and quantum computing between 2030 and 2050<sup>6</sup>.

With Wave 1 and 2 technologies now being considered a 'business as usual', **Gravity will pioneer the usage of wave 3 technologies** to cultivate convenience, deliver unrivalled levels of personalisation, facilitate the sharing economy, enhance the site's health and wellbeing offering and reduce the carbon impact of site operations. Alongside maximising its usage of currently available technologies, Gravity will ensure its digital infrastructure foundation is **ready to adopt new technologies** as they emerge, **ensuring that the campus remains at the forefront of digital innovation.**

Current Wave				
Wave 1 (1990-2010)	Wave 2 (2005-2020)	Wave 3 (2010-2030)	Wave 4 (2020s-2040s)	Wave 5 (2030s-2050s)
Personal Computers	Social Media	Internet of Things	Nano-technology	Full Artificial Intelligence
Connectivity	Mobile (3G/4G) & Smartphones	Smart Machines (AI, Robotics, AVs, Drones)	Androids & Advanced Biometrics	Quantum Computing
Online Content	Big Data	3D Printing & Additive Manufacturing	Image Reference: Urban Land Institute, Urban Technology Framework: 12 Key Trends and What Drives Them, 2019	
Internet and eCommerce	Cloud Computing	Immersive Technology (AR & VR) & Wearables		
		Blockchain & Distributed Trust		
		Private Energy		

Innovation Locations – Critical Success Factors

Across the globe, local authorities, landowners, planners and developers are seizing the huge opportunities presented by innovation and disruption in advanced, high growth industries. However, not all places have the assets, ecosystem and expertise necessary to make a new location work for innovation. An independent report has categorised global innovation locations into 9 distinct typologies and lists the critical factors or preconditions that are required to drive success.<sup>8</sup> As a rural enterprise zone located within the emerging South West Clean Growth Corridor, Gravity spans 3 of these 9 innovation location typologies. **Gravity’s scale, strategic location and focused leadership means it has all the critical factors required to become a successful innovation location. Moreover, there are a number of opportunities for digital connectivity and technologies to strengthen and reinforce these success factors.** These are highlighted by a lightbulb icon below.

Large Out-of-Town Innovation Zones

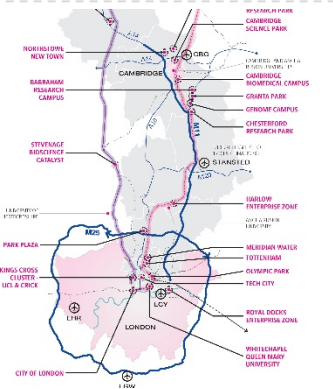
Around the world, cities and regions are creating large-scale zones dedicated to innovation, many of them configured as ‘special economic zones’ or ‘enterprise zones’.



Examples: Suzhou Industrial Park (China), Manchester Airport City Enterprise Zone (UK)

Regional Innovation Corridors

Often established to acknowledge an interconnected economic area, innovation corridors aim to optimise key assets and create an innovation-friendly model using specialisation, concentration and skills development.



Examples: London-Stansted-Cambridge (UK), N2 Innovation Corridor Boston (USA)

Site Vacated by Major Employers

Innovation centres are springing up on sites that have been vacated or are being ‘wound down’. These sites include airports, military bases and relocating hospitals.



Examples: Berlin TXL (Germany), Brooklyn Navy Yard (USA)

Critical Success Factors

1	Strategic location relative to other markets and centres in regional innovation system	✔
2	Flexible master planning and development parcels	✔
3	Agreement and assurances about major transport links	✔
4	Simplified and easy-access ‘one-stop’ systems for businesses to navigate	💡
5	Attraction of highly-skilled workers	✔

1	Key sector strategies	✔
2	Collaborative economic development institutions to support corridor	✔
3	Coordination networks in higher education and employer training	✔
4	Focus on placemaking and liveability factors	💡
5	Focus on the social value being created	✔

1	Clear pathway from transition from former use	✔
2	Appetite for, and deliverability of, large-scale redevelopment	✔
3	Creation of new identity, profile and positive visibility	💡
4	Wide mix of spaces	✔
5	Patient approach to value creation	✔

Reference: The Logic Of Innovation Locations, Future Cities Catapult, 2017

## 3.0 Research



## Research

Arup have undertaken a two-pronged research exercise to inform the creation of a Gravity Digital Vision. Arup reviewed the documents shown below to gain a thorough understanding of the context and ambitions surrounding the Gravity site. This was augmented by the completion of a dozen interviews with stakeholders including the site planning and development team, local authorities, regional LEPs, infrastructure providers and regional research and educational institutions. These interviews sought to understand how digital could be used to either capitalise on opportunities or resolve challenges relating to the Gravity site. The opportunities and challenges identified through these interviews are detailed on the following pages.



## Stakeholder Views: Opportunities

- 1) **A first-of-its kind digitally-enabled campus:** There is currently no campus in the world that uses digital to enable, improve and enhance every aspect of its operation. There is an opportunity for Gravity to become this ground-breaking smart campus; a campus that utilises digital connectivity and technology to cultivate the convenience, innovation ecosystem and physical connectivity qualities typically found in urban locations, while allowing users to enjoy the space, lifestyle and wellbeing benefits delivered by Gravity's intra-urban setting. By using digital to combine these hitherto mutually exclusive options, Gravity will bring a completely new offering to market that will attract the most innovative companies and allow occupiers to develop interesting and rewarding careers while maintaining a good work-life balance.

Additionally, Gravity has the opportunity to be the first campus to be built with new working and leisure preferences in mind. By acting as a both a physical and virtual hub for work, life and play, Gravity will allow people to live their lives as they want, and will connect a far wider community than is typical for a traditional, physical campus, and therefore deliver more transformational outcomes.

- 2) **An enabler of Gravity's zero carbon ambitions:** From underpinning the site's energy generation and smart grid infrastructure, to streamlining the operations of buildings, and providing access to clean and green modes of transportation, digital connectivity has a fundamental role to play in helping Gravity achieve its zero carbon ambitions. The potential of technology to help Gravity on this journey will only increase in time, as developments in the areas of artificial intelligence, robotics and immersive reality technology offer increased opportunities for automation, optimisation and resource conservation.
- 3) **A test-bed for high-end disruptive technologies:** In order to attract the world's most innovative companies and ensure the site remains at the forefront of digital developments, there is an opportunity for Gravity to present itself as a test-bed for future products and

services. The Gravity team are already pursuing this opportunity through their involvement in a regional consortium proposing to create a Free Port testbed. If successful, Gravity will be linked to Bristol Port via 5G-enabled 'corridor' to enable the trialling of next-generation logistics services. As a result of Gravity's participation in this test bed project, the site will have cutting-edge 5G infrastructure deployed ahead of the general market, demonstrating this model's ability to accelerate the deployment of emerging digital infrastructure to keep Gravity ahead of the digital curve. To fully realise the benefits associated with acting as a test bed, it is important that organisations that use this facility, physically locate a significant R&D function at the site and actively contribute to the community. This will ensure that Gravity maintains a vibrant innovation ecosystem and that associated benefits will be enjoyed by those in the South West region.

- 4) **A catalyst for local area transformation:** There is an opportunity for Gravity to open employment, skill development and learning opportunities to local communities, in order to drive a transformational change in the economy of the local area. Through giving local schools access to the site's facilities, data and innovation test beds, Gravity can expand the horizons of local children and give them early access to new technology thereby sparking their imaginations and aspirations at a young age. Through engagement with higher education institutions, Gravity can shape course offerings to ensure that the region is able to provide the skilled-labour pool required to attract the world's most innovative companies. Conversely, this engagement will effectively prepare students with the skills required to secure jobs with Gravity tenants and ensure that apprenticeship opportunities are forthcoming. Lastly, through the provision of grassroots digital skill programmes, Gravity can ensure that all local communities are able to actively participate in the Gravity Smart Campus. By capitalising on these opportunities, Gravity will create a strong and resilient local labour pool which will attract some of the world's most innovative companies. This self-perpetuating cycle will lead to widespread economic and social transformation in the region.

## Stakeholder Views: Challenges

- 1) **Changes to working practices and expectations:** In just a few months, Covid-19 has changed how and where we work, forcing different and flexible ways of working. The pandemic has accelerated a range of pre-existing trends in the commercial property sector around health and wellbeing, activity-based working, flexibility and the drive for better space utilisation. There remains some uncertainty around how these trends will settle as the pandemic subsides, and therefore how tenant's requirements and office users' needs will change in the future. Digital connectivity and services are already being used to enable new working preferences such as remote and immersive co-working, as well delivering flexibility in both lease arrangements and on-site space utilisation. Digital will be a critical in enabling Gravity to quickly pivot to satisfy ever-changing user needs.
- 2) **Site location and access:** Gravity's location away from major population centres means that those users that are not residents will need to travel to and from the site for work and leisure purposes. There is a risk that these journeys are conducted using private vehicles, thereby contributing to emissions and congestion in the local area. In addition to the proposed rail link, digitally-enabled initiatives such as car sharing, e-bike hiring schemes and wider mobility-as-a-service offerings can provide viable and attractive alternatives to private vehicle usage. Where private or shared vehicles are used, extensive charging points should be provided to encourage the use of electric vehicles over their fossil fuelled counterparts.
- 3) **Integration with surrounding areas:** Gravity has ambitions to become a world-leading smart campus that conducts globally-significant innovation activities centred around clean growth. While pursuing this ambition it is crucial that Gravity does not become a traditional 'business park' in the sense that it becomes a one-dimensional workplace that is isolated and removed from local communities. Digital technologies can open up real-time, bi-directional communication channels to local communities, keeping them abreast of the latest developments happening on the site and collecting their thoughts and feedback, while digital platforms can provide local communities with access to sports, leisure and recreational facilities.

While digital undoubtedly has the potential to connect communities, it also has the potential to exclude. It is critical that Gravity considers the availability and capability of digital infrastructure in the surrounding areas. As working and leisure practices change in the wake of the pandemic and virtual engagement and participation increases, there is a risk that Gravity delivers a digital offering that requires such strong digital connectivity that it can only be enjoyed by those physically on site. Those in surround areas may have insufficient digital connectivity provision to make use of the virtual and online services provided. This may result in Gravity being a 'digital island' and will impair the formation of a vibrant and inclusive community.

- 4) **Behaviour change to support digital and zero carbon agendas:** The success of Gravity as a Clean Growth-focused Smart Campus is not just dependant on the buildings, infrastructure and assets deployed. A critical component will be the tenants and users that occupy the site. For tenants, it is critical that they are bought in to Gravity's clean growth and digital ambitions and actively contribute to their achievement. From a user perspective, the behaviour changes necessary to adopt new digital services and adapt to digitally-enable lifestyles should not be underestimated. Users should be empowered to utilise digital services in ways that they feel comfortable and should be incentivised to fully participate in campus life and contribute to the achievement of clean growth goals. Through these activities, the site will develop its own culture, along with an associated sense of community.
- 5) **Pace of digital change:** Digital technology is evolving and advancing at unprecedented rates and it is near impossible to predict where the next breakthroughs will be made. Only 20 years ago, a basic online search engine and home wi-fi were cutting-edge innovations, and we are now in the era of immersive technologies and autonomous mobility. Any digital infrastructure deployed on the Gravity site must be flexible, adaptable and scalable to cope with the ever-increasing bandwidth and data processing requirements of emerging digital solutions, and to accommodate the 'unknown unknown' digital developments that will unquestionably arise in the coming years. Throughout this process of new technology adoption, it is imperative that digital solutions are considered within the context of Gravity's overarching aims and objectives, thereby ensuring that technology serves a clear purpose and delivers value.

## 4.0 Digital Vision



## Digital Vision

Gravity will be a **trailblazing smart campus and community**, a **physical and virtual hub** that **pioneers the use of digital connectivity and data** to **enhance, streamline and decarbonise every facet of life** for its users.

Enabled by a **flexible, scalable and future-proofed digital infrastructure** foundation, along with an **open and integrated data management layer** and **suite of cutting-edge end-user services**, Gravity will:

- **Catalyse clean growth and high-value innovation** in the UK through the provision of flexible, connected and remote workspaces, low-carbon energy, on-site innovation ‘test beds’ and a regional digital innovation alliance.
- **Create a vibrant, inclusive and thriving community** by connecting people, incentivising collaborative and sustainable behaviours, showcasing the natural environment and curating a dynamic, health and wellbeing-focused recreational offer.
- **Spearhead the active travel and future mobility agendas** through the promotion of active travel, the creation of a national exemplar integrated mobility hub and the trialling of next-generation transport services.

Gravity’s market-leading digital offer will **attract the world’s most innovative and conscientious businesses, accelerating the UK’s transition to clean economic growth and driving widespread transformation in local communities.**

The following pages provide examples of the digitally-enabled initiatives that could be implemented to make this vision a reality.





## Digital Vision – Potential Digital Initiatives

- **Catalyse clean growth and high-value innovation** in the South West and further afield through the provision of flexible, connected and remote workspaces, low-carbon energy, on-site innovation ‘test beds’ and a regional digital innovation alliance.

### Building Management Systems (BMS)



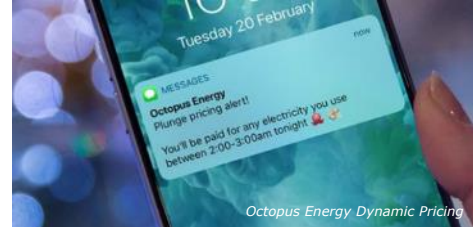
BMS's integrate and optimise the management and control of an intelligent building's infrastructure equipment using IP and open standards. These systems integrate the management of power distribution, HVAC and energy management, lighting, access controls, surveillance and security, and on-site energy generation. These systems can dramatically reduce energy costs and provide data to inform building configuration and predictive maintenance efforts.

### Flexible and Reprogrammable Spaces



Demand for space in future developments will constantly change as a result of growth, demographics and consumer preferences. The use of digital programming allows spaces to shift between uses, while minimising the overall built footprint. Reprogramming is often informed by feedback from community engagement portals and data from smart building systems. This reprogramming is then exploited through the provision of space-as-a-service offerings.

### Energy Demand Management (EDM)



EDM solutions use technology and data to help occupants make more sustainable decisions regarding energy usage. This could be through prompting them to turn off items that are no longer in use, encouraging them to run high-energy processes at times of low energy demand or charging electric vehicles during periods where solar energy production is high. Behaviour change could be further incentivised through smart-grid enabled dynamic energy pricing mechanisms.

### Borderless Working



The C-19 pandemic has accelerated the demand for flexible and remote working. This demand will only increase as Generation Z reach working age. Outdoor solar-powered workstations allow people to work in natural settings, while enjoying access to all the amenities they would have at their traditional office desk. For those that do not want to travel to the office, immersive technologies and remote access allow them to enjoy the campus from their own home.

### Innovation Test Bed



Innovation test beds provide a real-life environment for innovators to develop and test their products and services. These test beds do not only provide the physical or virtual space for experimentation, but also facilitate and curate the development of collaborative relationships between involved stakeholders. Test beds have been shown to strengthen relationships with educational and research institutes and can ensure the location gets access to the latest technologies ahead of the market.

## Digital Vision – Potential Digital Initiatives

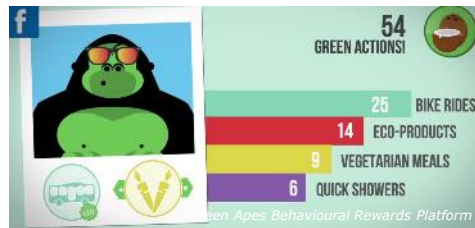
- **Create a vibrant, inclusive and thriving community** by connecting people, incentivising collaborative and sustainable behaviours, showcasing the natural environment and curating a dynamic, health and wellbeing-focused recreational offer.

### Gravity Campus Application



Campus apps act as 'one stop shops' for employees, residents and visitors to find out about what the campus has to offer, providing information on: services, amenities, interest groups and clubs, events, on-site retail and food and beverage outlets and real-time area information. These apps do not just enable communication between the site operator and users. Communication is encouraged between users to create a sense of community.

### Behavioural Rewards Platform



These platforms incentivise users to contribute to various site agendas such as sustainability, active travel and healthy living. They engage users and support them in changing their lifestyles to achieve the platform's ambitions, while also enrolling local businesses in order to provide rewards. For example, users may be encouraged to cycle or walk instead of taking their car. Progress is recorded and users earn reward points which can be redeemed at participating businesses.

### Civic Crowdfunding



Civic crowdfunding is the application of crowdfunding approaches to financing projects that aim to produce shared goods and services for communities. It is usually facilitated through online websites or platforms that host ideas for projects and handle financial transactions. The approach represents a new model of community development — allowing citizens to take an active role in the physical improvement of neighbourhoods and the building of long-term community resilience.

### Interactive Environments



Interactive environments comprise of spaces that sense, respond and encourage citizens to actively engage with the environment around them. By connecting data and experiences that develop through this engagement, the built environment becomes an interactive, adaptive and animate entity. Such environments may have many different functions, but what they have in common is the use of digital technology to enable them to interact with people.

### On-Demand Leisure



On-demand leisure can be a digital service that provides information on available sports facilities, equipment, clubs and events, and supports a number of use cases, from wayfinding and booking, to social functions and skill-sharing can help communities engage in leisure activities. A sport-as-a-service platform enables users to request locally-delivered sports and leisure equipment on-demand, supporting health, wellbeing, and activation of local spaces.

## Digital Vision – Potential Digital Initiatives

- **Spearhead the active travel and future mobility agendas** through the creation of a national exemplar integrated mobility hub and trialling of next-generation services.

### Digital Wayfinding



Peerless AV Outdoor Display

Integrated Travel Planning and Payment systems allow users to make informed decisions about their journeys and seamlessly pay for their desired transport options. Platforms provide information on the status of local transport services and provide supporting information about weather and traffic to help inform choices. They then enable users to book their desired transport without having to leave the platform. In some cases these may be multi-model transport bookings.

### Mobility as a Service (MaaS)



Free2Move app

MaaS describes a shift away from personal vehicle ownership towards rented, shared, and on-demand transportation models. MaaS digital platforms often integrate multiple transport modes to provide users with the easiest, cheapest, or most convenient route. MaaS can help increase the use of sustainable and active travel modes and provide greater access to transportation across diverse user groups. Subscription models are often used to streamline the payment process.

### Shared Micro-Mobility Schemes



Jump e-Bikes

Shared micro-mobility schemes have introduced a plethora of small personal vehicles, such as bikes and e-scooters, creating more options for people to get around at a relatively low cost. These services rely on digital platforms to manage accounts and locate vehicles. In some cases, docking stations are required to facilitate recharging. Shared mobility modes provide a more sustainable alternative to private car use and integrate well with public transit systems.

### Autonomous Transportation



Trapezio Electric Autonomous Bus

Autonomous public transport systems use buses, pods or rail-bound vehicles, along with autonomous driving technologies to provide a shared mobility option within a defined geography. Vehicles may move along segmented, pre-determined routes or may use advanced sensing technologies to be summoned to specific locations and select their own route based on external conditions. Pricing for these systems can be varied to encourage certain behaviours.

### Low-Carbon Deliveries



Delivery Start-Up Nuro

'Green' delivery vehicles such as electric vans and bicycle delivery systems are being used to reduce emissions and noise pollution. Delivery drones and robots are enabling companies to provide extremely fast and flexible delivery services, with smaller environmental impacts at potentially lower prices. Consolidation Centres are being used to collect and sort parcels for last-mile delivery, reducing the number of delivery vehicles on the road.

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## 5.0 Delivering the Vision



## Delivering the Vision

Gravity's Digital Masterplanning Model, developed by Arup, defines the various layers of underpinning technology, infrastructure and support that are required to enable the successful delivery of the digital vision.

### **Assets and Infrastructure** *(Ducting, chambers, ICT rooms, etc)*

This layer of the Digital Masterplanning model refers to the assets and underlying infrastructure that is required to enable the provision of fixed and wireless digital connectivity services.

### **Connectivity and Networks** *(Optical fibre cabling, radio technologies, LAN, WAN WLAN, etc)*

This layer consists of connectivity mediums or networks, such as fixed fibre cabling, which allow the efficient transmission of information around the site and within buildings.

### **Data** *(Data sources, schemas, governance approaches, etc)*

This layer of the model refers to the collection, storage, analysis, visualisation and sharing of data from digitally-enabled assets and services in order to optimise operations, enhance user experiences and realise cost savings.

### **End-User Services** *(Consumer-facing applications and required hardware & software, etc)*

This layer refers to the ways in which end users will be able to interact with and benefit from the various digital services available on Gravity.

### **Enablement** *(Digital literacy programmes, innovation facilitation activities, etc)*

This layer refers to skill development, community engagement and inclusion programmes and initiatives that will be put in place to ensure that everyone is able to participate in the Gravity Smart Campus.





## A Flexible, Adaptable and Open Approach to Digital Infrastructure Provision

Gravity will build an open and flexible infrastructure foundation which will seamlessly meet the initial needs of tenants, while also being adaptable to accommodate the unknown and ever-changing requirements of future tenants. In addition to deploying more conventional digital infrastructure, Gravity will be creative and innovative in their use of non-conventional assets, such as streetlighting poles and bus shelters, to deliver an unrivalled suite of digital connectivity and services. At a high-level, the initial digital infrastructure provisions at Gravity will be:

### Assets and Infrastructure

*(Ducting, chambers, ICT rooms, etc)*

### Connectivity and Networks

*(Optical fibre cabling, radio technologies, LAN, WAN WLAN, etc)*

### Data

*(Data sources, schemas, governance approaches, etc)*

### End-User Services

*(Consumer-facing applications and required hardware & software, etc)*

### Enablement

*(Digital literacy programmes, innovation facilitation activities, etc)*

- The principal infrastructure provision needed to support the site wide provision of fixed and wireless telecoms services is a duct network. This network will be installed within the primary utility corridors, and associated secondary and tertiary routes, and will serve residential, commercial and recreational buildings, as well as estate management services such as CCTV, wayfinding totems and digital signage. The routing of the duct network will need to be coordinated with other utility services and contiguous with services in neighbouring areas. In addition to a duct network, space within buildings will be required to host the rooms, routes and risers associated with fixed digital infrastructure.
- To enable the provision of wireless connectivity services, a range of structures will be required to accommodate the required telecommunication equipment. Depending on the location and distribution of buildings across the site, these structures may take the form of free-standing monopole towers and/or roof-based structures. In some cases, telecommunication equipment can be integrated into building facades and street furniture assets to minimise the need for and visual impact of such structures.
- Increasingly streetlighting poles, 'smart benches' and bus shelters are being seen as a multi-functional asset, from which a range of smart campus use-cases can be delivered. Such use-cases include:
  - Hosting of cellular small cells
  - Delivery of public Wi-Fi
  - Delivery of environmental monitoring sensors and solutions
  - Provision of electric vehicle charging points
  - Enablement of smart parking solutions
  - Housing of defibrillators
  - Provision of emergency buttons for public safety.

## A World-Class, Resilient and Future-Proofed Digital Connectivity Offering

All facets of life at Gravity will be underpinned and enabled by a world-class, resilient and future-proofed digital connectivity offering. Throughout its lifetime, Gravity will strive to remain at the forefront of digital connectivity developments through its participation in nationally and internationally-significant innovation programmes, like the 5G Create competition. Gravity's initial digital connectivity offering will include:

### Assets and Infrastructure

*(Ducting, chambers, ICT rooms, etc)*

### Connectivity and Networks

*(Optical fibre cabling, radio technologies, LAN, WAN WLAN, etc)*

### Data

*(Data sources, schemas, governance approaches, etc)*

### End-User Services

*(Consumer-facing applications and required hardware & software, etc)*

### Enablement

*(Digital literacy programmes, innovation facilitation activities, etc)*

- **Ultra Fast Fibre:** High-speed fixed broadband serves as the backbone of the 21st century connected place. A development with the aspirations of Gravity should aspire to provide full-fibre broadband to the premises, offering speeds of 1Gbit/s to 10Gbit/s as a minimum standard.
- **Cellular 4G:** Mobile services are an increasingly important part of people's lives and users expect high-speed wireless connectivity to be available wherever they are. While focus is increasingly shifting to next-generation wireless connectivity technologies (such as 5G), 4G remains the critical foundation for many wireless services. Therefore, strong, cross-site 4G coverage will form crucial part of Gravity's digital connectivity foundation.
- **Cellular 5G:** The fifth generation of mobile internet (5G) is considered to be a transformational technology that will enable a vast range of new use-cases through due to its ability to handle more data, connect more devices, reduce latency and provide increased network reliability. 5G services (that offer enhanced mobile broadband capabilities) are currently being rolled out by multiple providers across urban centres in the UK. While full 5G is not yet available, it is likely to become a business-as-usual connectivity medium during the lifetime of Gravity, therefore required provisions should be planned in from the outset. Gravity can ensure it is amongst the first to receive new 5G connectivity developments by participating in innovation programmes such as UK Government's 5G Create competition.
- **LPWA:** The Internet of Things (IoT) is a network of 'things' connected to the Internet. The IoT will affect the every-day lives of Gravity residents, along with the operation of its businesses and facilities. As the IoT market develops, several IoT use cases have emerged for which existing traditional cellular networks are not the best option. Low Power Wide Area (LPWA) can provide alternative connectivity for IoT applications requiring low cost, ubiquitous coverage, a long battery life and periodic or inconsistent data transfer over long distances.
- **Wi-Fi:** High-quality ubiquitous Wi-Fi will be necessary to support the 'connected' nature of the development. The public realm should have fast Wi-Fi throughout, covering outdoors spaces and all community and shared commercial premises.

## Unparalleled Levels of Data-Driven Automation, Optimisation and Convenience

Gravity will use the vast amounts of data created through the widespread use of digital connectivity and services to deliver the most convenient, enjoyable and inclusive experiences to end users, and to ensure the campus is operating as efficiently, transparently and sustainably as possible.

### Assets and Infrastructure

*(Ducting, chambers, ICT rooms, etc)*

### Connectivity and Networks

*(Optical fibre cabling, radio technologies, LAN, WAN WLAN, etc)*

### Data

*(Data platforms, sources, schemas, governance approaches, etc)*

### End-User Services

*(Consumer-facing applications and required hardware & software, etc)*

### Enablement

*(Digital literacy programmes, innovation facilitation activities, etc)*

To deliver these outcomes, Gravity will be underpinned by a **Digital Twin**. Enabled by an increase in computer power, cheaper sensors, the Internet of Things (IoT), advanced analytics, artificial intelligence and a greater sophistication of 3D visualisation and immersive environment technologies, this virtual representation of the real-world assets on the Gravity site will dynamically and securely collect, store, analyse and visualise large sets of data originating from disparate sources such as the various building management, smart grid and transportation systems.

The Digital Twin will unlock value by providing those running the **Gravity Smart Campus Operations Centre** with improved insights, which in turn will allow them to make informed decisions leading to better outcomes in the physical world. Together, the Gravity Digital Twin and Campus Operations will increase operational efficiency, allow for resource optimisation, improve asset management, deliver cost savings, improve productivity and safety.

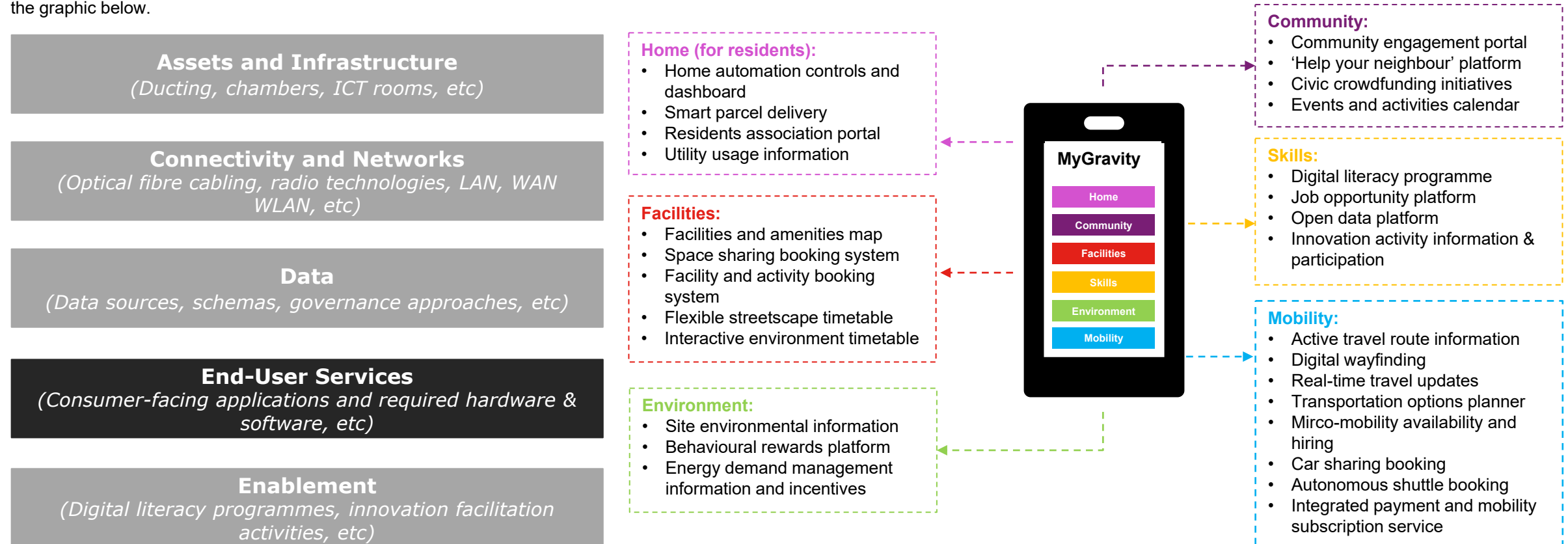
Campus operations will be further streamlined through the use of a **Data-Driven Distributed Ledger Platform**. These platforms immutably record information relating to transactions, decisions or performance, and will be used on Gravity to further streamline operations by automatically executing transactions and monitoring various utility and campus services such as smart parking, water management, waste management and energy billing. Due to the immutable and unchangeable nature of distributed ledger platforms, they have the added benefit of increasing the transparency of site operations and enforcing accountability.

Wherever possible, Gravity will aim to make appropriate data sets available to the wider innovation ecosystem through an **open data portal**. The benefits of open data provision are diverse and include:

- Enabling the innovation ecosystem to develop new products and services
- Improving transparency and accountability
- Enhancing community participation in evidenced- based decision making
- Engaging local educational organisations in local issues.

## A 'One Stop Shop' for All End-User Needs

The Gravity Campus Application is the 'one stop shop' for all end-user needs, helping them to become involved in campus life, encouraging them to co-create their own activities, events and culture, and empowering them to actively contribute to the site's overarching goals and objectives. It will enable users to interact with all digital services present on the site. Potential areas of functionality are detailed in the graphic below.



## A Smart Campus for Everyone

As Gravity develops into world-class smart campus, it will ensure that the clean economic growth it delivers benefits all local communities. Through a considered programme of digital enablement activities and employment accessibility programmes, Gravity will ensure local people are equipped with the skills and given the opportunities they need to fully participate in this rapidly emerging digitally-powered economy and community.

### Assets and Infrastructure

*(Ducting, chambers, ICT rooms, etc)*

### Connectivity and Networks

*(Optical fibre cabling, radio technologies, LAN, WAN WLAN, etc)*

### Data

*(Data sources, schemas, governance approaches, etc)*

### End-User Services

*(Consumer-facing applications and required hardware & software, etc)*

### Enablement

*(Digital literacy programmes, innovation facilitation activities, etc)*

Today in the UK, there are over eleven million people who lack the basic digital skills to fully participate in our economy. By 2028, the Good Things Foundation estimates that 6.9 million people will remain digitally excluded, resulting in almost £22 billion in missed value as a direct result of digital exclusion.<sup>20</sup> As our economy and communities become increasingly digitised, those that are not equipped with the required skills will struggle to access job opportunities and fully participate in their communities.

This emerging issue is particularly acute in the areas surrounding Gravity. According to 2017 ONS data, 16.11% jobs in Sedgemoor were considered to be at high risk of automation, compared to a national average of 7.4%.<sup>21</sup> Therefore, if Gravity is to become a world-class smart campus that delivers widespread clean and inclusive growth through the creation of high-value jobs, it is critical that it supports local communities gain the skills they will need to participate. To achieve this, Gravity will commit to:

- Ensuring that any organisations looking to base themselves on the campus are engaged with the local skills agenda and willing to provide a range of apprenticeship and retraining opportunities.
- Engaging with local schools and higher educational institutions, like Bridgwater and Taunton College, to deliver focused digital skills programmes, make sure curriculums are adapted to prepare students with the skills required by Gravity tenants and future digital businesses, and ensure that students are able to participate in the innovation activities taking place on the campus and access employment opportunities.
- Leading a regional Clean Growth and Smart Communities Alliance that will convene regional innovation, digital, infrastructure and economic-growth focused organisations, align interests and direct efforts to ensure the South West emerges as a major player in the UK's green recovery.
- Serving as a key test bed hub to enable the development and trialling of new technologies in the local area.
- Exploring the potential to expand and/or replicate digital services that have been successfully demonstrated on the Gravity Smart Campus in local towns and villages.



## Contribution to Gravity Priorities

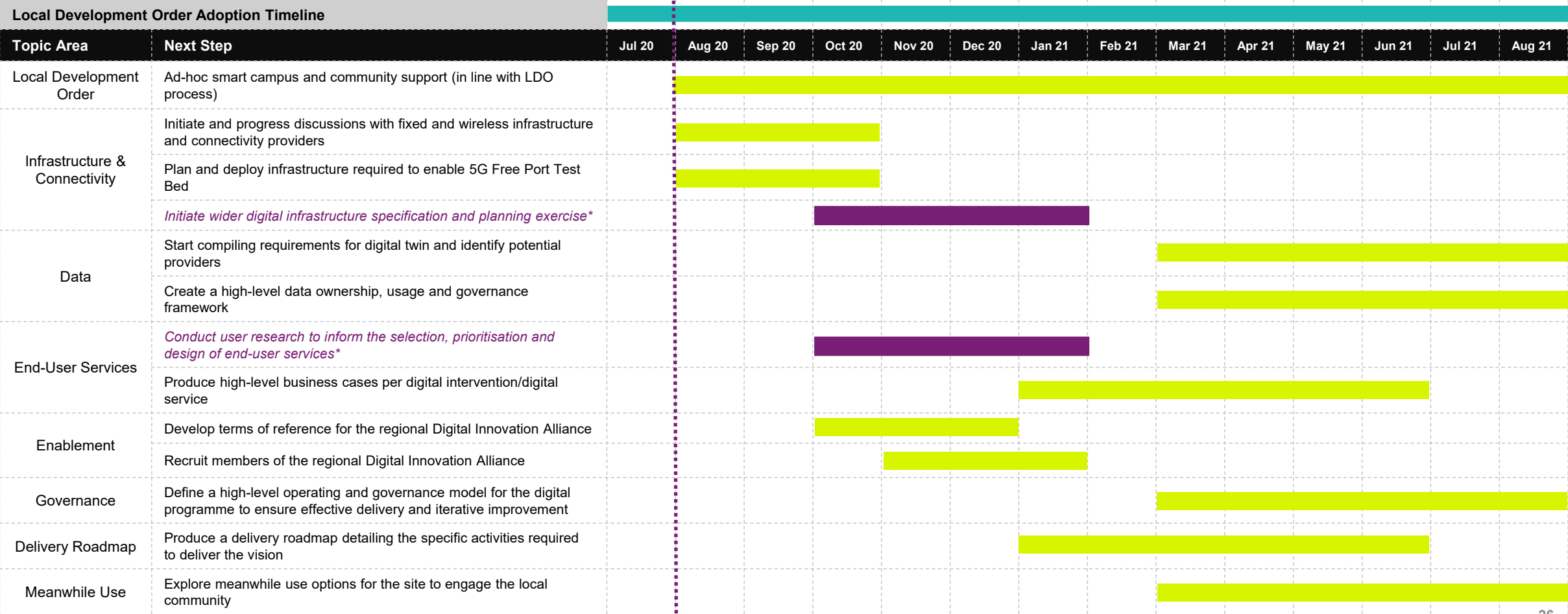
Gravity's processes and investments are defined by a set of 50 priorities that clean and inclusive growth will be achieved through. This Digital Vision will help deliver a wide range of Gravity's 50 designated priorities, highlighting digital's fundamental role in delivering a pioneering, clean growth-focused smart campus.

Wellbeing and Inclusivity @Gravity				Digital Revolution @Gravity	
P2	Enable the South-West to 'level up' in digital technology as part of the Heart of the South West's Local Industrial Strategy by establishing a regional digital innovation alliance.	P18	To shift away from fossil-fuelled combustion technologies, maximising low carbon generation, energy storage and management on site.	P33	Striving to minimise transport impacts on the strategic and local road network.
P3	Create a 24/7 smart campus and community that provides flexibility to live, work and play.	P20	Collaboration and co-design of energy infrastructure to enable clean growth across industrial, residential and leisure partners and occupiers.	P34	Participate in research and development to offer a free port site, linked to a digital free port zone logistics and security architecture.
P6	Gravity will be a test bed, home of research and development, and a host for green finance initiatives: developing new products, services, and establishing new practices to create green solutions.	P22	Provide intelligent digital controls to manage clean energy systems @Gravity to enable flexibility in energy demand and pricing.	P35	Establish a multimodal transport infrastructure combining rail restoration, motorway to micro mobility and autonomous shuttles.
P8	Invest in an array of sensors and edge computing to support wellness, deliver personalised experiences and enable ease of life through work life blended service.	P23	To provide site wide sustainable transport solutions including rapid charging and support for hydrogen powered vehicles, accessible to the community.	P36	Create a micro mobility grid through green infrastructure creating routes and spaces.
P13	Opportunities for learning will be embedded throughout, from sharing research findings, shadowing trials, through to incubating start-ups and new enabling new forms of business or technological deployment.	P24	Use our Enterprise Zone Status to provide incubation facilities for innovative energy technologies.	P37	Blend commuting and campus movement into single Movement as a Service deal (MaaS @Gravity) for occupancy based on blockchain transaction ledger. Discourage and phase out single mode travel using behavioural change and incentivisation mechanisms.
		Natural Resources @Gravity		P39	Provide 5G infrastructure, sensors and edge computing to enable fully autonomous movement within the smart campus.
		P25	Creating a 'Gateway' to a natural environment super reserve through digital technology..	P41	Design corridor infrastructure to enable logistic autonomous movement and platooning.
		Clean Transport @Gravity		P44	Gravity Home Hub Model to enable working from home, localised working linked to the campus, geared to reducing the overall need to travel.
P16	Establish smart grid infrastructure to provide flexible, and secure low cost energy to meet the commercial, residential and leisure needs and risk profiles of businesses at Gravity.	P32	De-carbonising transport, enabling shift to EV's and alternative fuels through investments into infrastructure that enable an interaction between transport needs and energy supply.		
				P45	Establish a digital route map and masterplan to shape the digital clean growth journey@ Gravity.
				P46	Host a test bed location for research and development such as free port zone digital architecture and new housing products.
				P47	Ensure underlying digital infrastructure is future proofed to seamlessly accommodate the requirements of future connectivity technologies such as 5G and 6G, and future digital services.
				P48	The Gravity Campus systems will be digitally twinned and managed by a campus operations centre, to support adaptive management and enable continual optimisation.
				P49	Create the open architecture for a Gravity Blockchain Ledger to enable campus transactions and accountability both in terms of building formation and operation of assets to evidence delivery on Clean Growth.
				P50	Drive out learning and skills development opportunities to inspire young people and enable communities to access opportunities by forming partnerships with local and regional educational institutions.

## 6.0 Next Steps

\*Line items highlighted in purple were part of the original Phase 1 scope

Recommended Next Steps for the Digital Workstream



End of Phase 0

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- Chris Roe, Head of New Work Delivery, E.ON

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## About Gravity

Gravity will be an immersive, connected, intelligent and sustainable mixed-use campus, home to the World's most innovative companies. Purpose built, diverse workspaces and resilient technologies will be set against an established natural landscape – supporting a culture of innovation and well-being that blurs the boundaries between work and play. Gravity will be designed to shape connections between people and the places in which they work, for a cleaner, sustainable future.

To keep up to date with Gravity, please visit [www.thisisgravity.co.uk](http://www.thisisgravity.co.uk)



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## About Salamanca Group

Salamanca Group is the founding shareholder in Gravity. The Group is a privately-held Merchant Banking business, home to experts in global investment and advisory, with a focus on real estate. The real estate team operates across the globe on large projects, purchasing land, developing sites and buying businesses related to the sector. Working with clients to enable their business, protect their assets and grow their capital, the Group is currently focused on projects in the UK.

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Arup is an independent international firm of designers, planners, engineers, consultants and technical specialists offering a diverse range of professional services across the built environment domain. The Advanced Digital Engineering Group has a proven track-record of delivering digital masterplans for forward-thinking developments, supporting them to deploy and exploit emerging digital technologies, and to harness the benefits they deliver.

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