



**THE SEARCH
FOR TALENT
- THREAT OR
OPPORTUNITY?**

**WINTER
2019**

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EXECUTIVE SUMMARY

Welcome to our Winter 2019 report in which the results of our survey are encouraging, interesting and challenging in equal measure. It is exciting to see that future demand levels for data centres show no signs of slowing down. Just over two-thirds of our respondents believe that the next year will see an increase in demand, up on the 55% from our previous summer survey. This is supported by over 90% of developers and investor respondents stating they expect to see a further expansion in their data centre portfolio over the coming year.

The backdrop to this is that our Design Engineering and Construction (DEC) respondents agree that there are general shortages amongst design, construction and operational professionals; four-fifths expressing resourcing concerns. DEC respondents identified build professionals as being subject to the most serious shortages - 82% stated this view compared with 78% for design professionals and 77% for operational functionality of data centres.

The highest ranking impacts that have been noted by our respondents are a greater workload placed on their existing staff (96%) increasing operating/labour costs (92%) and over 80% indicating that this has led to an increase in the use of outsourcing options over the past 12 months. The increased workload for existing staff had in turn led to problems in resourcing existing work, with just over 70% stating that they had experienced difficulties in meeting deadlines or client objectives. The sophisticated needs of our evolving industry mean that it needs to attract an educated workforce and therein lies the challenge. This is reflected within the context of widescale shortages of Science, Technology, Engineering and Mathematics (STEM) candidates across Europe as a whole. Engineering UK estimated recently that the annual shortfall in engineering graduates and technicians to fill core engineering roles was up to 59,000 in the UK alone, a trend reflected to differing degrees across Europe.

The current situation needs to be confronted and solutions sought, but what are they? We asked our respondents to rank a series of proposed areas in which they would like to see further action that could help ease these skills shortages. The most highly rated was greater industry engagement with educators. Google for example, have in recent years funded grants in Finland, Belgium, Ireland and Netherlands - the sites of their European data centres - to encourage curriculum initiatives as well as educational support through teaching collaborations at local colleges. We need to see more examples of this and not only in tertiary education.

BCS are currently doing the round of careers fairs looking for candidates for next year's graduate and apprenticeship scheme. When we are talking to these young people we often find that they either haven't even considered our sector and/or they have misconceived ideas about what this career path involves. We have got to start training them and become ambassadors for the industry by going into universities, colleges and schools telling STEM graduates about the data centre industry and how great it is. Without action, this will become more acute so the rallying cry for 2020 is that the sector is an exciting place to be and we have to get out there and spread the word.

James Hart
CEO

Welcome to the 19th data centre survey undertaken by independent research firm, iX Consulting and sponsored by BCS, offering integrated solutions through IT asset consultancy.

Our survey was conducted in October this year, reflecting the views of those with data centre representation across 35 European countries controlling an overall portfolio covering some 3.7 million square metres of technical real estate. Respondents included those who build and fund data centre real estate, service providers, users and those who supply the services and products that keep the industry running.

WHAT IS YOUR PRIMARY RELATIONSHIP WITH THE DATA CENTRE INDUSTRY?

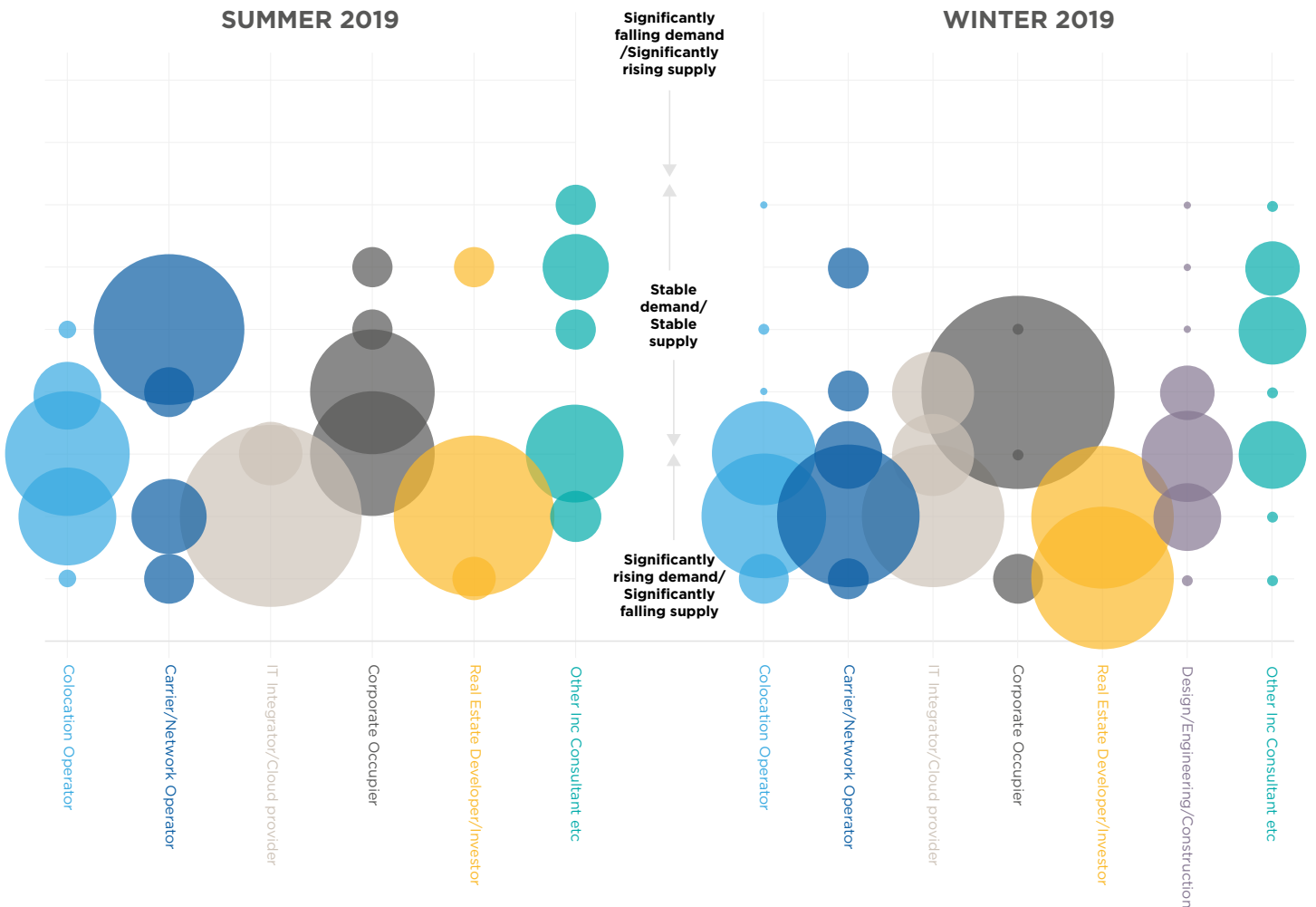


With demand for data centre services continuing apace, our latest edition addresses one potential threat to the supply of infrastructure and services needed to meet this demand; the professional skills gap. We examine whether there is a dearth of appropriately qualified individuals to service the future needs of the industry and whether this might become critical to the health of the future industry.

In particular we focus on the design, construction and operations of data centre facilities. Our findings suggest that in some disciplines, work needs to be undertaken to address these skill shortages so the impact on the industry does not accelerate, nor geographical areas suffer because of the lack of timely stock being delivered to the market.



THE SUPPLY DEMAND BALANCE

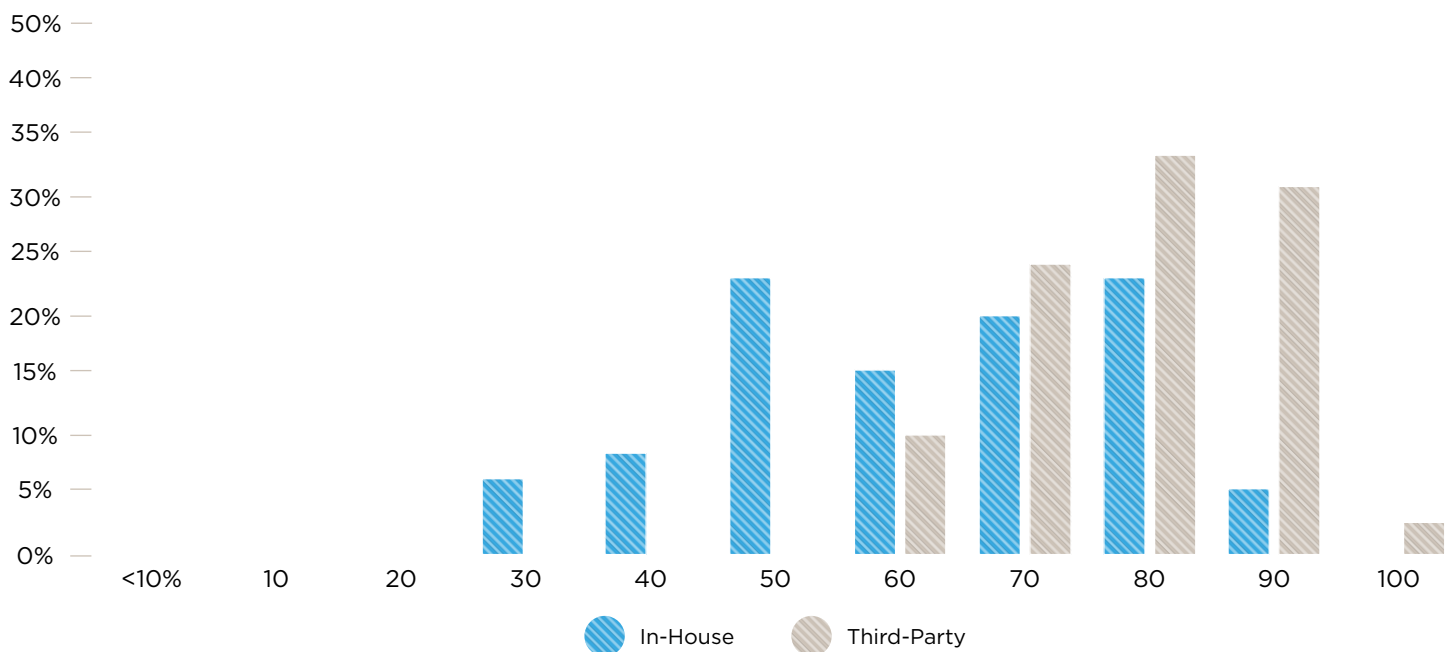


- Future demand levels for data centres show no signs of slowing soon. Just over two-thirds of our respondents believe that the next year will see an increase in such demand, up on the 55% who expressed that view in our previous summer survey.
- A further 29% of our respondents indicate that demand levels will remain stable, whilst just 3% indicate that they believe demand will fall over the coming year.
- Once again, developer and investor respondents remain the most positive regarding potential levels of demand for data centre space, with universal agreement that the coming year will see an increase. In addition, most colocation providers also remain buoyant, with around 85% predicting increasing demand levels in the next 12 months.
- Notably, network carriers and integrators are more optimistic than was the case six months ago; around four-fifths expect to see a rise in demand contrasted to the near 50% who expressed this view in last summer's edition.
- Amongst our corporate respondents, the majority have adopted a view that the market will see stability in both the demand and supply sides; around three-quarters said that they expect demand will remain stable with none seeing a fall during the year, a similar profile to that reported six months ago.

Results from the latest survey continue to support an established pattern of ownership and management trends amongst our respondents. For the majority of data centre infrastructure or services provider - colocation operators, IT integrators and cloud providers respondents - control of their own facilities remains an important requirement. This ability to own or manage their facilities, allows them the necessary control and flexibility to respond promptly to varying demand requirements. Indeed, in our latest survey we see that around three-quarters of this group now report that 80% or more of their data centre portfolio is internally controlled.

In contrast, end users maintain a different strategy with most corporates expressing a preference to rescind control and management of their data centre portfolio to third-party providers. This move towards outsourcing remains attractive for many occupiers aiming to benefit from the budgetary upside via CAPEX savings and service flexibility that this affords.

HOW MUCH OF YOUR CURRENT DATA CENTRE SPACE IS ACTIVE AND BEING USED?



Latest survey results provide further evidence of the attractiveness of this kind of solution; nearly four-in-five corporates outsource at least 80% of their data centre portfolio, which represents a small uplift on the three-quarters noted in our summer report and considerably higher than the two-fifths indicating this ten years ago.

With demand for cloud services witnessing substantial growth in the wake of corporates expanding their use of IT services, third-party managed space will continue to play an important part in the delivery of those services.

As we have identified in recent surveys, the pattern of utilisation of internal and external solutions differs significantly. For users of third-party data centres, the requirement to maximise efficiencies, allied to keeping flexible contracts to facilitate a phased build-out to respond to business demands has resulted in higher overall utilisation rates, with around two-thirds of respondents indicating that over 80% of their technical footprint was being actively used. This proportion has not changed over the course of the year.

Conversely, the proportion of respondents reporting that over 80% of their in-house technical footprint was being actively used stood at 28%, again unchanged over the course of the year, but roughly half of that recorded for our third-party space.

Amongst service/infrastructure providers, utilisation rates in their own facilities average 62%, rising to nearly 80% in externally managed facilities. For corporate occupiers, a similar profile of utilisation exists; average utilisation rate for third-party facilities stands at just over 80% for end users, contrasted to their in-house facilities where the average stands at 68%.

EXPANSION

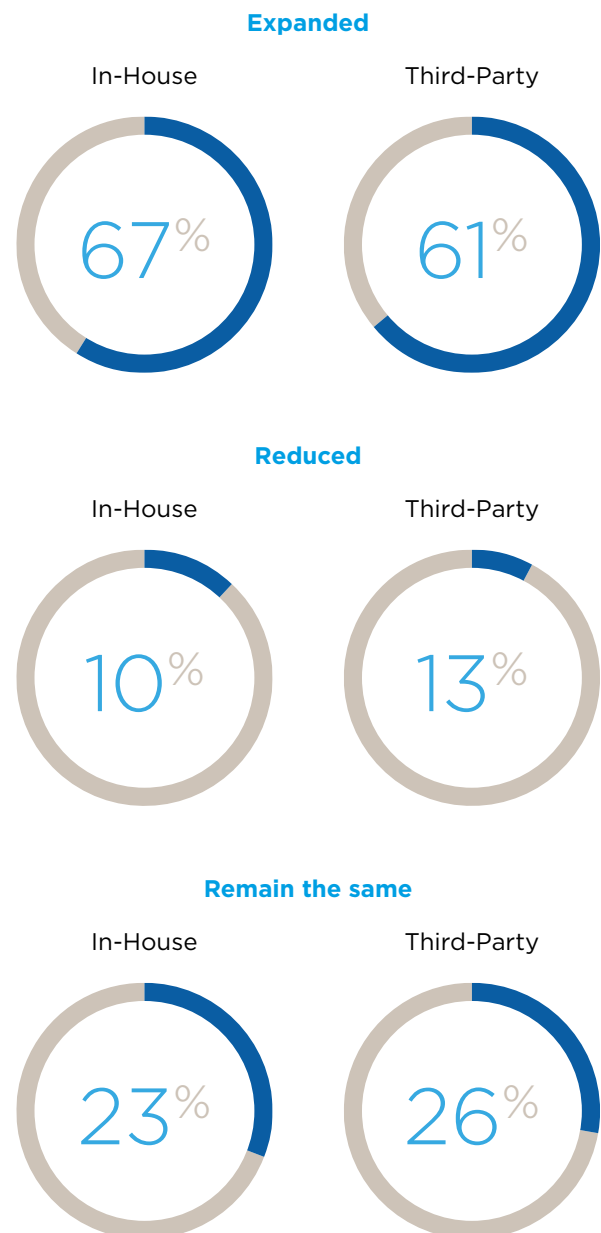
During the past six months, we appear to have had a small rise in expansion rates of in-house technical space amongst our respondents. Whilst 67% indicated that they had expanded their in-house managed capacity - a similar growth rate to that recorded in our summer survey - we monitored a small increase in those reporting 'no change' in in-house space; 23%, up from 20%. This has been at the expense of the number who indicated that they had reduced their in-house technical floor space, now standing at around 10%, down from 13%.

We have also seen expansion rates rise for those utilising externally managed space. Some 61% of respondents reported that they had expanded their third-party portfolio in the past six months, an uplift on the 55% reported in our preceding survey. This recent expansion goes hand-in-hand with a reduction in those reporting 'no change', falling from 31% to 26%, whilst the proportion reporting a reduction in their third-party portfolio has remained stable at around 13%.

A deeper dive into respondent profiles suggests different underlying dynamics amongst professional disciplines. For corporate respondents, the desire to reduce the size of their self-managed liabilities is given support by the fact that around 45% reported that they had slimmed down their in-house technical footprints over the past six months, whilst less than a fifth indicated an increase. Over the same period, just over half of these users indicated that they had expanded their third-party maintained estates; evidence suggesting a growing move to preferring to take on externally managed solutions.

This demand for third-party solutions - not just from end users but also from the IT managed services and cloud sectors - in turn fuels the need for colocation providers and other service providers to add to their supply pipeline. The sector continues to respond to this, with around four-fifths of colocation operators, IT integrators, carriers and network providers reporting that they have expanded their own facilities over the past six months.

HOW HAS YOUR TOTAL FITTED TECHNICAL FLOORSPACE ALTERED OVER THE PAST SIX MONTHS?



HOW DID THEY DO IT?

Of those who expanded their data centre portfolio over the past six months, 60% chose to do so through a self-build solution; a fall on the three-quarters who reported the same in our last survey. This decline appears to be as a result of a rise in popularity for the option of purchasing or leasing space from a development partner.

Significantly, several respondents reported the increase in floorspace of more than one facility over the period, with expansion through different methods suggesting that there is not one single route to market for our active respondents, rather these are examined on a case by case basis and opportunities taken that suite the specific dynamics of the local market and demand profile.

Colocation providers appear to be strong winners in expansion activity. Of those who expanded their third-party footprint over the period, some three-quarters chose to do so by taking space from a colocation provider, significantly ahead of alternatives such as utilising the services of a carrier/network operator or IT integrator.

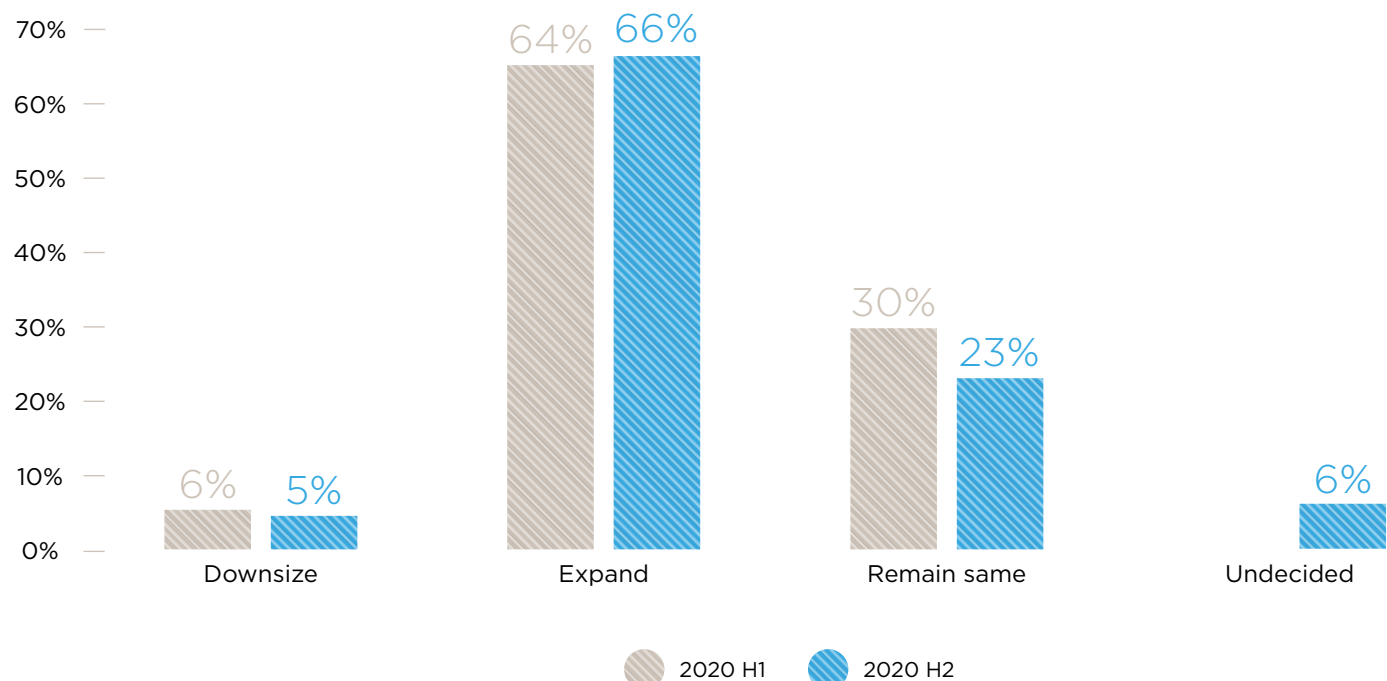
EXPECTED CHANGES

Looking ahead, around half of our survey respondents expect to increase their third-party managed data centre space over the coming 12 months, with a relatively even number of those expecting to do so in the first six months of the year compared to the latter half. Whilst this represents a marginal decline on the near 60% who expressed the same six months earlier, this proportion remains significantly above the long-term average and indicates healthy levels of demand for third-party space during 2020.

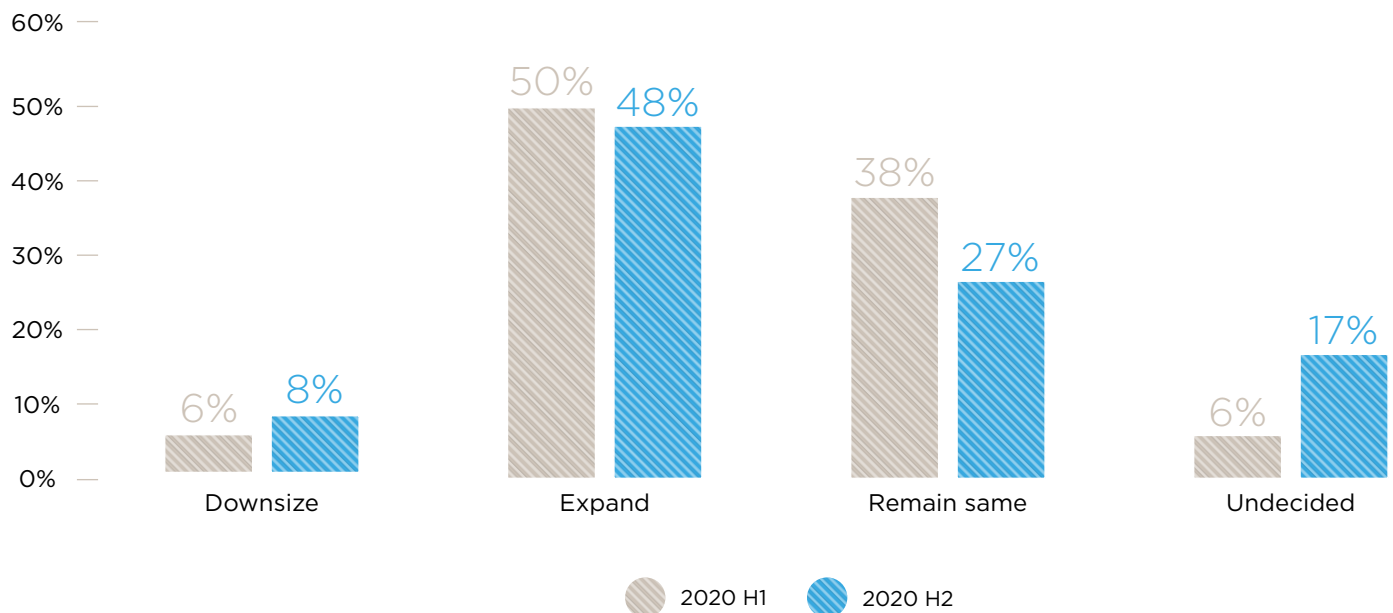
Perhaps surprisingly, regarding in-house technical floorspace, around two-thirds of respondents indicated that they expect to increase their in-house technical floor space over the next 12 months, which is an uplift from the 58% recorded six months ago. There appears to be little difference in terms of timeline, with an even split of expansion forecasts for the first and second halves of 2020.

However, the increase in expected demand for in-house facilities appears to be explained by the drive of service provider respondents; over 75% of them reporting that they are expecting to see growth in taking space for themselves over the coming year. In contrast, just 14% of corporate respondents suggested that they would be looking to increase self-managed data centre space over the period and around a third actively looking to reduce their facilities. Around half reported that they would choose to retain the same level of internally controlled space over 2020.

WHAT ARE YOUR CURRENT EXPECTATIONS FOR CHANGES TO YOUR 'IN-HOUSE' TECHNICAL DATA CENTRE AREA?



WHAT ARE YOUR CURRENT EXPECTATIONS FOR CHANGES TO YOUR 'THIRD-PARTY' TECHNICAL DATA CENTRE AREA?



Unlike their relatively limited approach to in-house expansion plans, over 70% of our corporate users stated that they intended to expand their operations with an external infrastructure partner over the coming year. Amongst the integrators, carriers, colocation and cloud providers, 43% reported an intention to expand their third-party managed estate whilst 37% suggested they would retain the same exposure.

This of course does not suggest that respondents adopt an entirely either/or approach to their requirements. It is likely that users will continue to choose a mix of in-house and third-party managed solutions to suit the requirement of their demand. However, it does suggest that increasingly occupiers are becoming comfortable with placing their IT estate with a specialist third-party in order to benefit from flexibility, scalability and access to a potentially enhanced infrastructure that may not be accessible to them through self build/manage.

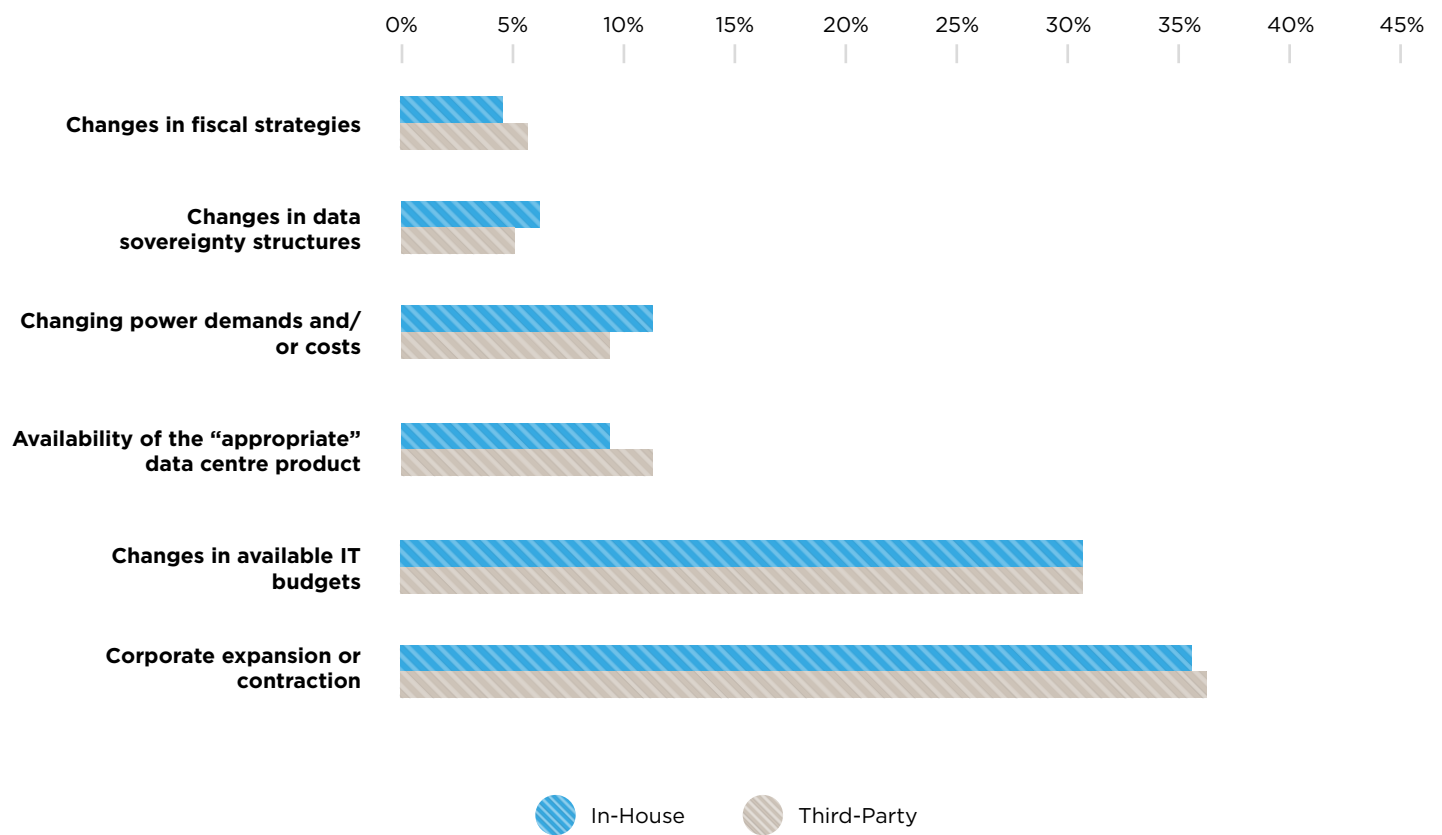
DRIVERS OF CHANGE

Since the start of our survey work over ten years ago, *corporate expansion or contraction* has been identified as the single most important factor driving changes to both in-house and third-party technical floorspace. Over the past few years we have noted that its relative importance ahead of other factors appears to have been reducing, with just over one-third identifying this as the number one priority in our latest survey, compared to a long-term average of around 45%.

Although it is likely that changing business demand levels will continue to underpin the traditional core drivers of demand for IT infrastructure, there does appear to be a wider spread of factors that are now being considered important amongst respondents.

One factor which has risen up the ranks in recent years is *changes in available IT budgets* - arguably linked to the demand levels of the internal business, albeit likely to lag the rise and fall curves of business demand. Almost one-in-three respondents cited them as a key influence, in line with that seen six months ago. Similarly, there has been little change in the relative popularity of the *availability of the 'appropriate' data centre product* and *changing power demands*; the former being a more pronounced driver for third-party managed expansion, as the cost of ownership and development timelines make in-house managed solutions less attractive to some, whilst *changing power demands and costs* appear to be listed as more important to respondents looking for in-house data centre space.

WHAT FACTORS ARE/WILL BE DRIVING THESE CHANGES?

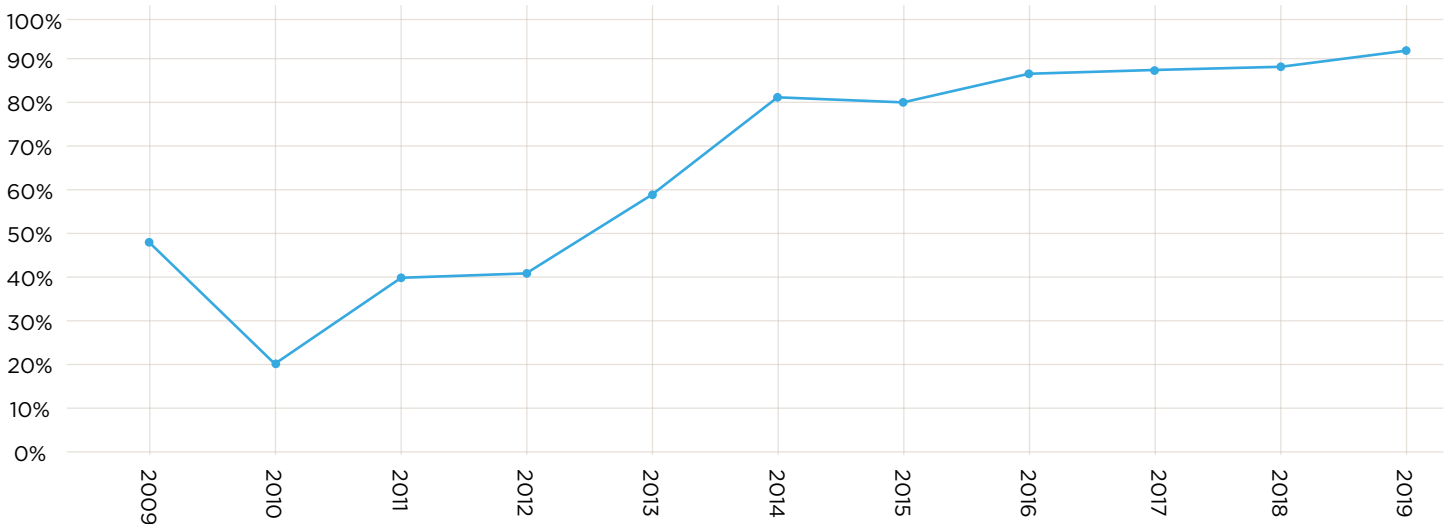


SUPPLY PIPELINE STILL FLOWING

The ongoing health of the data centre market can be gauged by the propensity of those involved in the delivery of new space to continue to invest and build. Although by their very nature, developers and investors immersed in the industry are naturally confident in their outlook, particularly around future demand, later in the report, we address the issue of a possible skills shortage amongst design, build and operational professionals that could throttle this in certain areas.

Whilst real concerns may exist about the ability of the data centre industry to address these skills shortages, results from the latest survey suggest that these are yet to seriously reflect real supply pipelines. For the third survey in a row, nine-out-of-ten developer and investor respondents reported an expansion in their portfolio of technical real estate over the past six months.

PROPORTION OF DEVELOPERS EXPANDING DATA CENTRE PORTFOLIO IN THE PAST SIX MONTHS

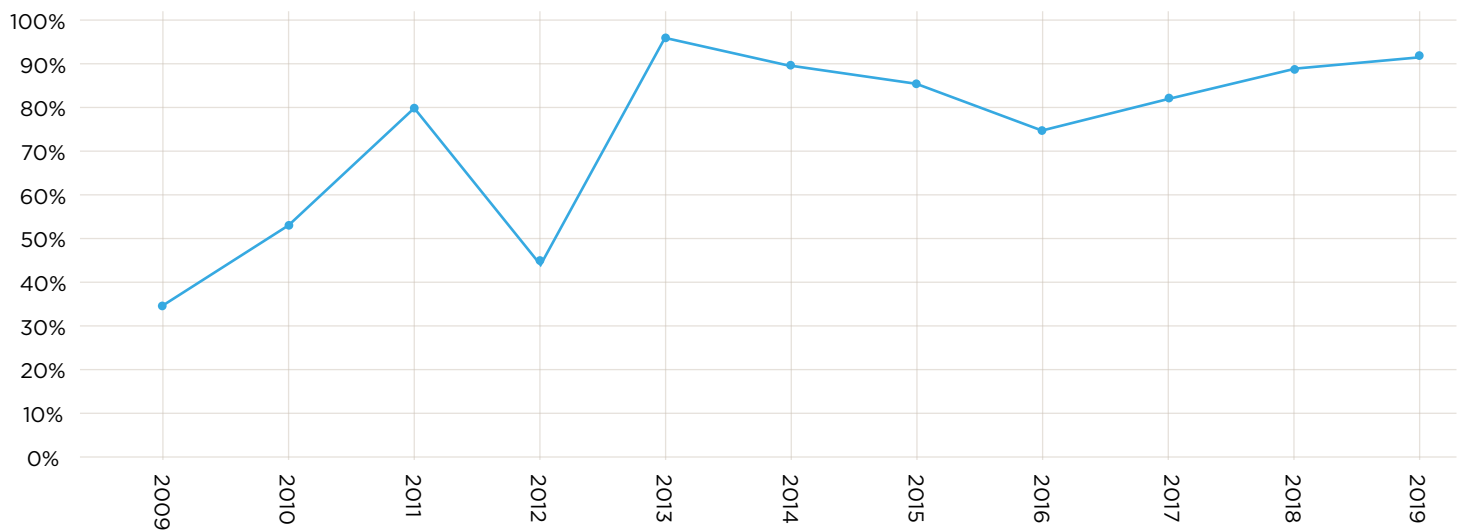


Of those respondents who reported a portfolio expansion, over two-thirds did so via development activity whilst the remaining one-third grew through acquisition or merger; a similar profile to that reported in our summer survey. It should be remembered that the relative size of individual transactions involved is not reported in these overall totals.

SHORT TERM DELIVERY

The short term is unlikely to see any slowing down in the supply pipeline for European data centre space. Evidence is provided in the latest survey by over 90% of developers and investor respondents who stated that they expect to see a further expansion in their data centre portfolio over the coming year, in line with that reported six months ago. It should be noted that this proportion remains significantly above the long-term average of around 70% monitored over the last ten years.

PROPORTION OF DEVELOPERS EXPECTING TO EXPAND DATA CENTRE PORTFOLIO



DRIVERS OF CHANGE

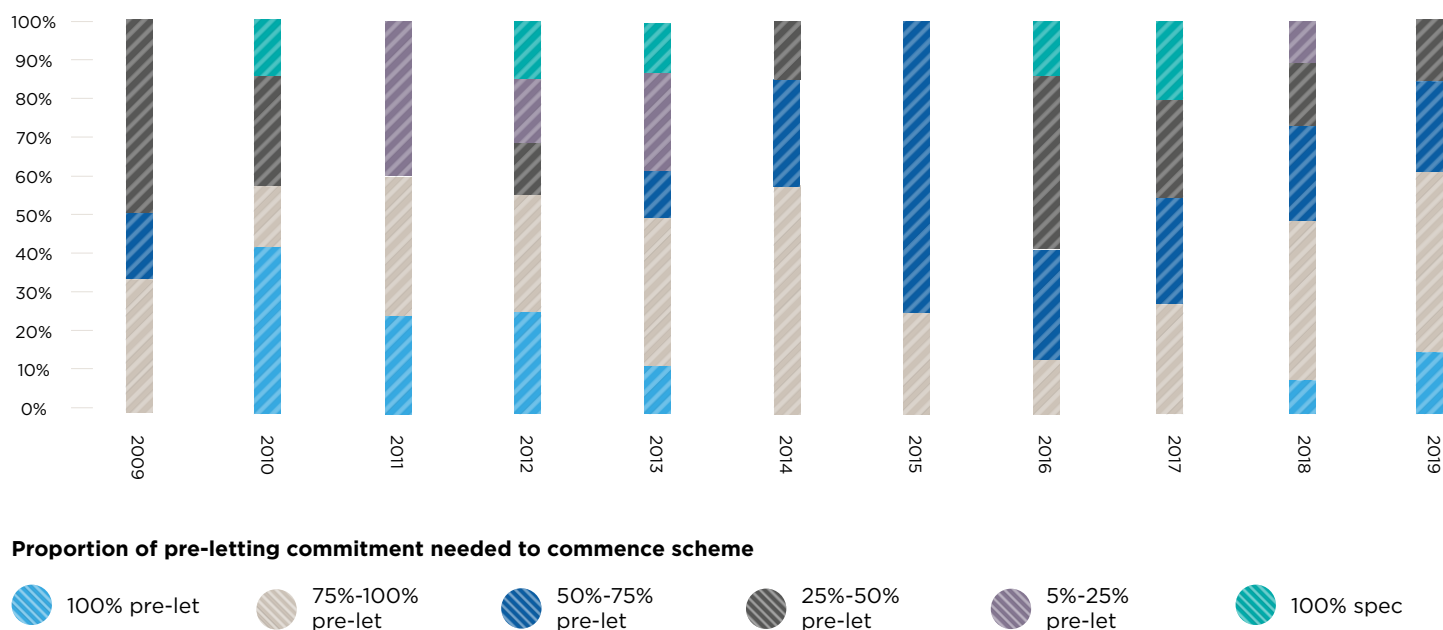
The fundamentals of demand and supply lie at the very core of the business model of data centre developers and investors. To this end, it is not surprising that these factors sit at the very top of the list of relative importance to decision-making in respect of drivers of expansion or contraction. This reaffirms that growing demand and the lack of supply have constantly been ranked as the number one and two drivers of expansion by developers since we began the survey over a decade ago.

One other area of note is that *diversification of portfolio* has been cited by over half of developers as an important contributory driver, representing a significant jump from the quarter monitored in our last survey. There are two possible elements to this – stock and geography. First, this might reflect a desire to diversify general real estate portfolios with stock in a now more mature, yet growing data centre market. Second, there may be a desire to benefit from a presence in new locations, with the increasing growth of edge data centres placing facilities in non-traditional areas offering an opportunity for this.

CAUTIOUS CONFIDENCE

Despite the reported opportunistic outlook in expansion of data centre stock, the survey results do suggest that our developers and investors have actioned a degree of caution through their commercial pre-requisites. In the last six months, for example, the survey has monitored a rise in the proportion of pre-letting required to secure the phased development of a scheme. Around 17% of these respondents recorded that they now need 100% of the scheme pre-let before they would be prepared to commence works, up from 11% recorded in the summer.

IF IT IS YOUR INTENTION TO DEVELOP MORE TECHNICAL SPACE DURING THE NEXT 12-18 MONTHS, ON WHAT BASIS WILL THAT BE?



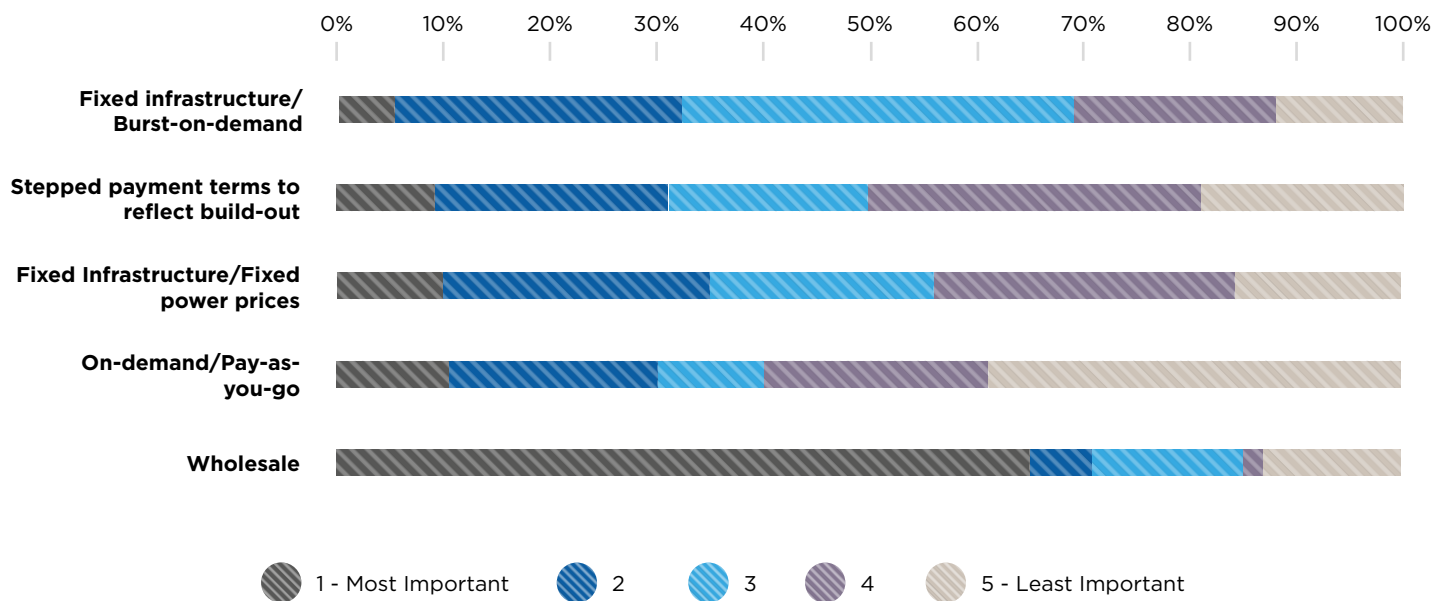
Indeed, just over two-thirds of respondents reported that they required a pre-let of at least 75% before they would break ground, a rise on the 53% recorded in our preceding report and above the long-term average of 47%.

DATA CENTRE CONTRACTS

As demand for IT services has grown in recent years, consumer expectations for a variety of differing contracting solutions to reflect increasingly more sophisticated services has also grown. To that end, the data centre industry has developed a diverse set of commercial contracting options to service this need.

Over the past few years we have analysed the popularity of a selection of flexible and scalable contract options, drawing on wholesale and retail colocation as well as IaaS and managed services products.

IN TERMS OF CONTRACTING FOR DATA CENTRE SPACE, PLEASE RANK THE FOLLOWING MODELS IN ORDER OF IMPORTANCE TO YOUR/YOUR CLIENTS' ORGANISATION



Across the respondent base, 64% ranked a *wholesale* approach as the most important contracting solution for their needs or client's needs, a proportion largely unchanged to that recorded six months ago. Given the longer-term nature of the wholesale approach and that securing finance for real estate development is traditionally based upon guaranteed longer term income streams, it is not surprising that all our developer/investor respondents ranked this model as their top choice - the fourth successive survey that this has been the case.

Excluding the wholesale commercial model, there are marginal differences in popularity amongst the other contracting models such as *stepped payment terms reflecting build out*, *fixed infrastructure/burst-on-demand*, *fixed infrastructure/fixed power prices*, and *on-demand/pay-as-you-go*.

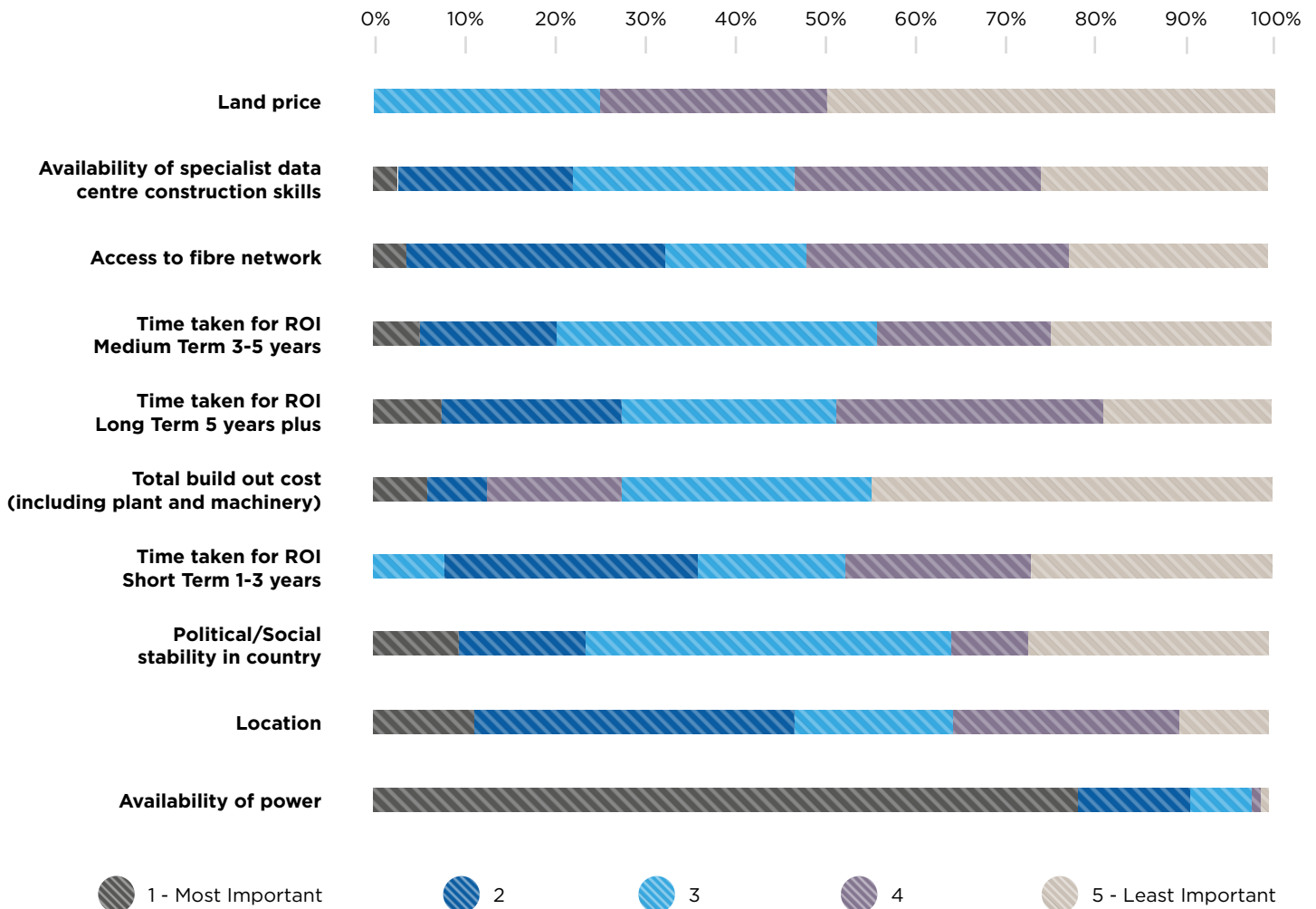
These results suggest that the industry is responding positively to the need to have a variety of commercial models in order to serve the ever-changing character of IT infrastructure demand amongst end-users. With around a third of respondents choosing each option in their top two choices, all suggested models share similar rankings.

Just over half of developer and investors/funders stated that the minimum lease length acceptable to them for a wholesale transaction was a three-to-five year timeframe, a slight rise on the 45% reporting the same six months ago. In addition, 42% stated that a longer five-to-seven-year period would be the minimum acceptable, marginally lower on that reported earlier this year.

RANKING OF CHOICE FACTORS FOR NEW DATA CENTRE

The single most important factor amongst our respondents for the data centre industry across Europe continues to be the *availability of power*. Nearly four-fifths of respondents cited it in our latest survey, an increase on the 70% who did so in the summer. Indeed, amongst our developer and investor respondents the ability to have access to a secure and economic power source is rated even more highly, with around 85% ranking it as the top factor.

DRIVERS SEEING DATA CENTRE CHOICE



Location remains as the second most popular factor, with around half of all respondents ranking it at least in their top two choices. Whilst this position is close to the long-term tracking average, the proportion of respondents choosing it as their top choice has fallen to around 11% from just over 20%.

Notably, amongst our corporate respondents this decline is more marked, and suggests that these end-users are becoming less influenced by the location of their data centre resources compared to other factors. Around three-quarters indicated in our summer survey that location was the highest ranking factor, falling to around two-fifths now.

Conversely, we have monitored a significant move up the rankings for political/social stability, potentially reflecting the unease felt across a number of European political and social landscapes as well as the wider global platform. The UK continues to suffer ongoing uncertainty regarding its

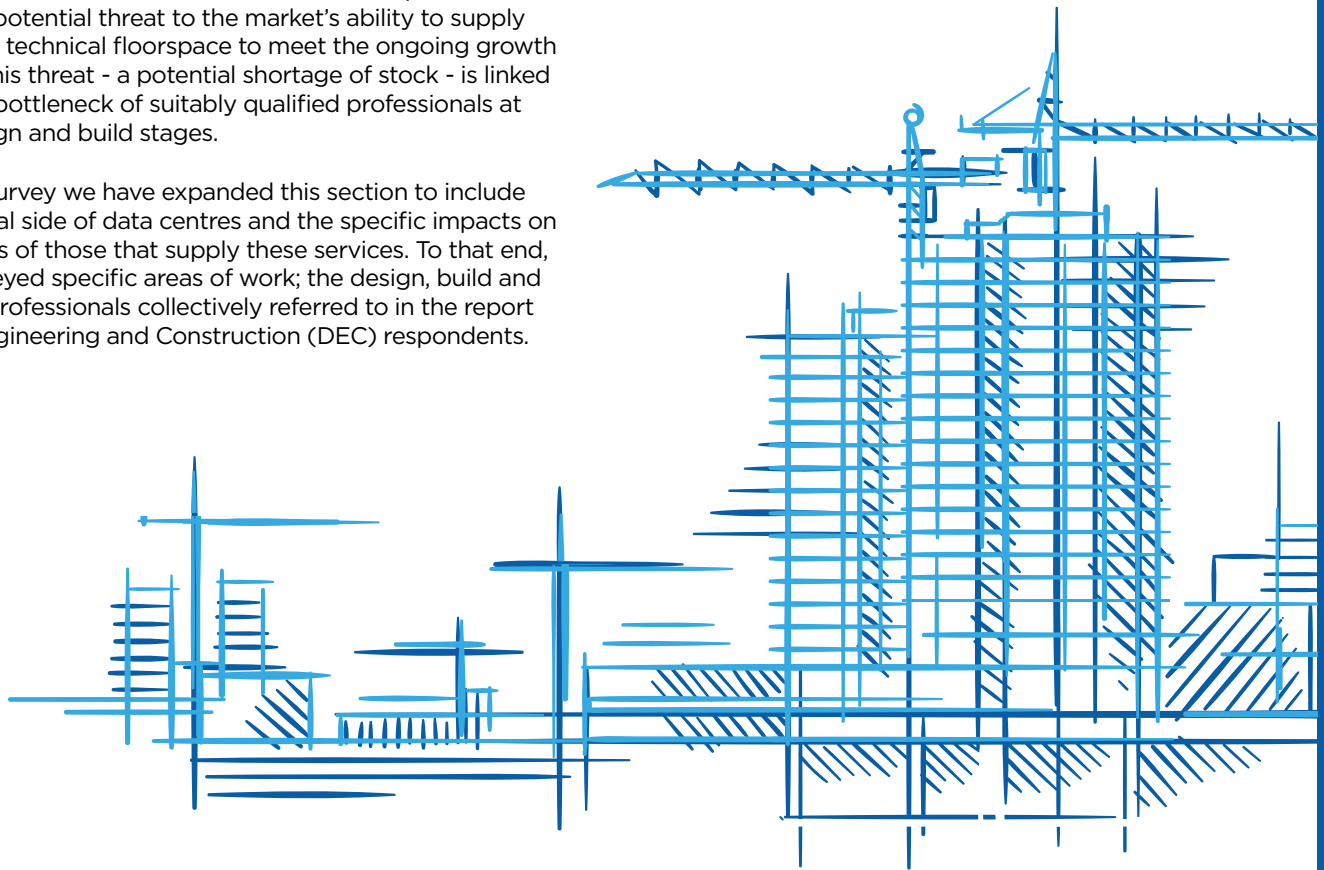
exit from the European Union whilst pro-independence protestors grow in Spain, political unrest simmers in Georgia and the yellow-vest activists continue activities across France. Notwithstanding, the escalating recent violence in Hong Kong provides a stark reality that businesses can be caught up in political and social protests which leave a major developed financial centre on the brink of a recession and facing huge uncertainty. Just over one-fifth of respondents have cited this as one of their top two ranked factors, nearly double that recorded in our preceding survey.

For our developer and investor respondents, the highest rated factors following power availability perhaps unsurprisingly are factors such as *total build-out cost*, *availability of specialist data centre construction skills* and *land price*.

THREATS TO THE INDUSTRY - SHORTAGE OF SKILLS

Over recent years we have started to track our respondent's views on the potential threat to the market's ability to supply the necessary technical floorspace to meet the ongoing growth in demand. This threat - a potential shortage of stock - is linked to a possible bottleneck of suitably qualified professionals at both the design and build stages.






In our latest survey we have expanded this section to include the operational side of data centres and the specific impacts on the businesses of those that supply these services. To that end, we have surveyed specific areas of work; the design, build and engineering professionals collectively referred to in the report as Design, Engineering and Construction (DEC) respondents.

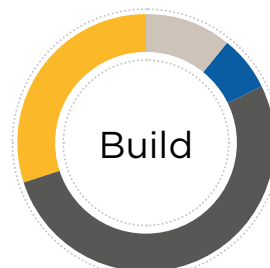
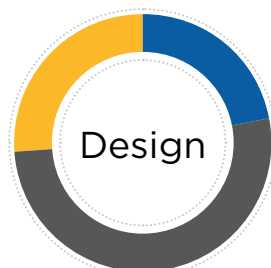


WHO IS IN SHORT SUPPLY?

The results of our latest survey suggest a significant element of concern characterises the industry. Amongst our DEC respondents there is a considerable degree of agreement that there are general shortages amongst design, construction and operational professionals, with around four-fifths expressing this belief to some extent. This contrasts with around three-fifths of all our respondents canvassed on this topic over the past four years, suggesting heightening concerns within the industry.

WITH REGARD TO THE DESIGN/BUILD/OPERATIONS OF DATA CENTRES IN EUROPE WE BELIEVE IT IS INCREASINGLY DIFFICULT TO SOURCE SUFFICIENTLY SKILLED PROFESSIONALS TO DELIVER OUR CURRENT PROJECTS

-  Strongly Disagree
-  Disagree
-  Neither Agree nor Disagree
-  Agree
-  Strongly Agree



The strength of agreement does vary amongst the skillsets, albeit relatively marginally. DEC respondents identified build professionals as being subject to the most serious shortages – 82% stated this view compared with 78% for design professionals and 77% for those staff concerned with the operational functionality of data centres.

In addition, those who considered construction professionals as being in short supply expressed their affirmation in the strongest possible terms – some 30% compared with 26% who expressed the same strong degree of belief in respect of design professionals and 23% for operational staff. It is concerning that just under half of those surveyed cited experiencing a shortage of data centre architects within the last 12 months.

Interestingly, whilst no-one expressed disagreement that there was a shortage of data centre design staff, one-in-ten did so regarding construction staff and one-in-twenty with respect to the operational workforce. This would indicate that these shortages are not spread evenly across Europe and indeed, in some localised markets shortages of qualified staff to meet the markets appears not to be a problem.

Where we see job shortage concerns, there appears to be widespread agreement that these are across a variety of specific job roles. Indeed, amongst our respondents, most identified multiple roles as areas of concern, providing evidence that they have direct experience of shortages across several disciplines.

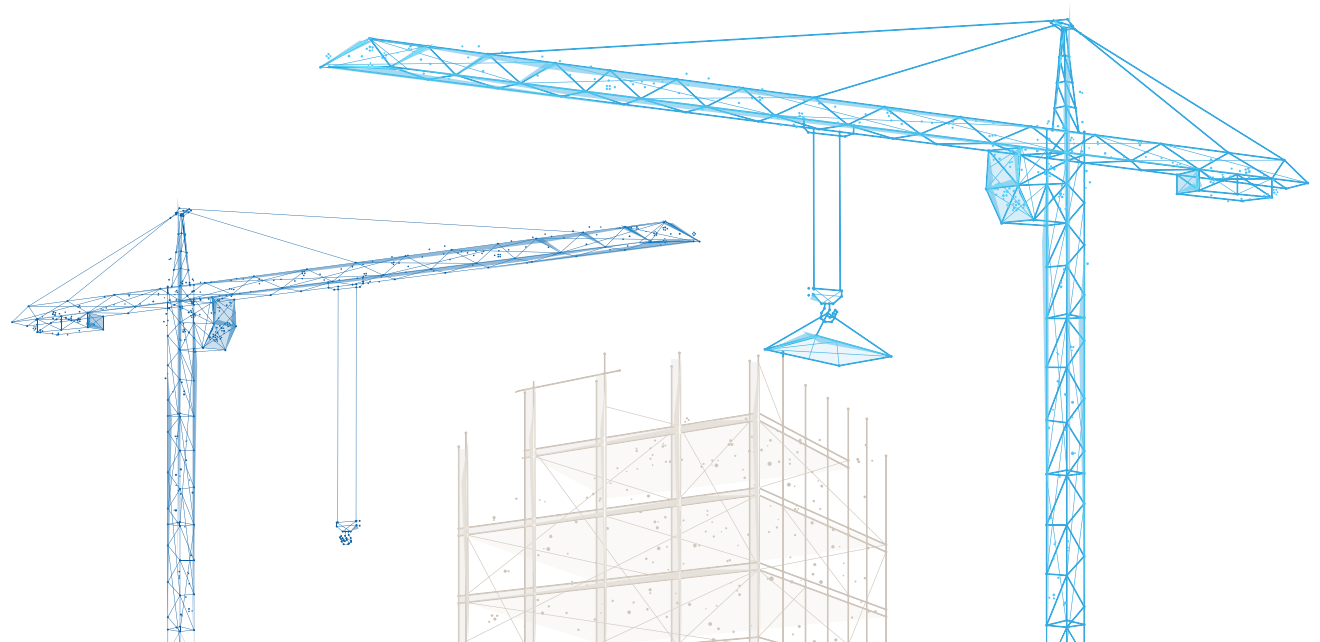
It is within the construction sector that it appears there are the most concerns amongst respondents. Almost two-thirds of DEC professionals stated that they had experienced shortages of quantity surveyors, site managers and site engineers within the past 12 months.

Within the operational sphere, almost two-thirds of respondents stated that they have had direct experience of shortages of operations and network engineers/technicians over the last year, with a slightly lower proportion seeing a shortage of infrastructure specialists over the same period. In addition, Mechanical & Electrical project managers were also highlighted as an area of concern around the availability of skilled workforce.

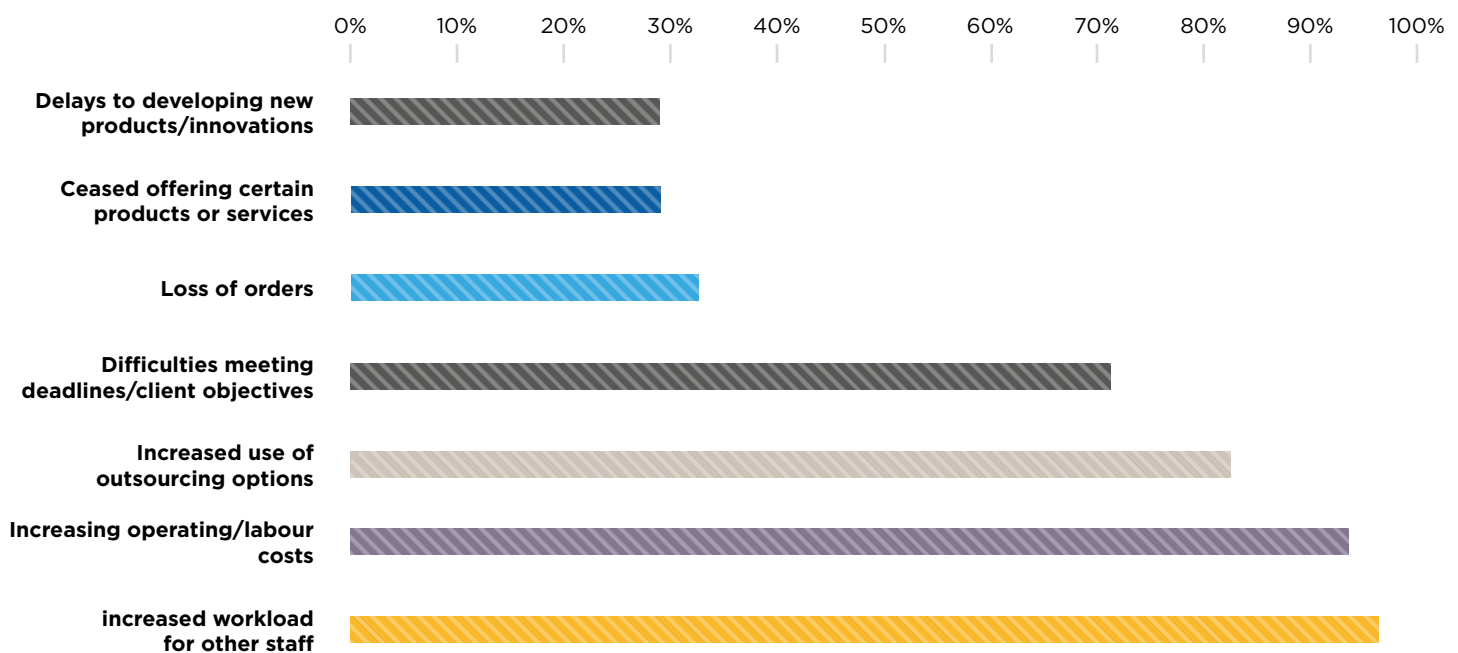
IMPACT OF THESE SHORTAGES

The skills shortage debate is framed around what could be the potential impact for the industry around the delivery of stock to the end user. Evidence from the survey suggests that there are real and ongoing consequences that they have already been directly impacted on respondents and their businesses. When asked about what impacts they had experienced as a direct consequence of these shortages in the past year, respondents cited multiple factors.

The highest ranking impacts that have been noted by our respondents are a *greater workload placed on their existing staff* (96%) *increasing operating/labour costs* (92%) and over 80% indicating that this has led to an *increase in the use of outsourcing options* over the past 12 months.



IN THE PAST YEAR WE HAVE EXPERIENCED THE FOLLOWING AS A DIRECT RESULT OF SKILL SHORTAGES



The increased workload for existing staff has in turn led to problems in resourcing existing work, with just over 70% stating that they had experienced difficulties in meeting deadlines or client objectives. The more extreme consequence of this has been lost orders - around one-third of respondents believing that this had been the case for them.

In addition, just over a quarter stated that shortages had led to delays to developing new products/innovations and a similar proportion stated that they had ceased offering certain products or services because of this shortage.

Although it is difficult to assess the exact outcome to the delivery pipeline of new stock, it is of concern that if these shortages are not sufficiently addressed and resolved, there would be more consequences to follow. For example, restricted innovation across the delivery and operation of data centre space may in turn lead to a limited ability for service providers to deliver new services to a client base and therefore competitiveness.

One beneficiary of the design build and operational skills shortage may be the outsourced infrastructure services market. Outsourcing could continue to prove to be more attractive as the ability to recruit in a limited specialised labour pool becomes more expensive and time consuming for end-users looking to build their own facilities. Selected end users may see this as further hassle they don't need as well as less economical and consequently an externally managed solution becomes more attractive.

Of course, service providers could also be impacted by inflationary pressures on workforces, combined with a slowing supply pipeline in certain markets and expected growth in demand levels. Whilst these providers are arguably more able to absorb these cost rises than most sub-enterprise level end users, the likelihood is that they will in turn be passed on to the end user leading to price rises across the market. This may become more important at a localised level as the balance between supply/demand and pricing becomes more sensitive particularly in more tertiary markets that are less mature than traditional Tier 1.

THE WIDER CONTEXT

The challenge for the sector is set within the context of widescale shortages of Science, Technology, Engineering and Mathematics (STEM) candidates across Europe as a whole. EngineeringUK estimated recently that the annual shortfall in engineering graduates and technicians to fill core engineering roles was up to 59,000 in the UK alone, a trend reflected to differing degrees across Europe.

The continuing challenge for the data centre industry is that it must compete against other technical industries to secure the skilled staff it requires. Indeed, competition comes from other markets that may be more mature, offer better salary prospects as well as more obvious career advancement. When asked, the majority of DEC respondents agreed that this is the case with over 60% expressing their agreement in the strongest possible terms.

ROUTE TO INDUSTRY

Understanding how the current workforce found their way into the industry may help to identify areas that can be addressed in order to either simplify the training and employment routes or at least provide some career definition to those looking at the industry as part of their career path.

Providing and operating the physical infrastructure and services that underpin the data centre industry calls for an increasingly complex set of engineering skills. This requirement for a knowledgeable workforce across differing skillsets is reflected in the number of routes that our DEC respondents have highlighted that have allowed them to join the industry.

The sophisticated needs of our evolving industry mean that it needs to attract an educated workforce. Around two-thirds of our respondents reported that they hold some form of degree or equivalent qualification in a related field such as engineering, quantity surveying or construction management. A more traditional route into the industry via an apprenticeship scheme, has also proven relatively popular, with over a quarter having followed this route. It should also be noted that a significant proportion of these - around two-fifths - have also achieved further educational qualifications.



ONGOING EDUCATION

As the industry moves forward, it is important that those within the industry continue to evolve their own skill sets to ensure that they are kept abreast of the latest processes, procedures and products and can respond to evolving industry developments. To that end, several professional organisations run a variety of programmes with suitable accreditation courses and programmes of continuing professional development.

We asked our respondents to cite the professional bodies they have utilised for professional development over the past year. Amongst the most highly cited organisations for UK based respondents are the British Computer Society Chartered Institute for IT, the Engineering Council, Uptime Institute, Institution of Engineering and Technology and the Chartered Association of Building Engineers. Non-UK organisations mentioned include Engineers Ireland, Federation Europeene d'Associations Nationales d'Ingenieurs and the European Association for Building Surveyors and Construction Experts.

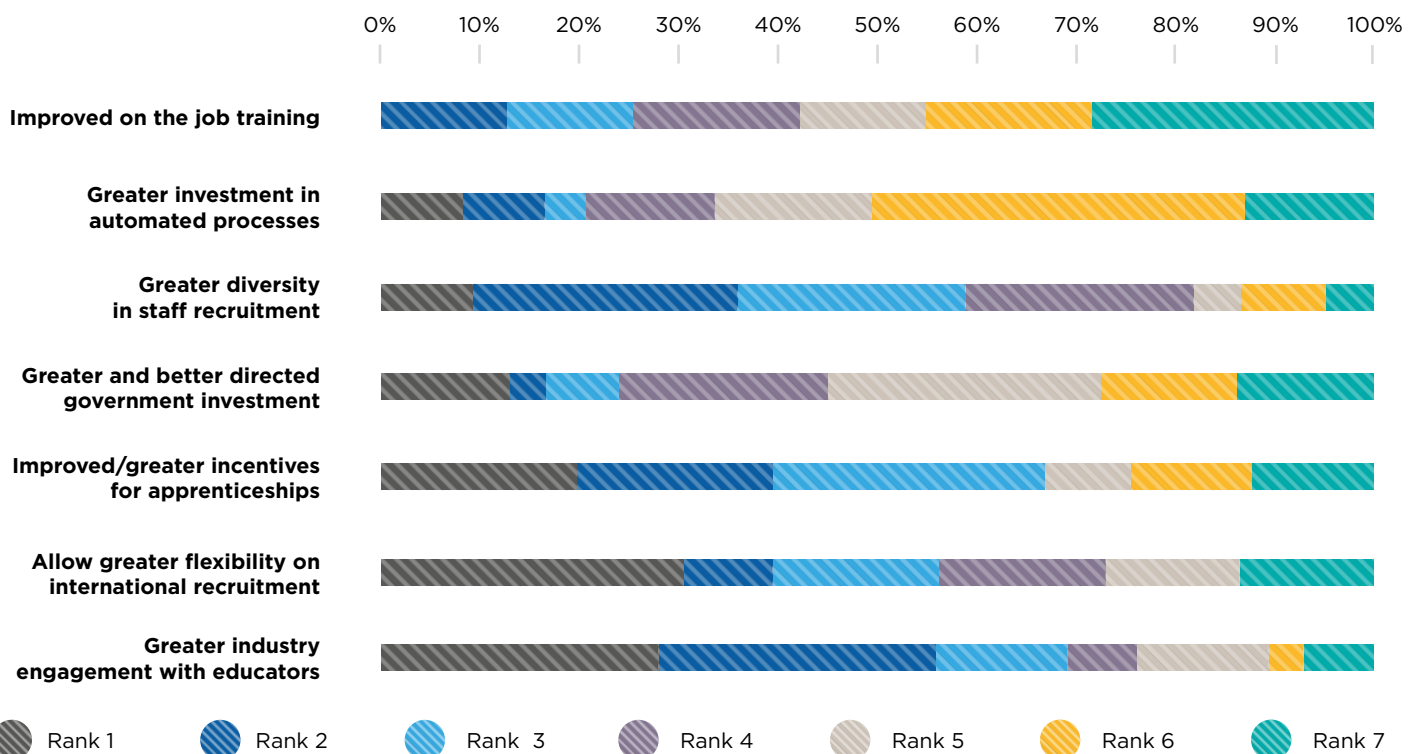
POTENTIAL SOLUTIONS

We asked our respondents to rank a series of proposed areas in which they would like to see further action that could help ease these skills shortages. The most highly rated was greater industry engagement with educators. To some extent, this is already happening with several examples of joint initiatives where enterprise providers or users of data centres are teaming up with educational providers. The primary aim of this has been to build local skills base utilising either resource or financial support from the service provider.

Google for example, have in recent years funded grants in Finland, Belgium, Ireland and Netherlands – the sites of their European data centres - to encourage curriculum initiatives as well as educational support through teaching collaborations at local colleges. The ongoing challenge for educational establishments is that their offering to students is as up to date as possible which suggests greater engagement with the industry to aid that process.

Allowing greater flexibility of international recruitment is also one of the top ranked factors. The ability of industry to address skill shortages by looking to different markets for candidates to fill those gaps has long been the mainstay of economic migration. It may be that the ongoing debate around Britain's proposed exit from the European Union has contributed to the high ranking assigned to this given the topics position at the forefront of political debate during the survey period.

PLEASE RANK THE AREAS WHICH YOU BELIEVE NEED TO BE ADDRESSED TO HELP RESOLVE CURRENT SKILL SHORTAGES ACROSS THE INDUSTRY AND INDEED IN THE CONSTRUCTION, ENGINEERING AND DESIGN INDUSTRIES AS A WHOLE



A significant proportion of our respondents also want to encourage further support for the provision of apprenticeships via improved/greater incentives with one-in-five rating it as their top ranked factor. The industry needs to remain as attractive to a new workforce and offerings available need to be competitive in order to attract the best candidates down this route. Respondents have also indicated that they would like further emphasis given to encouraging a *greater diversity in staff recruitment*; a third ranking it as one of their top two ranked factors.

Interestingly, further help for the industry via *greater and better directed government investment* was cited as the top ranked factor by just over 10% of respondents, indicating that this is viewed as a supplementary solution rather than a primary driver by our respondents.

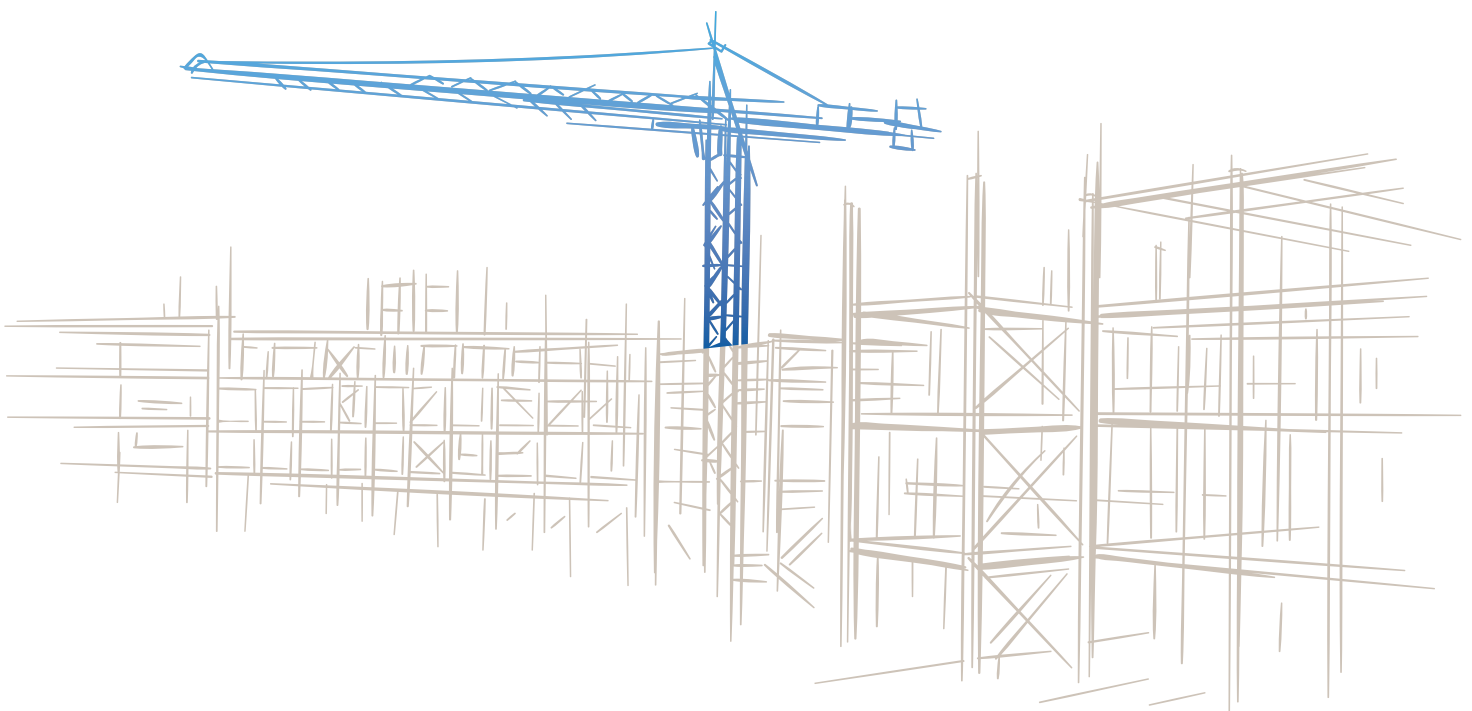
Also, ranked relatively low as an antidote is *greater investment in automated processes* with just 8% choosing it as a top factor to address the current skills shortages. However, when questioned regarding automation providing a solution over the longer term there is a much stronger belief from our respondents. Almost four-fifths agreed with this sentiment, whilst much of the balance expressed a neutral viewpoint and only 2% disagreed.

WE BELIEVE THAT GREATER ADOPTION OF FURTHER AUTOMATED PROCESSES WILL HELP ADDRESS SKILLS SHORTAGES OVER THE LONGER TERM



-  Strongly Agree
-  Agree
-  Neither Agree nor Disagree
-  Disagree
-  Strongly Disagree

Overall the responses suggest that industry practitioners recognise that no single solution will address the skills gap problem, moreover what is needed is a combination of approaches and initiatives in collaboration with industry bodies and educational establishments. There is little doubt that competition from other sectors for skilled engineers is strong and given the ongoing European wide concerns about STEM student shortages, the data centre industry must continue to invest in its future workforce.



IMPROVED BASE OFFERING ON SECURITY PROTOCOLS

Further evidence that the industry has ongoing concerns about potential cyber threats and is committed to raising standards to combat them is provided by our latest survey. For the fourth survey in a row, around three-fifths of respondents agreed that operators are under pressure to provide improved security protocols as a base level, a third of which expressed their agreement in the strongest terms.

AS CYBER-SECURITY CONCERNS INCREASE, DATA CENTRE OPERATORS ARE UNDER INCREASING PRESSURE TO RAISE SECURITY PROTOCOLS AT THE DCIM AND BMS LEVELS, AS A BASE OFFERING.



The highest degree of agreement comes from the service providers, with 74% of colocation operators, integrators, carriers and cloud providers in agreement. In contrast, our end users appear to be more ambivalent towards the statement with around three-quarters choosing to neither agree nor disagree. This is now the fourth survey in a row that similar results have been seen.

Arguably these end users would be the group that benefits from this approach given that it allows a bespoke solution to be delivered, aiding a more flexible product and contracting process. It may be that the corporate sector may not be taking this potential benefit fully on board yet.

POWER CONSUMPTION UNLIKELY TO DIMINISH

According to observers, data centres account for about 2% of worldwide electricity consumption. However, according to a study by Anders Andrae, who researches sustainable information and communications technology for Huawei Technologies, that could rise to 8% by 2030.

The ongoing challenge for the data centre industry is the sourcing and usage of sustainable power, with little sign of demand slowing down. Just over three-quarters of surveyed professionals expect their levels of consumption to rise over the next three years, a proportion marginally above the long-term tracked average. Over a third expect this rise to be significant. A further 14% expect their levels of consumption to remain static over the period whilst fewer than 10% are expecting to see a reduction.

OVER THE NEXT THREE YEARS, WE EXPECT OUR DATA CENTRE POWER CONSUMPTION TO



There is a marked difference between industry sectors in terms of the degree of uplift expected. For example, nine-out-of-ten colocation operator respondents expect to see a rise in their power usage whilst only two-thirds of end users do. For the third successive quarter, all our developer and investor respondents reported an expected rise in power consumption.

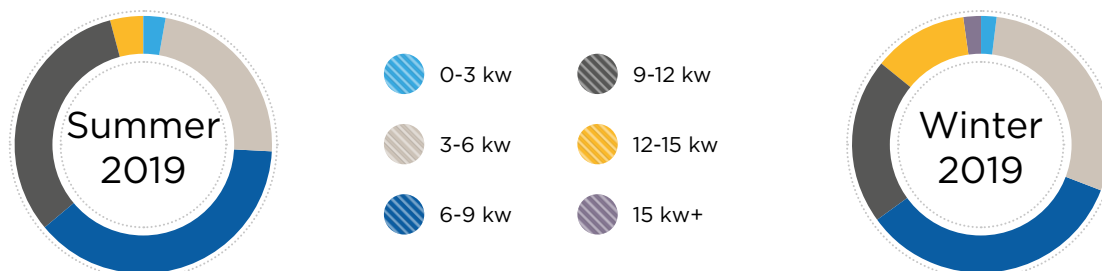
As a result of this expected growth in usage the challenge for the data centre industry is to ensure that it continues to pursue the goal of maximising facility efficiencies, reducing PUE, whilst ensuring that sourcing of power is as sustainable as possible to ensure that the industry plays its part in avoiding climate catastrophe.

AVERAGE RACK POWER/COOLING LEVELS TO RISE?

Around a third of respondents expect to see an average rack power/cooling level of 6kw-9kw over the coming 12 months, a fall on the 38% who reported the same six months ago. In addition, some 30% expect to see an average rack power/cooling level of 3kw-6kw over the course of the coming 12 months, up from the 22% who reported the same range in our preceding survey. In addition, once again only a small proportion of our respondents - around 2% - reported that they would see a level higher than 15 kw per rack.

Amongst our corporate respondents, around half are expecting to see average rack power/cooling level of 3kw-6kw by the end of next year whilst a further 40% suggest their average levels will be in the 6kw-9kw range.

WHAT IS YOUR EXPECTATIONS FOR YOUR AVERAGE RACK POWER /COOLING LEVEL IBY THE END OF THE YEAR

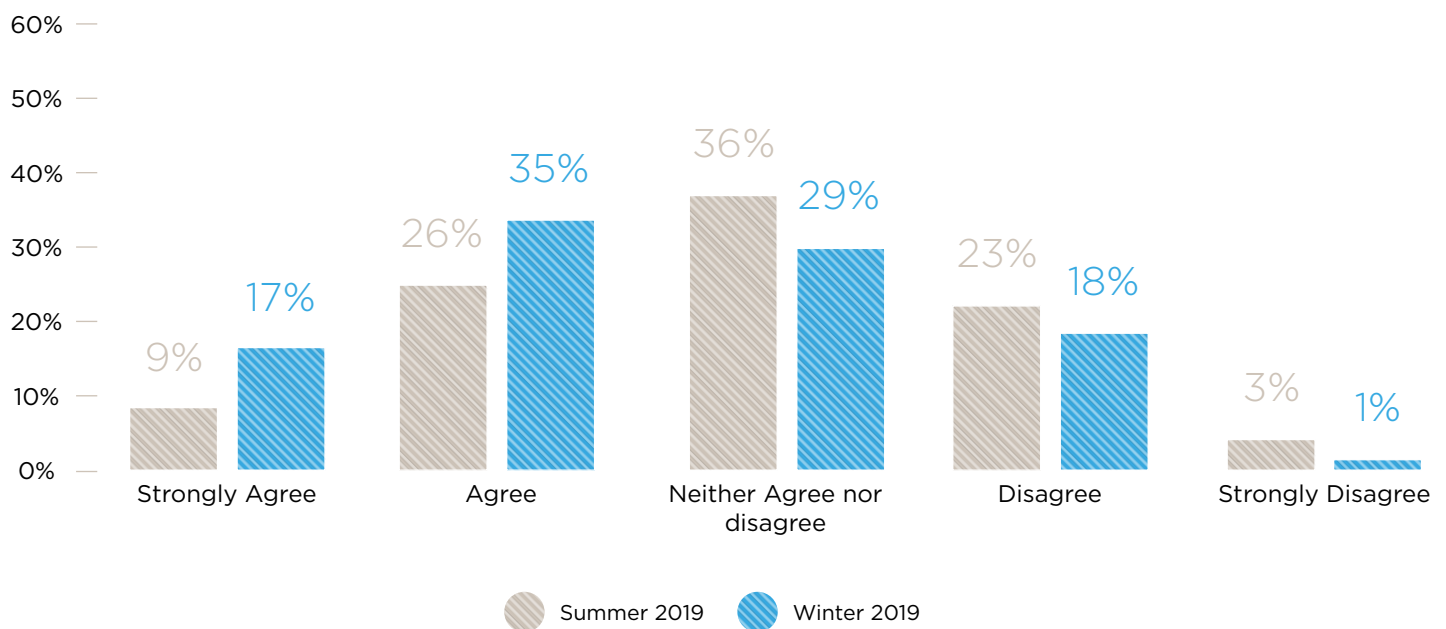


INFLATIONARY PRESSURES MORE PROBLEMATIC

Six months ago, around a third of our respondents identified inflationary pressure on the cost of raw materials in Europe as a potential threat to the data centre build process. Results from the latest survey suggest that this has risen to 52%.

When responses from real estate developers, investors, design/engineering and construction professionals are analysed, this proportion is much higher. Given that these sectors are those most directly involved in the process, a substantial rise from 50% last time to around two-thirds now is concerning.

INFLATION IMPACTING EUROPEAN RAW MATERIALS



“EDGE” DATA CENTRES – DRIVING FORWARD

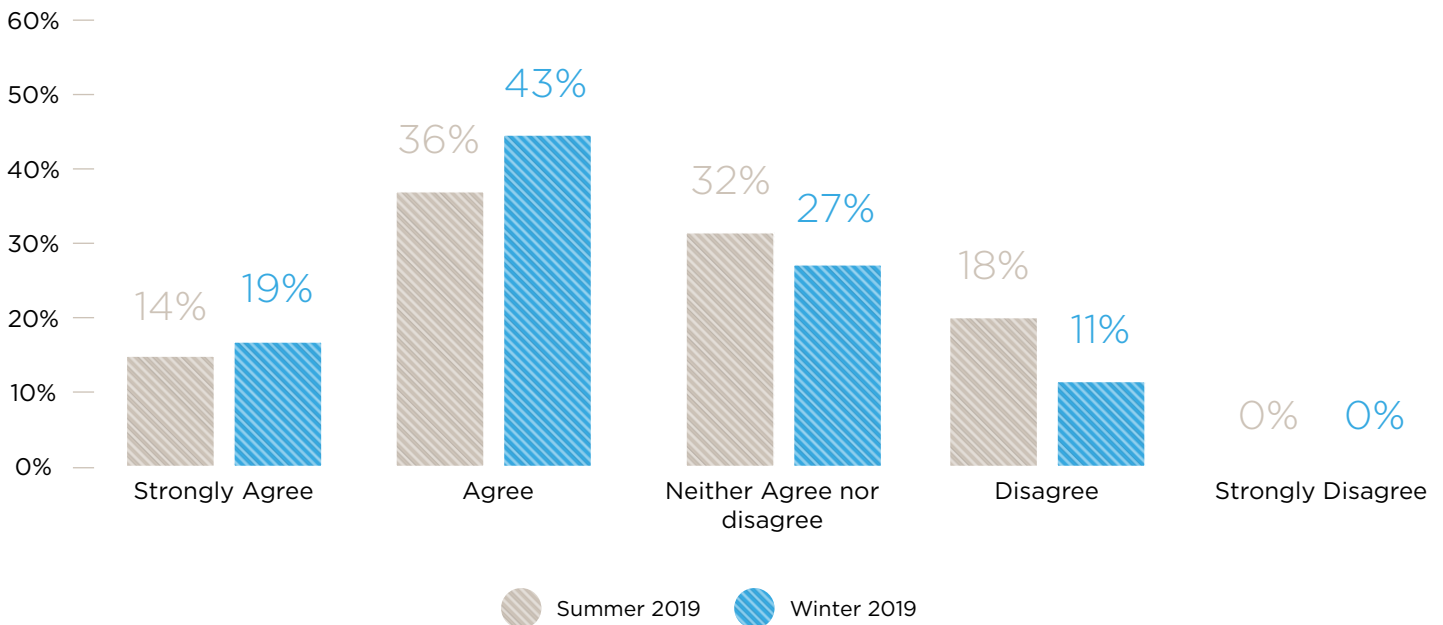
The introduction of 5G networks is providing the backdrop against which the debate around the proliferation of edge computing and edge data centres is growing. Whilst 5G is still perceived as an evolving network technology - with perhaps only Switzerland and South Korea considered as having comprehensive coverage to date - the push of 5G will undoubtedly have a significant effect on European data centre growth.

Viewed as a major game changer, it is seen that 5G will catalyse a different type of infrastructure model - many smaller data centres that by necessity must be located within proximity to where the IT service is being delivered. These facilities will allow faster data processing, sharing of compute power and optimisation of workloads to ensure the needs of the network's users are met.

Given this context, an increasing number of our respondents believe that the demand for Edge data centres will be the strongest driver of new data centre development; our latest survey has seen a rise from around 50% six months ago to 62% of those in agreement. Indeed, this increase appears to have been largely driven by an uplift in those who express their assent in the strongest terms, up from 14% to 19%.

There are some marked differences amongst respondent groups. For example, whilst the survey indicates that 11% of overall respondents disagreed with the view that demand for edge computing will be the biggest driver of data centre development, amongst service providers this figure rose to 26% suggesting that this group of occupiers are less convinced.

DEMAND FOR “EDGE” DATA CENTRES WILL BE THE BIGGEST DRIVER OF NEW DATA CENTRES, DRIVEN BY THE NEED FOR POWERFUL, LOW-LATENCY COMPUTING TO BE CLOSER TO THE END USER

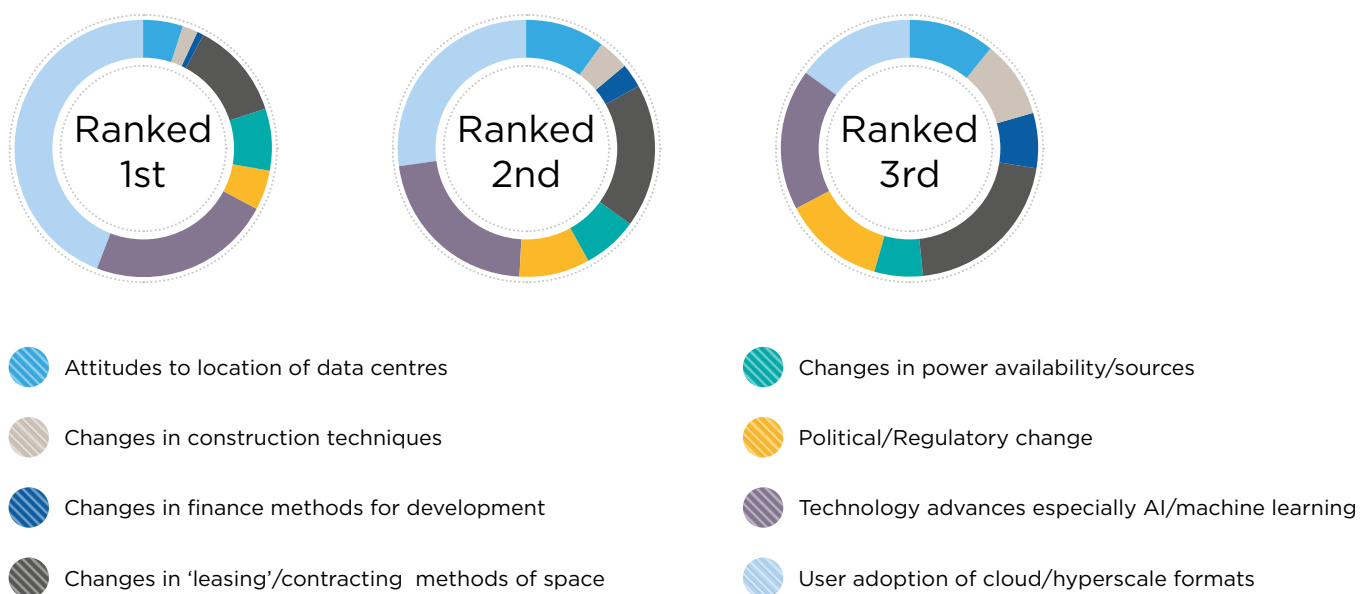


CLOUD DRIVING THE NEXT DECADE

Looking forward, our survey asked respondent's views on the most significant drivers of change in the data centre industry in the next decade. *User adoption of cloud/hyperscale formats* continues to be the most highly ranked influence, with 44% of respondents choosing it above others. This is unsurprising, given the current importance that demand for cloud services represents for the industry; a trend that shows no sign of abatement.

Also highly rated is *technology advances especially AI/machine learning* with almost a quarter citing it as their top ranked factor. The impact of this on the data centre industry is likely to be two-fold. First, there will undoubtedly be a continuation in the general increase in space demands from the sheer growth of data storage, analysis and output for advanced IT solutions and in particular the Internet of Things.

IN YOUR OPINION WHAT IS ARE THE 3 MOST SIGNIFICANT CHANGES THAT YOU BELIEVE WILL BENEFIT THE DATA CENTRE INDUSTRY OVER THE COMING 10 YEARS.



Second, the technical advances AI and machine learning will offer in the operational aspect of data centres should help push efficiency ratings of the sector and help offset environmental impacts of the growing industry. Indeed, around two-thirds of respondents are confident that data centres will utilise technologies such as AI to simplify operations and drive efficiency over the next three years.

Amongst our respondent groups, those who have an active role in running data centres showed a strong expectation that the introduction of such technology will be widespread with 65% agreeing.

For end users, where day-to-day exposure to the operational side of technical facilities is less, the issue is ranked less highly, with only half of end user respondents in agreement, and the remainder adopting a neutral view. These totals reflect a marginal decline over the past six months and may suggest that this group of respondents are not as yet fully convinced of the potential benefits that the advancements of AI can bring to the data centre environment.

Other factors which are cited as important include *changes in leasing and contracting methods* suggesting that the market continues to look to support more flexible contractual approaches to the delivery of services. The development of different contractual models in recent years to include more “pay as you go/pay for what you use” systems has been significant and future evolution appears to be inevitable as providers seek to attract occupiers in a competitive market.

Other factors such as those related to the build-out of the data centre, for instance *changes in construction techniques, changes in finance methods for development*, appear to be further down the list of our respondents rankings of importance.

IN THE NEXT 3 YEARS, DATA CENTRES WILL TURN TO INTELLIGENT SYSTEMS AND MACHINE LEARNING TO SIMPLIFY OPERATIONS AND ENABLE MORE PREDICTIVE AND EFFICIENT SERVICE AND MAINTENANCE



MEET THE EXPERTS

If you would like to hear more, please get in touch.



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