

# Smart Campus

From strategy to implementation



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## Introduction

*The ingredients of a Smart Campus are already available.  
The challenge is following the right recipe.....*

The Higher Education Sector stands at a crossroads. The Smart Campus and its benefits are beginning to be understood and appreciated by stakeholders both within and beyond IT and Estates. Proofs of concept abound. And yet there remains no real blueprint for delivery, meaning that the floodgates have yet to open, and the full value remains tantalisingly out of reach.

Making the Smart Campus a reality is not straightforward. Many factors – myriad stakeholder interests, fragmentation of the smart marketplace, the prioritisation of sound bites over solutions – contribute to its complexity. But they are surmountable.

PTS believes that by fully appreciating the nature of these challenges, and taking a measured, informed and independent approach, universities will be able to reap the benefits long-promised by the marketing.

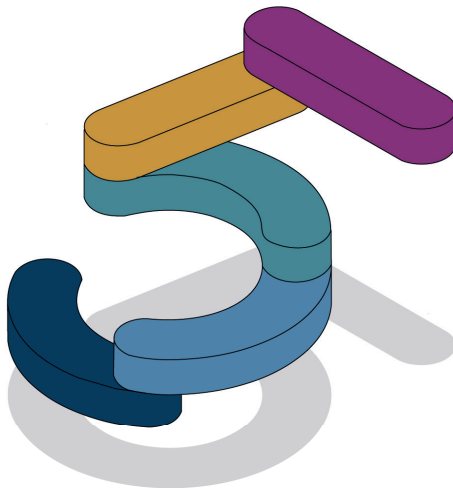
This Smart Campus Strategy brochure shows Higher Education Institutions how to do this by following a clearly defined approach, in order to turn the 'visionary' into a reality.



PTS is an independent Smart Campus Consultancy.  
We specialise in four key areas:

- Bringing digital thinking into the physical estate
- Creating compelling, visual stories around smart for non-technical stakeholders
- Demystifying the smart ecosystem
- Bridging the gap between strategic vision and practical implementation

We do this by adopting the following 5-step approach:



## **1. ARTICULATE THE VISION STATEMENT**

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We work with your stakeholders to develop smart principles to support the organisation's strategy

## **2. IMAGINE USER SCENARIOS**

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We explore different scenarios of smart in action, tailored to your organisation. It helps encourage imaginative thinking and makes sure that it's being done for the right reasons

## **3. CONDUCT A SMART MATURITY ASSESSMENT**

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We analyse your current level of smart readiness compared to the stated vision by looking at your operating model, digital infrastructure, culture and budgeting

## **4. CREATE A PLAN OF ACTION**

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We help to map out who needs to do what and when, so that you have a clear view of how to put your plan into action; especially if you have upcoming capital developments

## **5. BUILD A LONG-TERM ROADMAP**

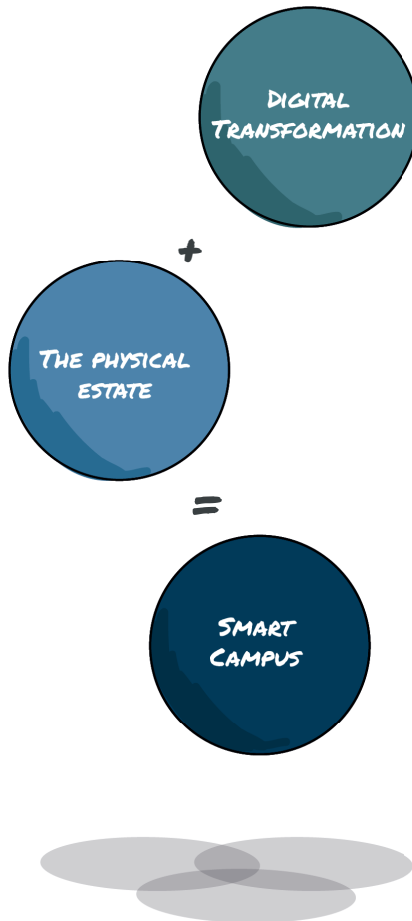
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We enable you to forecast what is on the horizon so that the search for innovation becomes a continuous process

# Smart Campus

*WHAT IS IT?*

## What is a Smart Campus?





## **1. DIGITAL THINKING IN A PHYSICAL WORLD**

Smart, like most technology neologisms, is both an umbrella term that helpfully signposts a range of innovations, and a marketing buzzword that obscures its underlying components.

In its simplest form, it is the latest example of digital innovation impacting the built environment. Otherwise put, the effects and benefits of digitisation in the consumer market – mobile first, data-informed services, real-time use, algorithm-driven interactions, and user-friendly interfaces – from the likes of Uber, Netflix, Meta, Google and Amazon, is increasingly being felt in the physical estate, thanks primarily to IoT technology.

## **2. AVOID PIGEONHOLING**

This opens up substantial opportunities for universities to rethink their approach to environmental sustainability, the fundamental experience of students, academics, wider staff, and visitors on and around campus, and the means by which the campus operates.

A key challenge in exploring and exploiting these opportunities is resisting the urge to pigeonhole what this means in practice and at a technical level. It is very easy to see smart through only one lens, such as improving utilisation through occupancy sensors, or building efficiency through BMS integration, or student experiences with a mobile app.

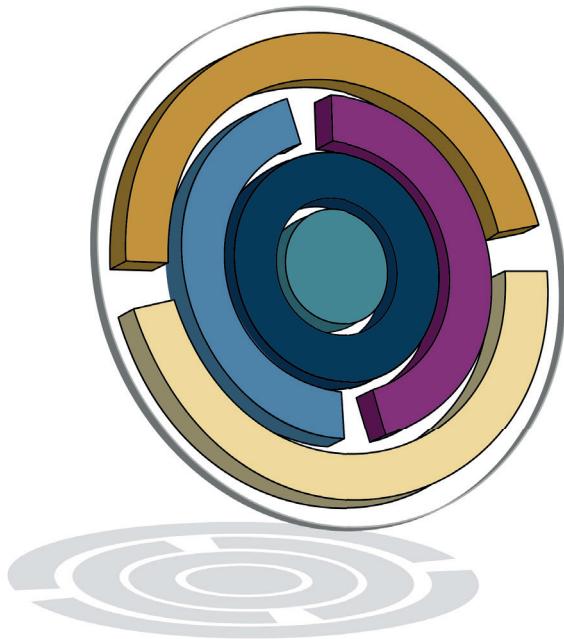
## **3. USER-CENTRIC APPROACH**

Our approach to developing a Smart Campus strategy and business case rests on the principle that we must explore its benefits at a user level, initially avoiding technical explanations, to ensure that as many stakeholders as possible begin to see the wider possibilities. Only then will universities be able to judge the true merits and value of a Smart Campus and make more informed investment decisions.

## Smart Ecosystem

In order to understand the Smart Campus, it is important to demystify its component parts.

The diagram below provides PTS's view of this ecosystem.



### **BUILDING SYSTEMS**

BMS, HVAC, Lighting, Metering, CCTV & Access Control, AV, Sensors,  
Energy Grid & Systems, Lifts

### **DIGITAL INFRASTRUCTURE**

Wired & Wireless Network, Cloud, Low-Power WAN, 5G, Comms & Cabling

### **MIDDLEWARE**

APIs, Integration, Additional Naming Conventions

### **DATA**

BIM: Naming conventions, Architecture, Security, Metadata

### **SOFTWARE**

CAFM, Room/Desk booking, Timetabling, CRM

### **DIGITAL TWIN**

Dashboarding & UI, Modelling, Control, BIM

### **TECH INNOVATION**

AR/VR, Chatbots/RPA, Robotics



### **BUILDING SYSTEMS**

Building and wider campus systems now come equipped with sensors that can both yield data from the system itself and enable those systems to be changed remotely through a digital interface.



### **DIGITAL INFRASTRUCTURE**

Digital Infrastructure provides the connectivity – through the network backbone, Wi-Fi and other IoT-friendly wireless forms – and the storage/hosting capacity, to support the Smart Campus.



### **MIDDLEWARE**

Middleware is the software layer that provides a common consolidated platform for extracting and surfacing data from building systems and other data sources. Middleware is not an out-of-the-box solution, and is often a key role of what is often described as a Master Systems Integrator.



### **DATA**

As the utility of a smart building is based around data, the ecosystem must adhere and align to the organisation's current principles around data management, analysis and governance, in particular its approach towards Building Information Modelling.



### **SOFTWARE**

This layer comprises existing systems whose integration with the wider smart building ecosystem is valuable or critical to delivering smart benefits. These include timetabling, learning analytics platforms, CAFM and room booking.



### **DIGITAL TWIN, DASHBOARDS AND APPLICATIONS**

This layer represents the overarching visualisation of the data to help universities to make more informed decisions, and ensure better control of and interaction with building. It also encompasses the ability to undertake in-depth modelling and scenario planning in a digital representation of buildings, to forecast and simulate changes in a test-bed environment before actually applying those changes.



### **WIDER TECHNOLOGY INNOVATION**

Additional technologies and innovations that are often considered as part of the term Industry 4.0, such as Augmented & Virtual Reality, Chatbots/RPA, Robotics and 3D printing.

# Smart Campus

HOW WILL IT IMPROVE THE  
CAMPUS EXPERIENCE?

## Benefits

The most effective way to understand what a Smart Campus really means is to explore the many ways in which it could enhance the experiences of those that have the most interest in the campus itself; the students, the academics and researchers, and the university's management and support teams.

This is a useful and enjoyable activity that we walk through with our clients. It encourages imaginative thinking amongst the stakeholders, which in turn makes them more invested in the strategy. It also ensures that any recommendations made around technology or design principles are rooted in that which matters most; the user experience.

### **STUDENT**

Learning Experience, Wellbeing & Safety, Personalised Service

### **AGILITY + PRODUCTIVITY**

Hybrid Working, Wayfinding, Optimised Conditions

### **ENVIRONMENTAL SUSTAINABILITY**

Energy Management & Generation, Waste Reduction

### **OPEX SAVINGS**

Energy Costs, Maintenance Costs, Expenses, Security

### **REVENUE GENERATION**

Retail, Advertising, Catering

### **CAPEX OPTIMISATION**

Optimised Capital Developments





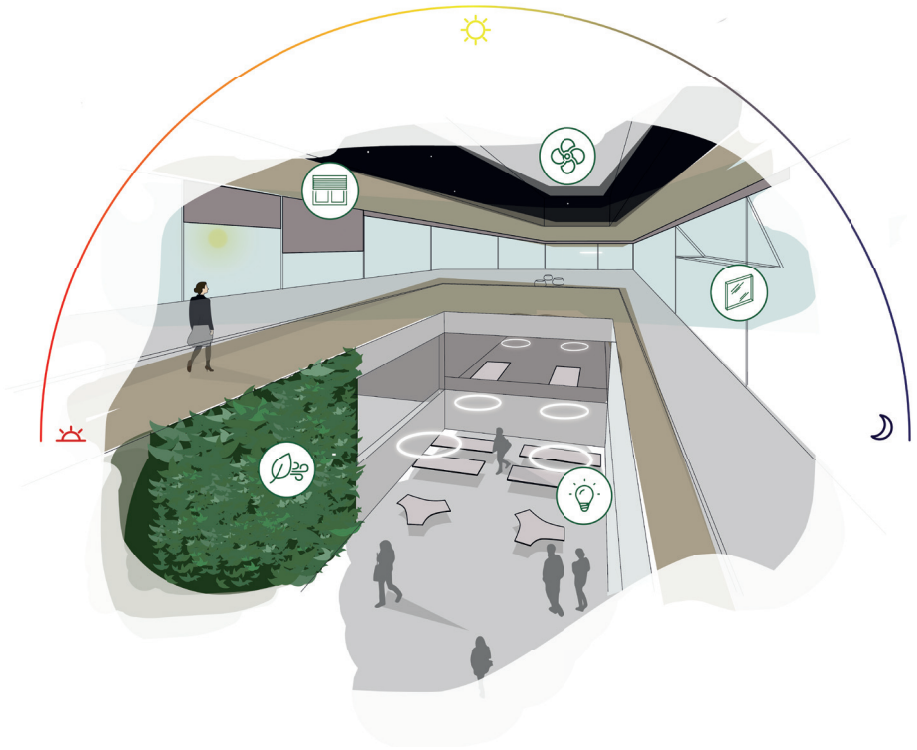
## Dynamic Experience

1. *User ID offers frictionless access to appropriate spaces, buildings and learning materials*
2. *Students are guided to their lectures, and visitors to their meetings, with external and indoor wayfinding and augmented reality technology, with active, step-free and scenic routes provided*
3. *Study space is automatically booked en route to campus during exam periods, with suggested breaks scheduled in*
4. *Notifications not to forget overdue library books appear before students leave for campus*
5. *Timetables intelligently group lectures based on proximity, and notifications pop up around required reading before seminars*
6. *Users have complete control and transparency over how their personal data is used, and when notifications are provided*




## Sustainability & Energy Management

- 1. Significant contributions to net zero targets by optimising energy use based on data on utilisation, timetabling and environmental conditions:*
  - Predictive maintenance and room adaptability*
  - Rooms, spaces and buildings adapt based on trends in usage, including lighting, temperature, configuration, CO<sub>2</sub> levels and power consumption*
  - Real-time responses to the in-room environment sustains and maintains the optimal conditions for the activity taking place*
- 2. Greater use of flexible furniture and partitions, to enable quick reconfiguration of rooms*
- 3. Renewable energy sources are connected to a smart microgrid to efficiently and sustainably manage carbon use across campus*
- 4. Energy digital twins allow changes to be modelled and tested before introduction into buildings*



## Personal Study

1. *Adaptive learning technology recommends literature and activities personalised to students to help them progress*
  2. *Students stream interactive, lectures, viewed using 360° cameras and aided by speech-to-text technology to make revisiting content much easier*
  3. *Digital assistants explore the campus online ecosystem to find information, such as viewing and booking available workspaces on campus*
  4. *Micro-credentials offer new opportunities for students to achieve and leave a digital footprint of their accreditations*
- 





## Academic Staff

1. *Presentation facilities are configured to the lecturer's preferences on voice command*
2. *Tutors and lecturers are given meaningful data around how students are engaging with course material*
3. *All course material is digitised and can be shared on any device in any university space to allow for group discussion and collaboration*
4. *Tutors and lecturers can be informed when certain students are making themselves more or less available for group work based on presence at group sessions and contribution to written text*
5. *All technology issues are dealt with proactively and remotely*



## Wellbeing & Security

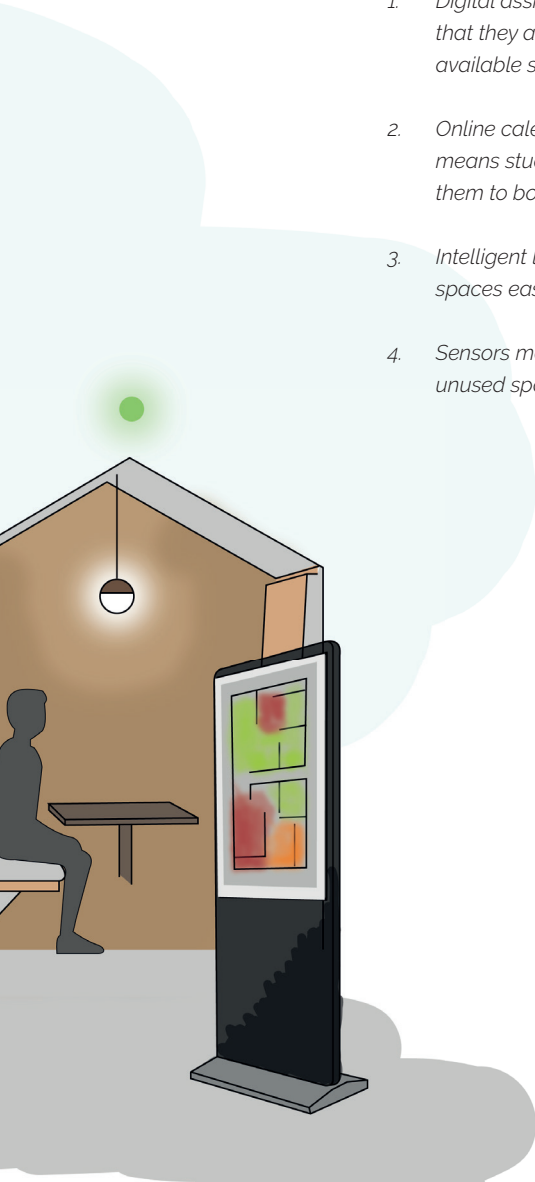
1. *Data on absenteeism and engagement with course material informs tutors and the Students Union of potential support needs of students (to be used strictly for pastoral care purposes, with the option to opt out at registration)*
2. *Mobile-enabled campus alert systems ensure that students can call for medical or security assistance anywhere on campus, with wayfinding technology to decrease response times*
3. *Pre-set security configurations for access control, bollards, wayfinding and CCTV allow for quick adaptation to high security situations, e.g. fire, flood, terrorism, A&E situations*
4. *Mass notification system enabling warnings and notices to be broadcast across campus during incidents*





## Group Study & Collaboration

1. *Digital assistants allow groups to request the type of space that they are looking for and receive recommendations of the available spaces that best suit their requirement*
2. *Online calendars of all collaboration spaces across campus means students see what areas are free at certain times for them to book, either at home or whilst on campus*
3. *Intelligent lighting and wayfinding technology makes finding free spaces easy*
4. *Sensors monitor room usage in order to release booked but unused spaces, or suggest more suitable alternatives*



## Immersive Spaces

### 1. Augmented Reality

- *Medical, Veterinary and Sport Science students examining human/animal anatomy*
- *Engineers inspecting components*
- *Architects reviewing building designs*

### 2. Video walls

- *Video walls replicate different environments so that students can simulate practical scenarios from their courses, with cameras recording to allow them to review*
- *Emergency services callouts for medical students*
- *UN translation for languages students*

### 3. Virtual Reality

- *Virtual autopsies for forensic/medical studies*
- *Complete replication of the lecture experience in remote locations*
- *Gym sessions – cycling, rowing, running*

### 4. Holographics

- *Allowing for a more geographically diverse cast of lecturers to speak at the institution*



## University Management Teams

1. *Complete overview of:*
  - *Space utilisation*
  - *Profiles of energy usage*
  - *Preferred spaces and room configurations*
  - *Transportation flow on campus, halls of residence and surrounding area*
  - *Students' engagement with course material*
  - *Security alerts and concerns*
2. *AI-assisted decision-making to optimise the above areas and significantly reduce energy use, maintenance, traffic and environmental costs*
3. *Excellent smart campus showcases for prospective undergraduates on open days and current students*





# Smart Campus

WHERE IS YOUR UNIVERSITY  
ON ITS JOURNEY?

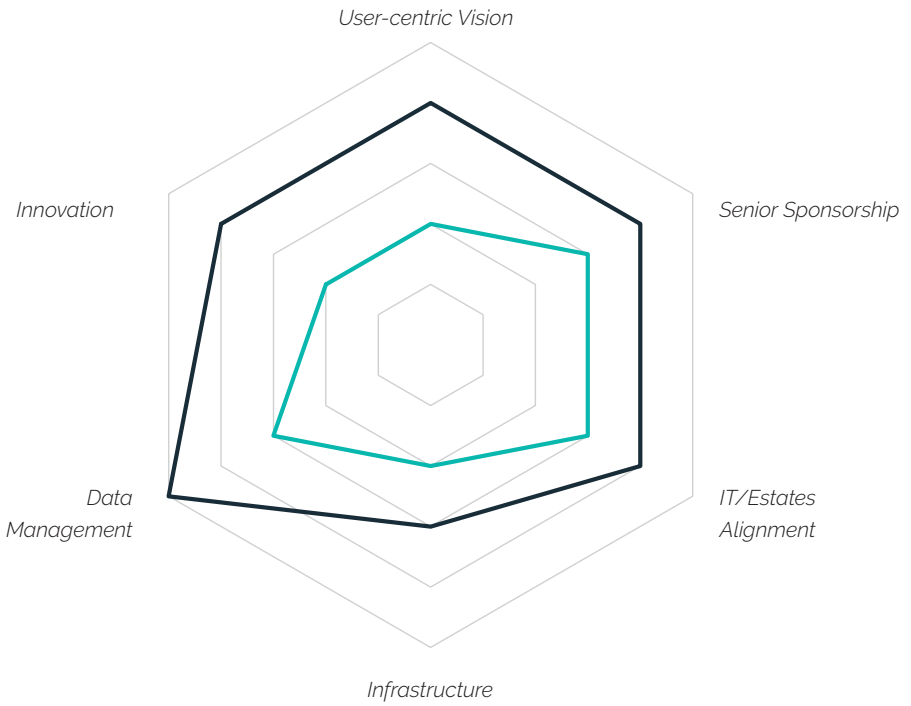
## Smart Readiness

The exciting part of a Smart Campus strategy is in imagining the user experiences of the future and articulating the vision. But knowing the route to your destination requires knowing the starting point. Understanding the university's current estate helps to ground the vision in reality.

This is where a Smart Maturity Assessment becomes invaluable. By measuring levels of preparedness for a Smart Campus across a number of domains, and comparing the results to the levels needed to support the ambitions of the university, a picture begins to build of the areas on which the university will most likely need to focus, in order to meet the stated ambitions.

This exercise helps universities to identify the low-hanging fruit – what benefits can be derived fairly swiftly, easily or cost-effectively – as well as testing how high a priority those areas that will require the most attention really are.

It is important to note that attaining peak maturity is not always necessary, or even desirable, for every university. Developing a Smart Campus strategy means establishing a vision of 'smart' that is appropriate for the particular needs and profile of the institution.



— Ambition

— Current

# Smart Campus

*WHO NEEDS TO BE INVOLVED?*

## Stakeholder Engagement

Because the Smart Campus impacts everyone across the university, the stakeholder group is necessarily vast. Ensuring that engagement is comprehensive and well-informed is crucial to a successful strategy.

At its heart, however, is the relationship between Estates and IT. Both teams are pivotal to unlocking the potential, but have traditionally operated in very different ways, to different cycles, with different priorities. Aligning the vision across the teams, whilst recognising and embracing the differences, is a necessity for any Smart aspirations to bear fruit.



## **UNIVERSITY TEAMS**

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Estates & Facilities, IT Teams, Students' Union, Strategy & Policy,  
HR & Engagement Teams, Teaching & Research Communities,  
Commercial, Security & Safety, Finance

## **TECHNOLOGY MARKETPLACE**

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Emerging Tech Start-ups, Industry Research Bodies,  
Vendors & Integrators, Current Suppliers

## **PROFESSIONAL DESIGN TEAM**

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Architects, Quantity Surveyors, Project Managers, Structural Engineers,  
Services Engineers, Specialist Consultants, Main Contractors

## **COMMUNITIES**

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HE Institutions, Other Sectors, Local Government,  
Local Community, Local Industry

## **STUDENTS**

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Future Cohorts, Undergraduates, International,  
Postgraduates, Alumni, Lifelong Learners

# Smart Campus

HOW DO WE PRIORITISE OUR  
INVESTMENTS?

## Investment Analysis

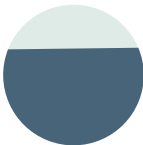
Whilst there is no hard and fast rule as to what smart technologies, systems and initiatives require investment, it is always an interplay between the current environment, the desired future state, offerings in the marketplace, and the appetite for change in terms of cost, risk and time. We take universities through this process to elicit the investment priorities and provide the impartial appraisal of the vendor community's ability to meet the university's objectives.

### *Evaluation Criteria*



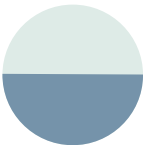
#### **ENHANCEMENT**

Experience Enhanced  
Delivers Efficiency  
Improves Environmental Sustainability



#### **COST REDUCTION + REVENUE POTENTIAL**

CapEx  
OpEx



#### **COST OF IMPLEMENTATION**

CapEx  
OpEx



#### **EASE OF IMPLEMENTATION**

Complexity  
Delivery/Implementation Risk  
Proximity



## *Investment Tiers*

### **ENABLING**

---

Deliver the foundations on which additional functionality and user scenarios can be built

### **BRONZE**

---

Deliver functionality and user scenarios, and score positively in terms of cost/ease of implementation

### **SILVER**

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Offer greater value but may incur greater cost or difficulty in implementation

### **GOLD**

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Premium investments that deliver excellent value but also incur more considerable cost or difficulty in implementation

# Smart Campus

WHY SHOULD UNIVERSITIES  
BE INTERESTED?

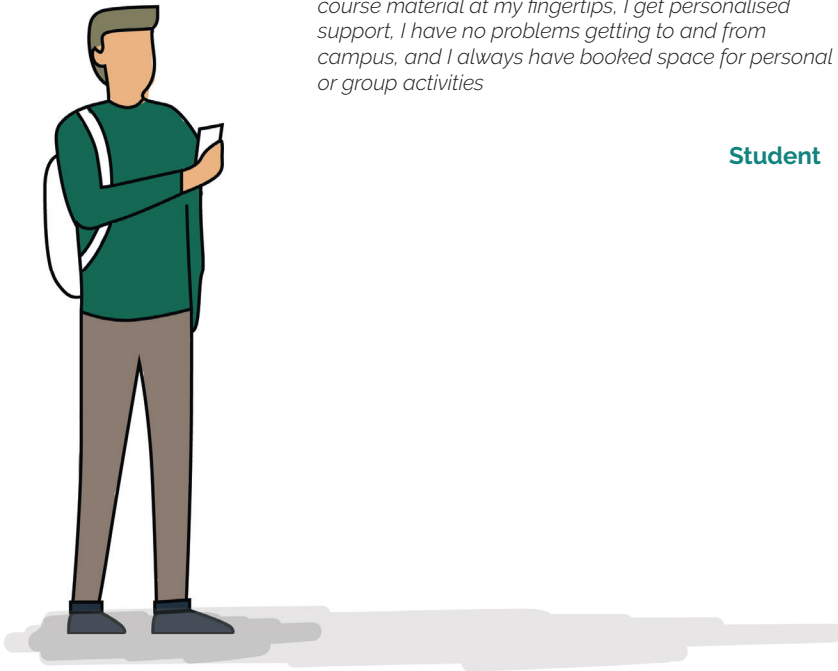
The benefits of a Smart Campus come in many forms, depending on the different stakeholders' perspectives. Here are some examples of the sentiments that these groups may have within a Smart Campus environment.

“

*My campus experience is excellent – I have all of my course material at my fingertips, I get personalised support, I have no problems getting to and from campus, and I always have booked space for personal or group activities*

**Student**

”



“

*We have exceeded our student acquisition and retention targets, and have opened up new revenue streams to allow us to invest back into the university.*

*With more efficient space use, greater cost certainty and optimised student numbers, our finances have never been so healthy*

”



**Senior Management**

“

*I have the data to make informed decisions about what our campus should look like, and have increased our space utilisation considerably*

”

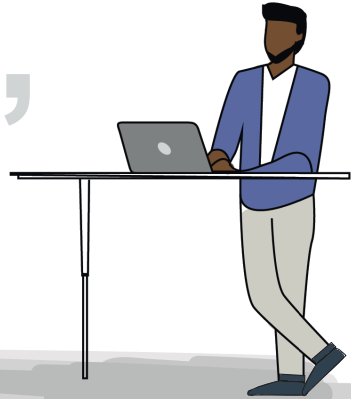


**Director of Estates**

“

*The services we provide are contributing significantly and positively to the university achieving its strategic objectives*

”



**Director of IT**



“

*I have an in-depth view of how students engage with the course material, and my lectures start on time because the technology just works!*

”

**Lecturer**

“

*Students feel better supported, safer, and more engaged with their university experience*

”



**Students' Union**

“

*By managing energy far more intelligently across campus, we are firmly on the path to achieve our net zero carbon targets*

”

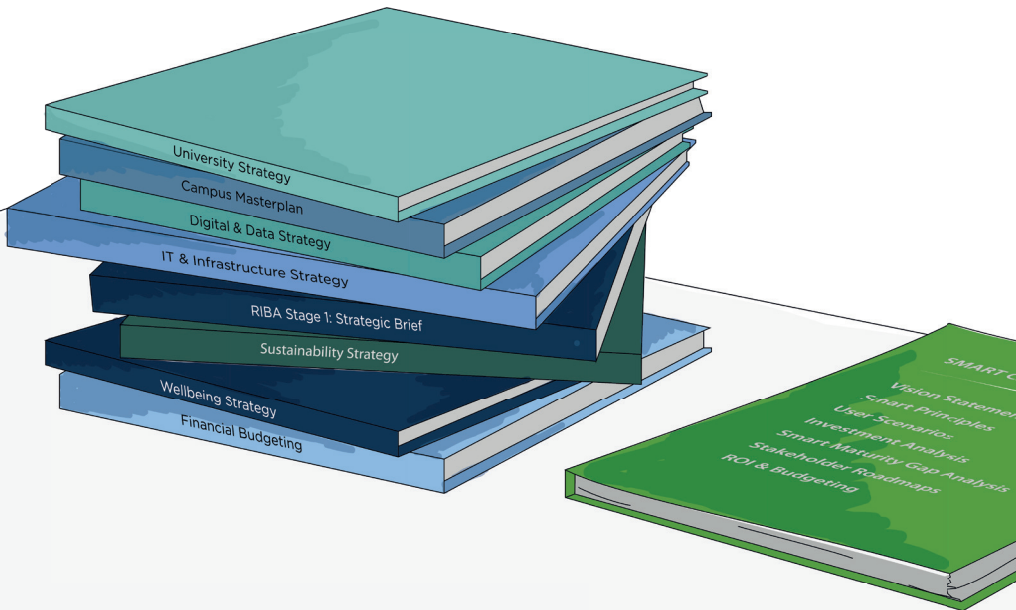


**Head of Sustainability**

# Smart Campus

*WHEN DO WE NEED TO ACT?*

PTS's Smart Campus strategies are intended to inform the strategies of the different stakeholders that have been involved throughout the process. Therefore, the earlier that your university can develop its thinking around Smart Campus, the more informed the wider university strategies will be.

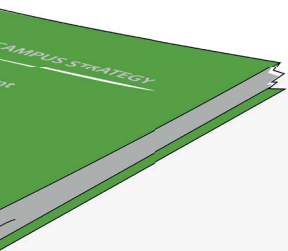




We work very hard to ensure that our strategies are imaginative yet feasible, with clear guidance on what each stakeholder should take into consideration to bring them to life. For example, will a Capital Projects Manager be able to take the Smart Campus principles and embed them into the design of a new building? Does the IT Manager understand the extent to which the network infrastructure must be future-proofed to support the Smart Campus?

These are practical steps that are vital to ensuring that the university actually derives the value expected from the strategy. Too many strategies end up gathering dust on the shelf; our Smart Campus strategies are designed to be the start of a journey to implementation.

Universities are unique institutions in that they often have considerable autonomy over a whole campus or civic environment, and it is in these multi-use and multi-building spaces where smart technologies really come to life. Therein lies a fantastic opportunity to realise something truly exciting; providing that it is considered as part of the wider strategic planning.



## About PTS

PTS is an independent Technology Consulting Firm, providing strategic advice, design and project management services on Higher Education campus masterplans, refurbishments and new build programmes.

One of our key aims is to deliver a first class technology learning and teaching experience whilst preserving the integrity of the buildings' architectural designs. We do this by understanding people, space and technology.

We act as the conduit between Estates, the Professional Design Team and Technology to help universities craft innovative and feasible solutions to the benefit of its students, staff and business operations. We help these diverse groups of stakeholders to communicate, collaborate and stay engaged throughout the project lifecycle.

Ours is a unique position; equally adept within the realms of workspace innovation, technology consulting and robust project management.

Digital Transformation is often described as the blurring of the physical and the virtual. PTS's core expertise lies in the interplay between the technology and the physical campus estate, and, as an independent Consultant, reimagining this relationship to deliver a better student experience.

## *SCAN ME*

Browse our latest Smart Campus and Public Sector project experience.

To enquire about a complimentary Smart Campus workshop, please get in touch at [hello@pts.global](mailto:hello@pts.global)





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