HOW CAN **SMART BUILDING** TECHNOLOGY (S BECOME MAINSTRE











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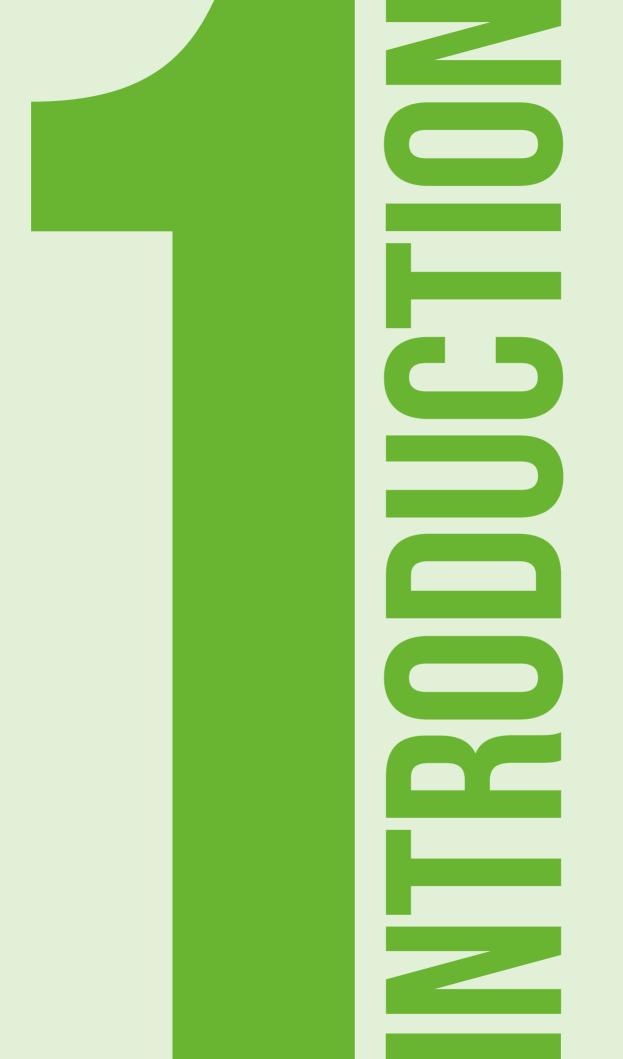
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HOW SPACEWORX CAN HELP



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Smart building technology adoption is growing. But despite an increasingly obvious business case for investment, this technology has yet to achieve mainstream market adoption. Truly integrated smart building solutions are still largely restricted to a few high-end commercial real estate projects. Why? And more importantly, what can be done about it?

This white paper seeks to identify the key issues that are restricting mainstream market adoption and offers solutions that will act as catalysts to growth.

We are reaching an inflection point in the smart building market. If the industry is serious about driving more growth through digitization then complex structural issues need to be addressed. **Fundamentally**, **it's not technology holding things back, it's people!**

Building on **Memoori's** research, the insights provided in this paper are drawn from a series of in-depth interviews carried out in Autumn 2022. Interviews were conducted with key market stakeholders including architects, developers, master systems integrators, smart building consultants, building controls manufacturers and civil engineers.

In order to explore end-user perceptions and expectations of technology, a survey of over 1,000 building end-users in Australia, Singapore and the United Arab Emirates was carried out. The survey included responses from end users across a range of building types.



Several key themes that help explain why smart building technologies has failed to gain mainstream market adoption emerged consistently across our interviews. 🌖 spaceworx 🎊 memoori

Legacy real-estate commissioning and procurement processes, particularly for new build construction, remain rigid, inflexible and ill-suited to the delivery of successful smart buildings. The typical building design and construction processes followed by architects and construction professionals fails to fully evaluate the requirements and potential value of smart building systems until way too late in the process.

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All too often, fundamental decisions related to building systems design, commissioning and procurement are left to the main contractor and their core design team.

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These stakeholders are typically heavily focused on capital cost expenditure and have few incentives to ensure that the resulting smart building solutions work effectively. Often, they possess only rudimentary knowledge of the value potential of smart building systems and have limited knowledge of best-practice approaches for systems design, commissioning, procurement and integration.

By following this traditional, outmoded process, smart building professionals, such as master systems integrators (MSIs) or smart building consultants are engaged much too late in the process to have any kind of tangible influence over the overall building systems design and systems specifications. The current status-quo means clients and lead contractors regularly fall into several traps in relation to cost effective smart systems delivery, which include:

- Underestimating costs, complexities and specialist skill requirements associated with effective systems integration.
- The development of vague, or poorly written RFPs and system specifications.
- Not providing the client with a comprehensive evaluation of the cost/benefit of smart solutions during the planning phase, can lead to "value engineering" by the general contractor or quantity surveyor that strips out smart solutions from procurement plans.

These factors create a scenario whereby most smart building systems are simply not commissioned properly and can therefore never be expected to achieve their full potential. They create a tendency for projects to use sub-optimal, lower-cost technology approaches to fit tight budget requirements. This leads to projects that regularly fail to meet customer expectations, and generate additional long-term cost implications and challenges for delivering effective systems interoperability. Moreover, responsibility for systems interoperability often remains unassigned under this legacy delivery model, and nobody is being held to account. As a result, a muddle of sub-optimal, poorly configured, poorly integrated systems is often handed over to the client at project completion, and the exercise of systems integration itself can get a bad reputation for being overly expensive and or failing to work properly.



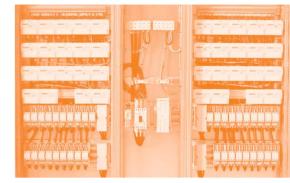
All too often the brief is: "I want a smart building" but they don't engage an integrator early. They follow the normal design process, and it's very common for me to receive the documents for integration as the very last specialist to be engaged. So, the builder gets engaged, they go to market and tender they get all their MEP, mechanical, electrical, fire etc. And because the integration is, I think in their minds, difficult to procure, they don't know who to go to, and it ends up being the very last thing that is procured.

Rob Huntington, Master Systems Integrator & Founder of Emeseye

SECTION 2: THE PROBLEMS



The fragmented nature of the smart building solutions market remains a source of confusion and frustration for customers. Incumbent building controls vendors, technology giants, real estate services companies and cloud-based Software-as-a-Service startups are all competing in the market, offering a range of solutions with few guarantees of interoperability. We also continue to observe a steady stream of new market entrants, with 288 companies in our database now offering platform solutions to the digital workplace market alone¹, an increase of 30% in 2 years.



 $\overline{\mathbf{G}}$ While some incumbent Building Management System (BMS) providers have continued to push their proprietary approach, no dominant, "platform of platforms" solutions have emerged to simplify the smart building delivery experience for end users. The market remains characterized by lack of collaboration across the supply-chain between competing vendors, leading to the emergence of multiple siloed ecosystems forming.

At the building level, the disjointed nature of building systems commissioning and procurement practices (explored above) mean that the majority of smart building investments to date have been dominated by ad-hoc, siloed, point solutions designed to exclusively manage one particular building system or application.



¹https://memoori.com/portfolio/the-global-digital-workplace-market/

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I think of a truly smart building like a human body. Each organ has internal smarts but for true smartness they need to operate together.

> Hui Min Chan, Director, DP Architects

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The siloed, fragmented nature of the vendor landscape explored above has generated a marketplace of point solutions that are challenging to integrate. Many of these solutions provide easy to understand outputs for a particular niche application, and offer a viable means for building operators to improve operational efficiency, save on energy and operational costs, or reduce emissions, however, siloed solutions suffer from a number of challenges and deficiencies, that ultimately mean they typically fail to capture the full value potential of smart building technologies.

These include:

- Regular duplication of features and work carried out by different vendors for particular smart building applications. With almost every vendor offering their own distinct platform and building operators regularly having to manage 10 and 15 different platforms to operate each of their building systems. Customers report struggling to effectively manage a plethora of different platform APIs, user interfaces and data streams. This situation ultimately leads to end-user frustration, increased management and training expenditure, network inefficiencies, redundant integration, and excessive data storage.
- Constraints in terms of the quality of their outputs, and the ease of data integration between disparate systems - with end-users needing to invest additional time and effort into manual data input, human analytics or horizontal integration via APIs for effective decision making.
- Limited levels of dynamic control and responsiveness to changing building operating conditions.
- Limited systems data accessibility for tenants and end-users.

While "smarts" may be enabled on an individual system, for example smart lifts, packages of systems are still typically being delivered separately. This legacy approach can make sense from a vendor point of view, as a proprietary, siloed system approach leaves them focused on the effective operation and maintenance of the system they are responsible for delivering, but with little consideration given to interoperability, the siloed approach offers little in terms of value-add to the client.



DIGITA IKANS FIR AIUN **Digital transformation** remains a challenge for many organizations, with executives unable to effectively evaluate and understand the cost benefit of new technologies to their busines<mark>s ope</mark>ration. While some of the "low hanging fruit", outcome driven, applications for smart building technologies, such as

those related to operational cost

savings through energy efficiency,

are relatively easy to understand,

the business case for the delivery

of other smart building solutions

intangible. As such, most building

operators still lack the long-term

for other applications are more

vision required to fully exploit

the value that smart building

technology can offer.

Too often, building technologies are developed in an ad-hoc fashion, with little regard to future integration challenges, or the wider stakeholder value a more holistic approach may offer. While opting for the easy-to-understand solutions, ad-hoc solutions is appealing for many end users at the beginning of their smart building journey, when technology is deployed without a coherent vision aligned to the end-goals of the organization, this can lead to increased spending over the long term with many of the potential benefits never being seen.

Added to this, the building technology stack has become much more complicated than it used to be, with vendors and building operators often underestimating the complexity of digitizing commercial buildings. Large buildings today may operate upwards of 30 different technologies and networks, the building technology landscape has become increasingly difficult to manage.

SECTION 2: THE PROBLEMS

EUUCATI



Without a clear understanding of the benefits, innovation will continue to be stripped out from systems specifications, and solutions delivery will continue to be watered down.

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A further barrier to adoption emphasized by our interviews is the consistently low levels of awareness or understanding of the cost/benefit case for smart building technologies amongst both end customers and key building delivery stakeholders, such as quantity surveyors. As one put it: "why would they choose to pay extra money in order to get something they don't understand?"

Other interviewees highlighted the need to develop a more tech-savvy generation of "smarter" Facilities Managers through improved education as the industry steadily progresses away from the more rudimentary systems of the past.

Many building users by contrast, have become increasingly cognizant of the positive benefits that technology can make to their workplace experience, with 42% or respondents to our survey scoring technology's contribution to their experience in the building as either a 4 or a 5 (on a scale of 1–5), compared to only 28% who ranked it between 1–2. These building users highlighted technology's contribution to increased comfort and wellbeing (31%), efficiency & productivity (30%) and adding to a sense of security (26%), as the leading contributions to their overall workplace experience.

Such levels of endorsement for the positive contribution that technology can make to the occupant experience should, in time act as a clear incentive for future technology adoption.

FIG 1

ON A SCALE OF 1-5, HOW MUCH DOES THE TECHNOLOGY IN YOUR WORKPLACE IMPROVE YOUR EXPERIENCE OF THE BUILDING?

30%

18%

25%

17%



COST & VALUE 5

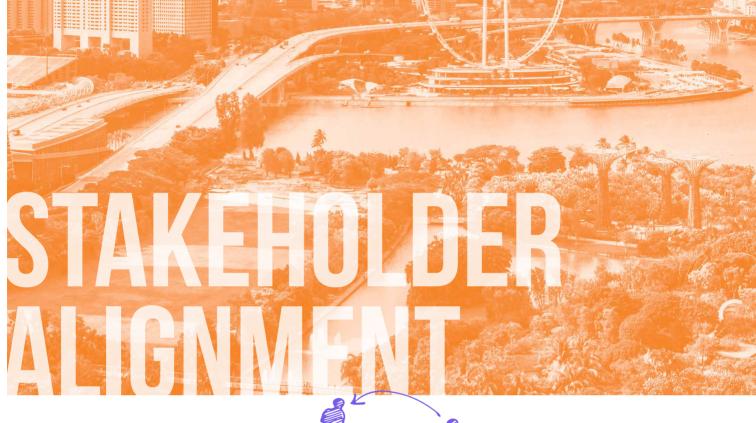
Customer perceptions of the cost/benefit case, as well as a lack of stand-alone budgets for technology investment into smart building systems were consistently cited by our interviewees as persistent barriers to mainstream adoption.

The continued real-estate focus on up-front capital expenditure also means that many end-users continue to overlook investment into new smart building projects, as they still see new technology as simply additional delivery cost, with limited consideration given to the longer-term cost saving potential of the technology. While many vendors in the industry are now marketing subscription-based SaaS solutions the property industry is still very capital driven, so this can be a hard sell.

Due to these outdated perceptions and entrenched industry attitudes to capital costs, buyers and designers still often select more traditional technologies instead of more innovative, efficient options, meaning the buildings being delivered are less smart than they should be. However, the stakeholders we interviewed remain confident that the costs of smart building solutions technologies will continue to fall, further strengthening the business case for investment.







To fully realize the benefits of smart building technologies, improved stakeholder alignment between developers and tenants was noted as a key barrier to mainstream adoption.

The traditional lease structures under which many commercial buildings operate, whereby the tenant is responsible for the utility bills, but the landlord is responsible for maintenance also generate the infamous "landlord tenant split incentive" problem for the realestate market.

Under the structure of most commercial building leases, operational costs are borne by the tenant, leaving the owner with little control or financial interest in impact on efficiency or effectiveness of technical solutions operating in the building. This leads to a financial disconnect between those responsible for the investment in any operational upgrades and those who benefit from them, often resulting in underinvestment in upgrades over time.

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To foster increased investment into smart building technology, property developers to become more invested in the improved performance of their buildings, they need to know "what's in it for them", be that through new revenue generation opportunities, the ability to attract and retain tenants, or new opportunity to better manage their own costs.

With ownership and control of different systems also split between the landlord and their tenants, providing adequate data access to tenants to enable their provision of smart building solutions to building users was also highlighted as a point of friction. For example, a tenant may desire access to building access control data to integrate into their user experience apps, but as the system is managed by the landlord, they may not be inclined to readily share the data due to concerns such as data security or increased management cost.



Our interviews highlighted several solutions, drivers, trends and strategic approaches that will progressively overcome the problems explored above. These solutions will allow smart building technology to deliver on their promise and achieve mainstream market adoption over the next 10 years.



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The overwhelming consensus amongst our interviewees was that the successful development of a smart building development involves going on a journey, rather targeting a specific destination.

Respondents highlighted lessons learnt by early adopters on the benefits of adopting a holistic and thoughtful approach to solution development and delivery over time, rather than scrambling to serve the latest trend.

DEVELOPA STRATEGIC VISION

Fundamental to best-practice delivery of cost-effective smart building solutions is the development of a strategic vision that carefully considers critical business objectives and systems data requirements.

Smart building solutions, where possible, should also be designed to offer compound benefits to address the varied needs of wider variety of stakeholders across the value chain and the enterprise. These stakeholders may include owners/Investors, property/facility managers, tenants and building occupants. Each stakeholder has a different perspective and expectations as well as different key performance indicators to measure their organization's productivity.



The transition to a fully integrated smart building does not have to occur overnight, indeed attempts by newcomers to the market to develop a comprehensive, onesize-fits all smart building from scratch have historically ended in costly failure.

By attempting to develop a fully converged 'single-pane-of-glass' solution for all of buildings systems from a standing start, end users report facing several pitfalls and unforeseen issues along the way, including issues with system interoperability, solutions failing to deliver the quality of outputs expected, and challenges with providing balanced, mutually-beneficial outcomes to a wide range of stakeholders in the business or wider supply chain. Instead, the smart building journey should be based on a roadmap that seeks to deliver a series of tangible, prioritized benefits that best service the needs of the business and its various stakeholders in a gradual and iterative manner.

Even for owners and developers focused initially on one particular use case (such as energy efficiency), due consideration should still be given to potential applications or integrations that may add value in the future. By using flexible infrastructure and data models from the start, the owner or develop can leave the door open to more seamlessly integrate new smart applications that add value, improve the customer experience, generate additional revenues, or provide competitive advantage.

A priority driven, iterative approach can help to reduce initial capital outlays, and effectively prove the business case by testing preconceived notions about how the system should work and quality of systems outputs. While owners/ developers will undoubtedly still make mistakes and need to learn as they go, such an approach help owners and operators to develop the relevant skills and expertise over time, build trust amongst vendors and internal stakeholders and add additional value over time.





As previously explored, the traditional commissioning and procurement processes for new buildings regularly fail to deliver cost-effective smart building solutions. Market leading smart building adopters have learnt through experience the value of engaging with relevant experts such as master systems integrators and smart building consultants from the very outset of their projects, side by side with the services consultants. These experts possess the critical blend of building systems, IT, physical security and cybersecurity expertise required to navigate the technology landscape and facilitate complex integrations for clients.

They can act as a client-side technology representatives on the smart building development journey from design through to completion. Providing the following services:

- Help clients to overcome the typical pitfalls experienced from standard real-estate commissioning and procurement processes.
- Assist with the development of a strategic vision, providing advice on which technologies and standards should be specified.
- Provide technology guidance during tender interviews, ensuring that specifications are tailored to meet the client's performance requirements.
- Factor in systems integration costs and considerations into the delivery plan.





SKILLED TEAMS CAN MAKE ALL THE DIFFERENCE



Another key differentiator for successful smart building technology adopters, particularly amongst owner-operators, is the development of dedicated and appropriately skilled asset technology teams, that sit between the project team and the operational team and oversee smart building developments from beginning to end.

With the appropriate training, these teams can develop a clearer vision of exactly what the business needs to make their smart building investments a success, particularly from a process, procurement, or contractual point of view. They can develop an in-depth understanding of requirements as well as being better placed to articulate requirements when it comes to putting forward the business case, outlining systems specifications, contractual arrangements, and compliance in order to help the business achieve its smart building goals.

Successful internal smart building teams can also help to bridge silos between the business and the project delivery team, highlighting the potential impact that cost-cutting decisions made in the planning phase may have on long-term systems performance.

Investing in improved education and training with regards to smart technology across the board can also help to improve the ability for stakeholder to articulate the business case for investment, develop a willingness to pay for more sophisticated innovative technologies amongst the customer base, while also helping to foster behavioral change to long established procurement and operating models.

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INTEROPERABILI **BEASE OF USE**

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Over time, tools and systems will need to be simplified and become easier to integrate. 22

There was widespread consensus amonast our interviewees that siloed smart building solutions focused on one particular trend or application consistently fail to deliver value for end-users.

They were bullish however, on the ability of the market to develop and deploy more cost-effective, unified, and adaptable solutions. Several highlighted the positive prospects

for platforms designed to allow technology to evolve over time, with a menu of compatible technologies and application modules that a customer could choose from, that can be easily modified, upgraded, or patched in a plug and play manner. Such a scenario would see smart building solutions develop in a manner more akin to the kinds of solutions seen in Enterprise IT, with customers able to select the

best-in-class solutions which align with their requirements and facilitate data visualization and improved decision making.

Rapid advancements in Artificial Intelligence were also highlighted as a having the potential to ease the burden of integration, with systems and devices becoming increasingly self-discoverable on the network.

DATA STANDARD **ARE IMPROVING**

A considerable and concerted industry effort is underway to improve alignment and adoption of a new generation of smart buildings standards. The latest aeneration of BMS typically conform to the latest open standards and come with in-built IoT connectivity options. Over time, legacy siloed building system technologies developed prior to the advent of the IoT and open data standards will progressively be replaced by these new generation systems.

Open data standards and protocols, designed to enable improved systems interoperability are widely seen as critical to combatting market fragmentation and improving choice/flexibility for end users. By integrating data from typically siloed data sources, building owners and operators can develop compound applications that incorporate data from multiple systems or devices.

Meanwhile, the recent industry push to develop improved frameworks, models and ontologies (including BRICK, Project Haystack and RealEstateCore) provides a common means of structuring and tagging data and should enhance the value of building systems.





EXTERNAL MARKET FORCES REQUIRE CHANGE

External factors, including green regulation, green customer/ occupant pressures, electricity prices, the pandemic, and others, should push the market towards mass adoption.

The power of external factors to drive change to technology adoption was highlighted with dramatic effect by the COVID-19 pandemic. The pandemic drove a surge in corporate digitization efforts initially to facilitate remote working and then subsequently to support a safe return to the office – amply demonstrating how external forces can act as significant drivers for change, innovation and end user technology adoption.

The operational vulnerabilities highlighted by the effects of the pandemic have also seen a major shift in corporate strategic priorities, with organizations investing in solutions to develop more resilient, future-proof buildings designed to withstand future risks and external forces, be they related to climate change, unforeseen natural disasters, man-made events, or future health crises. Exacerbated by the conflict in Ukraine, demand for energy efficient solutions will continue to be driven by rapid rises in global energy prices, with the cost of all traditional energy sources reaching record highs, driving inflation and threatening global growth². Cost saving opportunities, incentive programmes, and the emergence of greater corporate commitments to Environmental Social and Governance (ESG) targets are helping to incentivize smart solution adoption.



Three years ago, I spoke with an institutional investor with a \$5 billion fund in real estate in Asia, then they didn't really care about green building and sustainability, because none of their clients cared. Now that's all they want to talk about. Everything they touch has to be green and future proofed going forward.

> Charles Reed Anderson, Chief Strategy Officer at Eight Inc.

² https://www.weforum.org/agenda/2022/09/inflation-rising-food-energy-prices-economy/



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In order to achieve Net Zero targets by 2050 further significant improvements will need to be made to building energy and emissions performance, and here technology will have a significant role to play.

The development of a range of smart and green building certification schemes, such as **Green Mark Certification** in Singapore and Australia's **NABERS Energy** rating system have helped to spur market adoption to an extent, as building owners have sought to demonstrate their sustainability and innovation credentials.

However, the consensus amongst our interviewees was that tightening government regulations (the stick as opposed to the carrot), would be what helps push smart building technology into mainstream adoption.

The ever-increasing government focus on building sustainability and net zero commitments will see governments increasingly move beyond voluntary certification schemes onto mandated performance targets and place ever greater responsibility on the real-estate industry to improve their sustainability performance.

Emerging environmental performance regulations, such as Singapore's carbon tax³, and the **GFA Incentive scheme**, aimed at to encouraging improved adoption of **Construction Industry Transformation Map** standards in areas of digitalization, productivity and sustainability were highlighted as prominent examples of government interventions that are helping to significantly drive market adoption.



TENANT AND END -

Tenant and building end-user expectations have begun to have a significant impact on market demand for smart building solutions, often with specific requirements around having access to particular datasets. Office buildings in particular stand out in this regard, because they are competing to attract the best tenants in an increasingly competitive market.



A recent Oracle backed research study found that 78% of respondents expressed frustration with society's lack of progress on ESG and sustainability initiatives, and 91% want businesses to be held accountable⁴.

These findings are borne out by the results of our survey (shown below), which found that overall, the majority of respondents (53%) stated that they would prefer to see more technology in the workplace, scoring their desire for more technology at either 4 or 5 on a scale of 1-5, versus only 20% scored between 1-2 on the scale. The preference for an increase in the technology used in their workplaces was strongest amongst respondents in the UAE, where 65% respondents scored between a 4 and a 5 on the scale.

³A tax introduced in 2019, which sees emitters charged \$\$5 (-\$3.60 US) per tonne of greenhouse gas emissions they emit, rising progressively to \$25 from \$\$25 (-\$18 US) in 2024 and eventually to between \$\$50 and \$\$80 by 2030 (-US\$36 to US\$68) by 2030. ⁴No Planet B:How Can Businesses and Technology Help Save the World?, Oracle, 2022

PECTATI



KEY

UAE SINGAPORE AUSTRALIA

Respondents also stated a clear preference for careers in tech enabled workplaces, with 58% indicating they would change iob for a workplace with more technology, with only 13% indicating they would prefer a workplace with less technology. The extent to which technology in the workplace is likely to affect career decisions was most pronounced in the UAE, where 66% of respondents indicated a willingness to change job for a workplace with more tech, and in Singapore, where only 6% of respondents indicated a willingness to change to a workplace offering less technology.

Companies are becoming increasingly incentivized to invest in workplace technologies as a means to maintain their status as a leading brands or employers, attracting and retaining employees, as well as being seen as "doing the right things" when it comes to ESG. To address their clients' technology needs, progressive landlords and property development companies have begun offering improved technology solutions to their tenants, generating new revenue streams and helping to differentiate their offerings.

Several of our interviewees even went as far as to suggest that buildings which don't keep up with these evolving user expectations will simply be left behind, becoming stranded assets in the evolving digital/Net Zero economy.

FIG 2

ON A SCALE OF 1-5, WOULD YOU PREFER TO SEE More or less technology in your workplace?

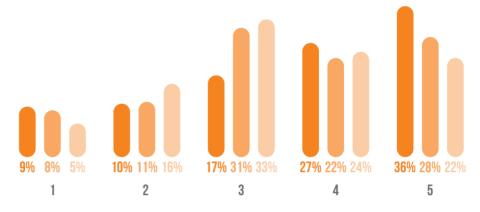
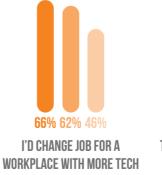
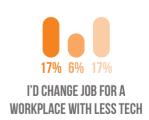


FIG3

WHICH STATEMENT BEST DESCRIBES HOW THE LEVEL OF TECH IN THE WORKPLACE WOULD INFLUENCE YOUR NEXT CAREER DECISION?









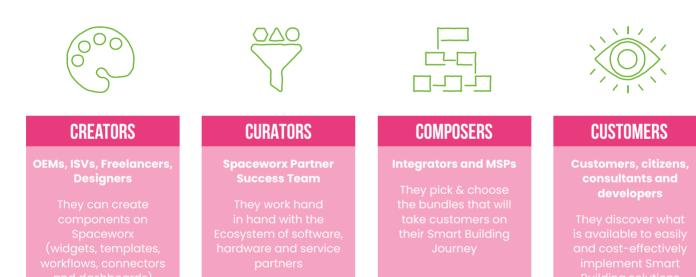


Has your organization fallen foul of any of the common challenges highlighted in this white paper during your digital transformation or smart building initiatives? Spaceworx can help. Driven by a vision to enable customers and partners to achieve sustainable and enjoyable spaces, and with over 20 years of experience gained through the delivery of over 300 million Sq. Ft of projects for smart workspaces, buildings, and smart cities. As this white paper has shown, moving towards a Smart office, building, precinct, or city is an ongoing journey, not a single destination, while recent socio-economic and geopolitical challenges have accelerated the need for organisations to change the way they behave and operate. These changes often face initial misunderstandings and resistance before they achieve successful adoption; and that is precisely the raison d'être of Spaceworx.

If Smart Facilities Management, Hybrid Work or Sustainably initiatives are attempted too abruptly, they will encounter internal friction and ultimately fail. The Bundles offered within Spaceworx empower integrators and customers to take a gradual approach to change with a clear roadmap of the business objectives they want to achieve.

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Whether you are seeking to lower your operational costs, generate new revenue opportunities, meet ESG targets or improve your customer's experience, Spaceworx has the expertise, and real-world experience of working with stakeholders across the supply chain to guide you through your Smart Building development journey.

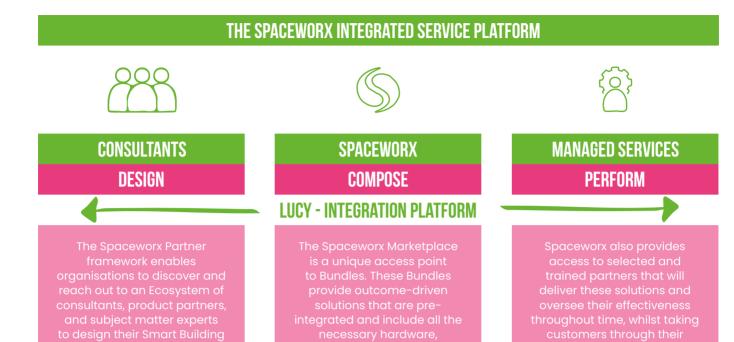


Spaceworx offers the world's first "composable marketplace" for smart spaces. Their online B2B marketplace provides landlords, tenants and operators access to a pre-integrated single procurement source for smart building service providers, products, and solutions. Customers can opt for Spaceworx's pre-built, outcome driven bundles and use these as building blocks, to deliver user-centric, cost-effective outcomes.

Alternatively, customers can choose to assemble their own, custom smart space solutions, that align more closely with their organizational priority use cases, by selecting from over 10,000 pre-approved products, services, and partners, 100s of templates, 1,000s of widgets, all managed through a single portal. Integration and interoperability concerns can be readily overcome with Spaceworx, as all of the offerings on the marketplace are pre-integrated to Lucy, their low-code technology platform. Lucy provides integration and orchestration of applications and systems, workflow implementation as well as a comprehensive set of data visualization tools and mobile access.

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Through their partner network, which includes integrators, consultants, and managed services professionals, Spaceworx can help address any commissioning, procurement, on-boarding, and integration challenges you may face along the journey. They offer end-to-end support for the delivery of fully integrated smart solutions - from developing your strategic vision, through systems design, procurement, integration and on to ongoing management and performance optimization.





To kickstart your smart building project today, contact Spaceworx:

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