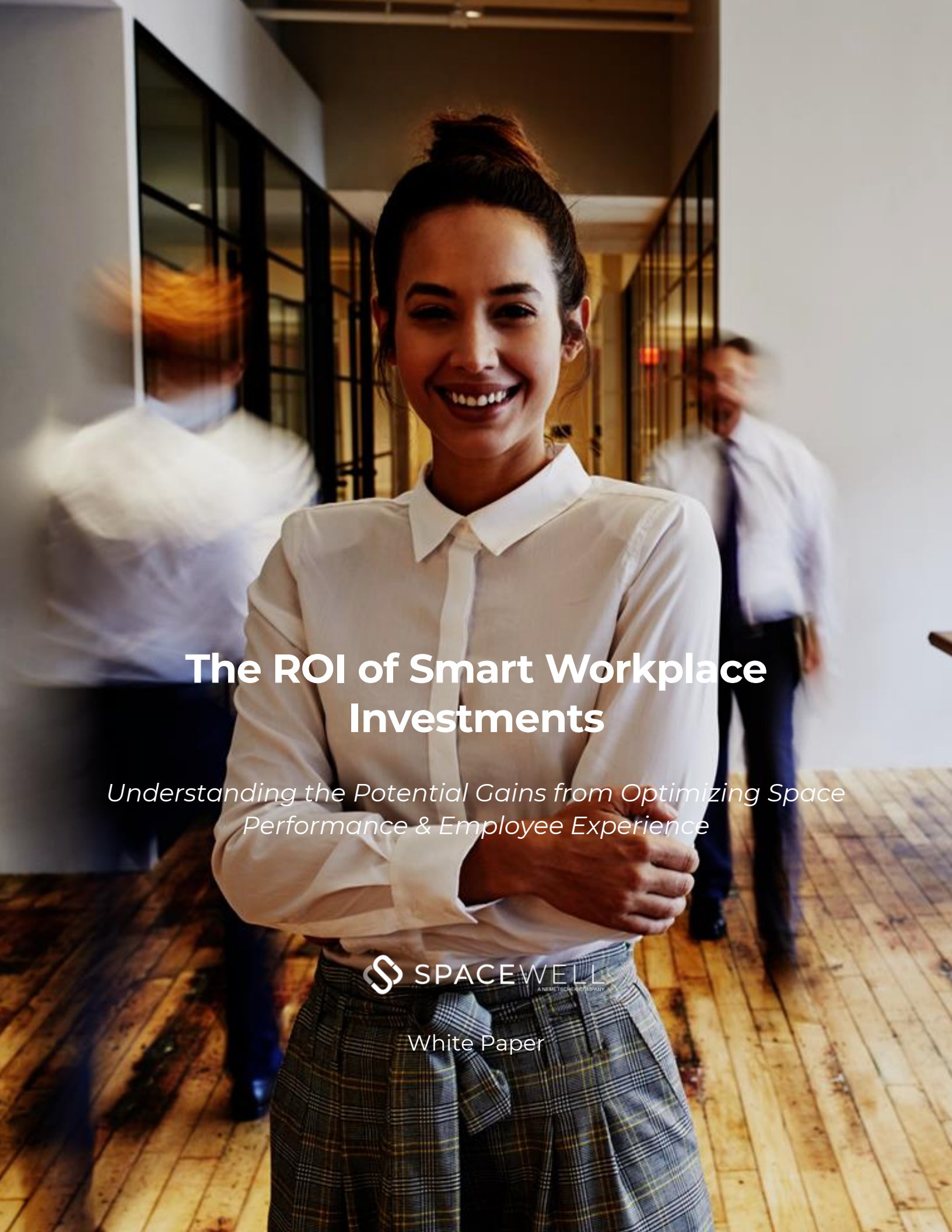


The ROI of Smart Workplace Investments

Understanding the Potential Gains from Optimizing Space Performance & Employee Experience

SPACEWELL
A NEMETSCHEK COMPANY

White Paper

Contents

Executive Summary

Companies aiming to improve their workplaces are juggling a large set of competing demands for investment to support both on-site and remote work. With so many new priorities, a natural question to ask when evaluating any new product is how the returns on that investment (ROI) compare to those of other potential products.

Smart workplace solutions, which encompass hardware and software solutions to optimize the physical workplace, streamline ways of working in the office, and create a positive workplace experience, have become increasingly cost-effective but can still represent a significant investment. Discussions of ROI for smart workplace technologies often stumble over the fact that the technologies have an extremely wide range of applications, not all of which will be relevant to every company, both because of differences in workplace cultures and existing technologies.

In order to help companies evaluating smart workplace solutions, this paper outlines the different ways companies can capture return on investment from sensor-based workplace technologies aimed at optimizing space and employee experience. It draws heavily on third-party research to explain both the source and size of potential returns and outlines different approaches to calculating returns so that potential investors have all of the necessary tools to estimate the potential gains for their own office spaces.

Space Optimization

Perhaps the largest and most visible source of ROI from smart workplace solutions is the return on space optimization: If a company is able to eliminate an entire floor or building by cutting down on unnecessary space, the savings on rent, utilities, and services are substantial and easy to quantify to stakeholders. The same is true for avoiding future real estate investments: finding ways to make the most out of an existing portfolio (even if it doesn't lead to space reductions) can help delay or reduce the amount of real estate required for expansion.

Space optimization falls into three types of approaches: footprint optimization focuses on managing the amount of space in aggregate, densification aims to optimize the amount of space per person, while optimizing the space mix ensures that the types of spaces provided actually align with the spaces employees need to support their work.

Optimizing the footprint of the workplace involves the comparison of the aggregated square footage of a location or portfolio to the actual need based on occupancy and utilization data. It takes place by aligning actual use of each type of workspace to best practice benchmarks, subject to adjustments based on industry or company characteristics. Additionally, when setting optimization targets, it is critical to consider peak or maximum occupancy alongside the more commonly cited averages. Workplace sensor technologies are crucial to this optimization approach, delivering the continuous reporting and level of granularity that enables data-driven decision making around when and how much space to add or release.

Densification refers to the reduction in the average amount of space per person by fitting more people into the same space. When done well, densification occurs without detracting from employee experience or productivity and may even result in a more varied workplace ecosystem as specialized spaces are added. The most well-known path to densification is the shift from individual, private offices to cubicles, bench seating, or other open-office desk arrangements. Another common path is to eliminate assigned seating altogether and reduce the desk-to-person ratio. In these densified environments, smart workplace solutions like sensors can help employees easily find and access the spaces they need by identifying which spaces are available in real time. The benefits of densification can take the form of space savings, but research has also linked densified environments to higher productivity and collaboration.

Space mix optimization refers to the reconfiguration of collaboration spaces like conference rooms or huddle rooms to align the size of the space with actual usage patterns. More generally, it captures the attempt to align demand and supply of space so that it is largely used at or near capacity. Space mix optimization takes place by measuring how often and how intensively a space is used over time, typically by means of headcount sensors, although other sensor and monitoring options exist. Actual measures are then compared to both occupancy and utilization benchmarks to evaluate the combined performance of each space, which can help identify which spaces are underperforming and, ideally, also to understand why.

Optimizing the Employee Experience

Employee experience reflects efforts to enhance employee engagement, with benefits in terms of retention and productivity. Although the employee or workplace experience is shaped by a wide range of factors, some estimates suggest that the physical and technological environment each contributes up to 30 percent of the overall employee experience.

Workplace research on flexible and agile spaces provides one approach towards understanding how technologies can enhance the employee experience, as these flexible work concepts rely heavily on technology to function smoothly. The types of productivity enhancements associated with workplace experience and enabled by smart workplace technology fall into several categories: purpose, autonomy, communication, and reputation.

Purpose describes the way in which technology helps employees find and access the spaces and tools they need to complete different types of tasks in the office. Additionally, purpose can also include the ability to match employees with spaces that fit their personalities or needs (such as difficulty concentrating in noisy environments or environmental preferences), separate from the actual tasks they are performing. Aligning space with purpose is one of the central tenets of activity-based working but is also the governing logic of other types of flexible work, including hybrid work.

Autonomy refers to the sense of efficacy that arises from employees' ability to choose their workspace in the office. In this view, productivity (along with benefits like talent retention) is not just enhanced by having well-designed spaces that support certain types of activities but is also the result of the feeling of empowerment and satisfaction that comes with choice. This positive feeling, in turn, results in greater performance.

The concept of communication captures both serendipitous encounters that can spark creativity along with day-to-day teamwork and sense of community. One of the key ways technology can enhance workplace connections is by making it easier to find colleagues as well as to facilitate densification.

Reputation encompasses both the ability of the corporate image to provide gains in terms of talent attraction and retention, as well as broader benefits in terms of morale. Having a high-performing workplace, which includes both space and technology, has been associated with a number of positive outcomes, including being perceived as more innovative and more likely to be recommended to others by current employees.

Finally, in addition to the four categories above that are associated with a high-performing flexible workplace, technology also serves as a powerful tool in terms of optimizing the work environment for performance on an ongoing basis. Specifically, the ability to monitor and analyze data about how employees interact with space is not limited to understanding what size conference rooms employees prefer, but it can also be used to gather systematic data on how employees respond to changes in fit-out. Thus, a final benefit of technology is its ability to enable active experimentation in the workplace.

Each broad class of workplace optimization can be illustrated through simplified use cases, but the reality is that calculations are likely to be far more complex in practice. A single company might be deploying solutions across multiple locations that all have different average rent, salaries, or employee numbers. Even within two sites owned by the same company in the same city, the outcomes could look quite different. We offer a three-step process that allows potential investors to estimate their potential gains:

1. Determine the optimization scenarios that apply for each part of your portfolio.
2. Gather relevant inputs for the organization, both from internal sources as well as publicly available resources such as benchmarking data.
3. Use those inputs to calculate either ROI or technology break-even estimates to guide decision-making, keeping in mind that the returns from different scenarios may not be perfectly additive.

What is a Smart Workplace?

Smart workplace technologies encompass a range of solutions aimed at optimizing the physical workplace, streamlining ways of working in the office, and creating a positive workplace experience. They range from IoT-enabled hardware like space and indoor air quality (IAQ) monitoring devices that can be used to generate management insights and automate workplace processes, to mobile apps and digital signage for a better workplace experience.[1] This solution space is even beginning to extend its reach beyond the traditional office to reflect interest in coworking and hybrid working.

While this diversification can be a boon to companies seeking tailored solutions to their emerging needs, it also complicates the technology selection and evaluation process. Are companies better off buying a single integrated solution, even if it means potentially locking themselves into that ecosystem? Should they choose special-purpose apps for each of their workplace needs and develop custom integrations that may require updating as new product releases are pushed out? Which use cases are business-critical, which are nice to have, and does any one solution support everything?

This paper is designed as a guide to understanding the potential returns around one subset of smart workplace technologies: software platforms that capture, process, analyze, and visualize space monitoring data. These technologies are designed to optimize two essential attributes of the workplace: space performance and employee experience, each of which can be further subdivided to reflect different optimization functions. While treated as discrete categories for the sake of clarity, in practice they are overlapping and changing one can affect the others.

In addition, depending on where a company is located on its workplace optimization journey, not every attribute is equally significant in terms of potential returns. As such, companies need to adjust their expectations and calculations of return on investment (ROI) to their unique circumstances. The goal of the paper is to give readers the information and tools to make those internal adjustments and evaluate how and to what extent these technologies might suit them.

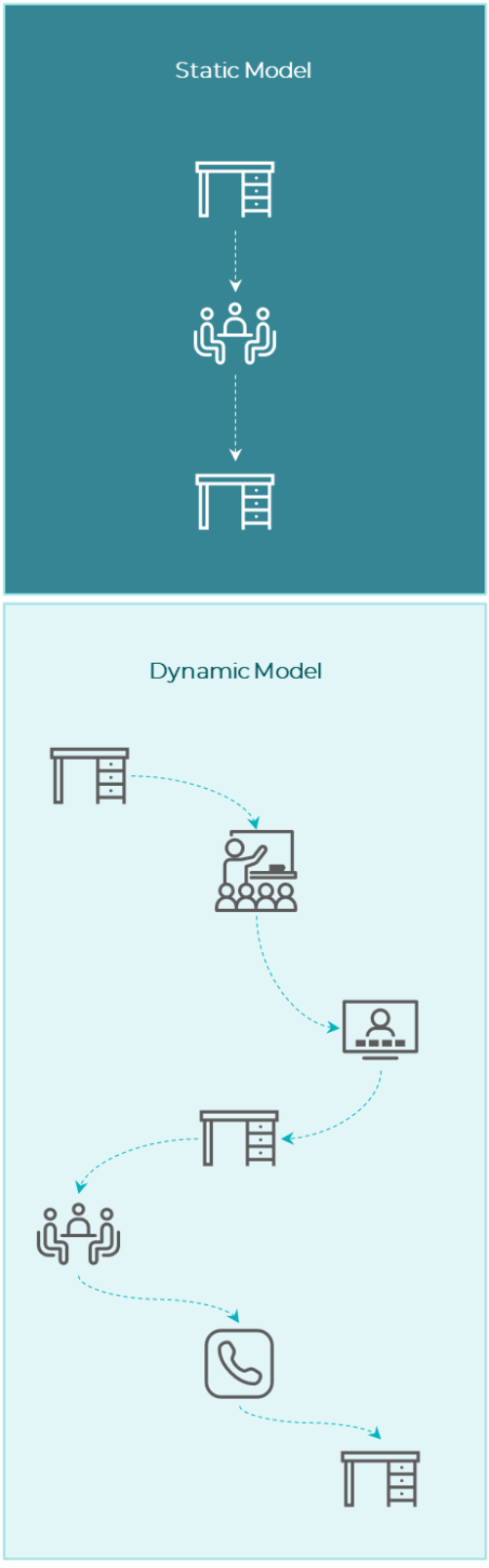
[1] For one industry definition of "smart workspace" see Gartner (2020).

Two Paths to ROI: Space & Experience

Companies aiming to improve their workplaces are juggling a large set of competing demands: more investment into health and wellness, more investment into reservations systems to support flexible or hybrid work, more investment into building analytics to help guide real estate strategy, and more investment into remote working tools like video conferencing equipment, all while responding to growing cybersecurity risk. With so many new priorities to add to existing needs, a natural question to ask when evaluating any new product is how the returns on that investment (ROI) compare to those of other potential products.

Smart workplace solutions have become more cost-effective over time as technology has improved and the price of sensors has fallen. The growth of Software as a Service (SaaS) business models in this space has also improved the value proposition of these products as clients get access to new features and improvements over time. Even so, these solutions can represent a significant investment that requires extensive internal approvals – not to mention substantial time commitments by real estate and IT teams that are evaluating different options.

This evaluation, however, is not easy. Discussions of ROI for smart workplace technologies often stumble over the fact that the technologies have an extremely wide range of applications, not all of which will be relevant to every company. For example, a sensor-based reservation system for workstations is essential in a workplace in which teams are frequently changed, employees regularly switch between different work areas, and the seat-to-employee ratio is low. However, if a company has stable teams that spend most of their day at individual workstations, and an office culture in which most people gravitate to the same desk every day, a simple reservation system without sensors might suffice.



Likewise, the ROI of a smart workplace investment will also vary based on what solutions a company already has in place. An integrated workplace management system (IWMS), for example, will represent a much greater value gain to a company switching from a mess of spreadsheets than one that is simply migrating from one IWMS to another. Likewise, a company switching from a wide range of different reservation apps across different locations to a single, global solution is fulfilling a different need than a company that is adopting a reservation system for the first time.

With these limitations in mind, this paper aims to spell out different categories of returns on smart workplace solutions, focusing on the insights gained from workplace sensors. It draws heavily on third-party research to estimate a range of outcomes returns so that potential investors can assess which scenarios fit their situation most closely. It should be noted that, beyond variations in use cases, outcomes will also be affected by a range of other factors, including location, employee salary and activities, as well as workplace concept. The cost of solutions, one of the components of ROI, will also vary substantially by the scope of the project and the choice of technology. Companies should therefore use this guide as a starting point to guide conversations as they develop tailored estimates.

We focus on two broad categories of returns on smart workplace solutions: space and employee experience. Each of these, in turn, is subdivided further to reflect different ways in which technology can prove beneficial. For space, we consider footprint, densification, and right-sizing. For employee experience, we focus on productivity and talent management. Most workplaces can expect to see benefits across multiple categories and sub-categories, but the precise combination can vary across time and location, which can make it challenging to calculate ROI. Rather than offer a simple formula for calculating returns on investment, we instead present the research and business case along with general approaches towards calculating returns that can be adapted on a case-by-case basis.

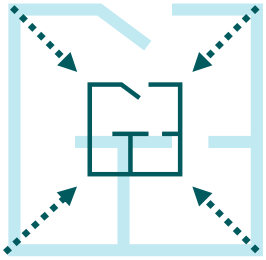
Optimizing Space Performance

Perhaps the largest and most visible source of ROI from smart workplace solutions is the return on space optimization: If a company is able to eliminate an entire floor or building by cutting down on unnecessary space, the savings on rent, utilities, and services are substantial and easy to quantify to stakeholders. The same is true for avoiding future real estate investments: finding ways to make the most out of an existing portfolio (even if it doesn't lead to space reductions) can help delay or reduce the amount of real estate required for expansion.

That said, space optimization can go well beyond managing the size of the footprint. Whereas footprint optimization focuses on managing the amount of space in aggregate, densification aims to optimize the amount of space per person. Finally, optimizing the space mix or stacking, can also ensure that the types of spaces provided actually align with the spaces employees need to support their work. All three approaches (optimization of footprint, density, and space mix) can result in significant returns, but they do not all result in the reduction in physical space.

Potential investors in smart workplace technologies need to carefully consider how each of these strategies aligns with their particular real estate portfolio as well as their optimization objectives as they assess the potential benefits of the investment. The potential for gains from optimization can be dependent on the state of the existing portfolio, ranging from factors like location, size, and primeness, which influence the size of savings, to factors like lease term or the ability to sublet, which determine when savings can actually be realized.

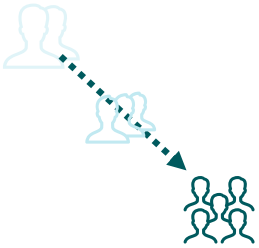
Footprint



Optimize the aggregate square footage by eliminating excess space

Objective: Reduce overall square footage (current of future)

Densification



Increase the number of people in a given space

Objective: Reduce square footage per person

Space Mix

Adjust the size and use of different spaces to align supply and demand

Objective: Increase usage of each space type

Footprint optimization

Optimizing the footprint of the workplace involves the comparison of the aggregated square footage of a location or portfolio to the actual need based on occupancy and utilization data. In most cases, it involves the identification and elimination of wasted space, meaning conference rooms that sit empty most of the time as well as workstations that are only used half of the time and could be consolidated through desk-sharing. This assessment often takes place in anticipation of a change in workplace concept, such as a shift from assigned desks to flexible seating or the implementation of expanded remote or hybrid work policies that could reduce the number of people in the office. It might also coincide with a change in office location or lease renegotiation, which would allow a company to immediately capitalize on any potential savings.

Broadly speaking, footprint optimization takes place by aligning actual use of each type of workspace to best practice benchmarks, subject to adjustments based on industry or company characteristics. For individual workstations or desks, a common benchmark is 70% average occupancy. This means that, on average, workstations should be occupied or in use approximately 70% of the working day within a given time frame. One corporate survey found that actual levels of occupancy across all spaces (not just workstations) in most industries fall between 49% and 68%,[2] suggesting substantial room for optimization.

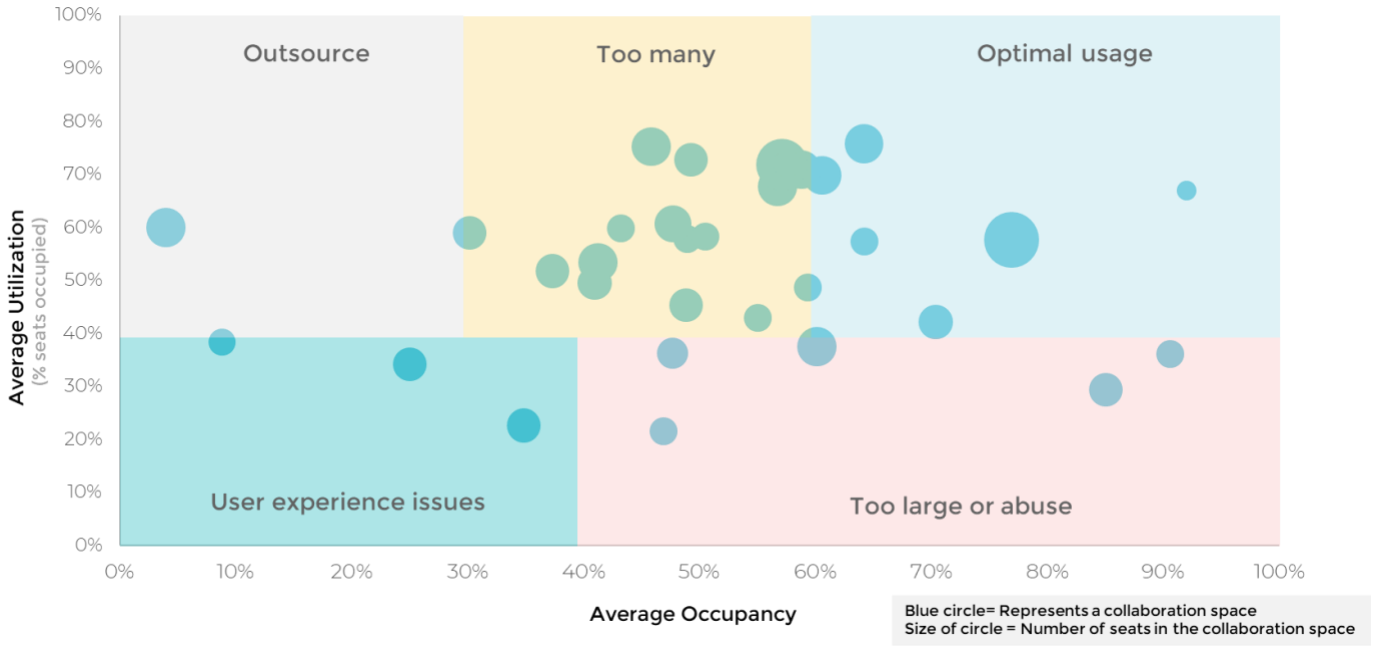
Here we should note that the best practice benchmark for collaboration spaces like conference rooms may be different from that for workstations. While benchmarks might change as a result of hybrid work practices, traditionally occupancy in collaboration spaces has been set at a somewhat lower target of 60%, partly reflecting the diversity of size and characteristics of collaboration spaces.

Additionally, when setting optimization targets, it is critical to consider peak or maximum occupancy alongside the more commonly cited averages. In addition to *average* occupancy, therefore, organizations should also seek to target *maximum* occupancy rates above 95% for workstations to ensure that they are not over-supplying space. In the case of collaboration spaces, a similar calculation should take into account utilization numbers, meaning the share of people in a space relative to its capacity (in other words, for group spaces it is important to consider both how often they are used and how many people are in each space). Focusing on utilization helps ensure that space planners can differentiate between conference rooms that are being used for group meetings rather than being misused as personal offices.

The balancing act involved in optimization is illustrated in the figure below: considering both occupancy and utilization, we can see optimizing for just one dimension could lead to sub-optimal outcomes overall. A space might always be occupied, while only being used by one or two people who are using a conference room as a personal office (which would place the room in the red zone in the following chart). Where spaces are rarely used but near capacity when in use (grey zone), such as training rooms or board rooms, it might be more efficient to rent off-site space for those gatherings. By examining both dimensions at the same time, we can identify both the problems and potential solutions.

[2] For regional and global distributions of common target and actual occupancy rates, see JLL (2020a). It is important to note that JLL's use of the terms "occupancy" and "utilization" differ from those in this paper and does not appear to separate metrics for individual and group spaces, which often have different targets.

Space Occupancy vs. Utilization



Source: Rudy Clonen, Global Strategic Advisor, Spacewell

Workplace sensor technologies are crucial to this dual optimization approach. While a growing number of companies are now monitoring space usage, surveys suggest that over 80% of organizations rely on badge swipe data, with visual observation being the second-most used source of information.[3] Both of these are potentially powerful tools that can often be readily applied, but they do have important limitations. Badge swipes might only capture entry into a building or floor or (if used at the room level) might only measure the first participant in a meeting. If additional attendees fail to check in once the room is occupied, occupancy measures might be accurate, but the true headcount would be lost. Badge swipes are also unlikely to accurately reflect when users leave a room, missing out on information about whether the length of bookings aligns with actual usage. Visual observation is typically limited to randomized or scheduled spot checks and therefore is unable to capture true flows of people across spaces.[4]

Instead, various types of sensors (and increasingly also technologies like conference room video or WiFi networks) are able to continuously track patterns of usage to provide an accurate picture of both utilization and occupancy over time. These granular data can then be evaluated using big data analytics to determine whether space can be eliminated altogether or converted to a different use, potentially resulting in a reduction in office footprint, with surplus space being sublet or eliminated in future leases. Sensors can thus be used for the initial optimization and should be used on an ongoing basis to ensure that the behavioral changes that result from the changing office space do not require further interventions.

From a change management perspective, having objective, ongoing measures about space utilization is also important for responding to complaints about not being able to find rooms. Actual usage data can be used to verify reports, help direct users to alternative locations, and explain management decisions about what types of spaces are available, all parts of ongoing optimization activities.

[3] JLL (2020a)

[4] As Ramseur also notes, visual observation is also not a scalable solution or large organizations and JLL is embracing a sensor-based approach to portfolio management.

Footprint Optimization ROI Calculation

Although estimating the gains from footprint optimization is challenging, a natural point of departure for such a calculation would be to start with a comparison of average occupancy rates in one's own industry to optimized benchmarks. The difference represents a rough estimate of how many desks or conference rooms can be eliminated.

Here it is important to note that average occupancy is only a starting point – in practice, full optimization needs to also take into account maximum and spread of occupancy rates to ensure that there are no performance issues in practice. The following example, which focuses on average occupancy, serves solely as a rough guideline of savings potential.

Let us begin with a life science company located in a prime location in Boston with 300 employees. In its sector, the typical allocation of space per person in 2019 was 200 square feet,[5] so we assume a beginning footprint of 60,000 square feet.

The company currently has average occupancy levels typical for its industry, or 60%. If the use of workplace technologies allows the company to raise its average occupancy levels from 60% to the 70% best practice mark, it can potentially eliminate 10% of its space without impacting workplace performance, assuming that maximum occupancy was also below 90%.

In a prime location in Boston, the rent per square foot is $99,[6] so optimizing the footprint can result in overall savings of $594,000 per year in this example. This figure would need to be set against the cost of the technology used to evaluate actual occupancy and utilization data, but even at an exorbitant cost of $9.90 per square foot, such a project would break even in its first year.

While this represents a simplified calculation that would need to be modified for the specific characteristics of each company and location, it serves as a useful guidepost in evaluating potential returns on footprint optimization.

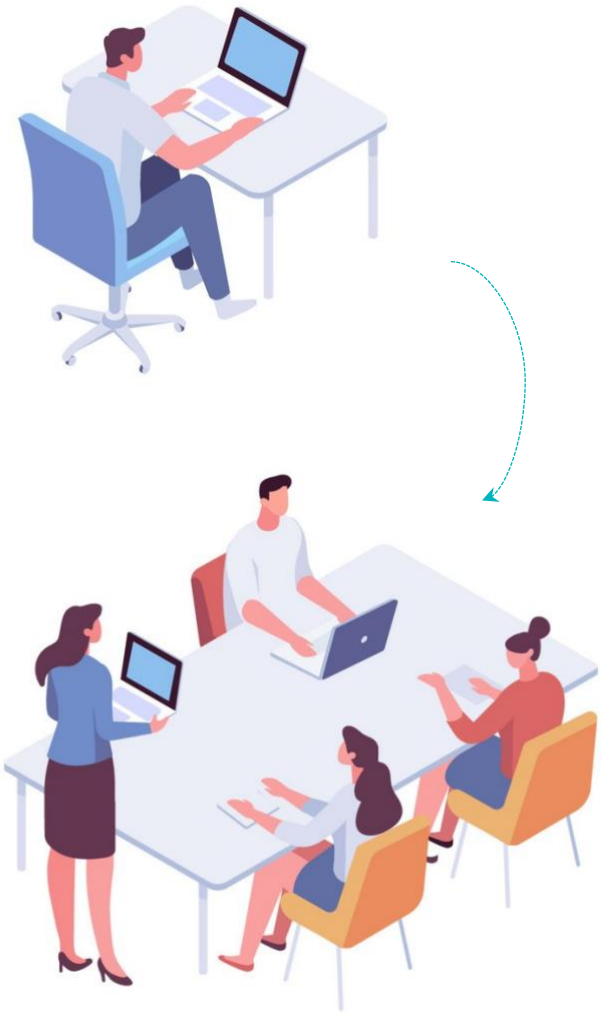
[5] JLL (2020b).

[6] For an estimate of rent per square foot based on location and primeness, see Cushman & Wakefield's Global Occupier Metrics, https://occupiermetrics.com/workplace-metrics/.

Densification

Densification refers to the reduction in the average amount of space per person by fitting more people into the same space. It is often a complement to footprint optimization, although it is not a precondition (or necessary consequence) for changing the office footprint. Although densification has acquired a negative association with cubicle farms, densification is not inherently a negative development. When done well, densification occurs without detracting from employee experience or productivity and may even result in a more varied workplace ecosystem as specialized spaces are added.

The most well-known path to densification is the shift from individual, private offices to cubicles, bench seating, or other open-office desk arrangements. Although widely maligned in popular culture and frequently accompanied by complaints about noise and distractions, this shift is often well-intentioned and is commonly accompanied by other design improvements.[7] One key objective of the transition to open seating is to encourage greater communication and teamwork, although some research questions the effectiveness of this strategy.[8] When done well, this type of densified environment also accounts for the need for privacy and focus by allocating some of the freed-up space to concentration spaces and phone booths. In this way, the workplace provides for a variety of spaces to accommodate different ways of working while also encouraging more interaction. In such an activity-based environment, smart workplace solutions like sensors can help employees easily find and access the spaces they need by easily identifying which spaces are available in real time.



[7] For a discussion of the widespread adoption of the cubicle in the modern workplace and its popular perception, see Saval (2014, Ch 6-7).

[8] As McElroy and Morrow note, there is research to support both sides of the argument that open-plan offices increase *as well as* decrease employee communication and satisfaction. One reason for the difficulty determining the precise effects of open-plan offices is that much of the research dates to earlier transitions from private offices to cubicles, whereas contemporary densification often consists of modifications to open-plan offices that reduce the space per person while also adding desirable office features like more natural light.

Another common path to densification is to eliminate assigned seating altogether. In this scenario, companies can reduce the desk-to-person ratio from the traditional 1:1 level down to as few as 0.6 desks per person.[9] This can be achieved without causing shortages when employees spend at least part of their time in other parts of the office (such as conference rooms) or away from the office (such as when they are making sales calls or, increasingly, when they work from home). While the potential savings are substantial, for a flexible seating arrangement to be successful – particularly when density levels are high – it is essential to have management buy-in as well as the right technology in place.

Floorplans showing occupancy of desks can help avoid wasted time and frustration spent searching for available seats.[10] Useful features also include the ability to find colleagues. For workplaces that use reservations for workstations (which can, however, limit the extent of densification), sensor or check-in data can also be used to automatically cancel bookings in the event of a no-show, a feature that is likely to become more important as companies embrace more flexible working.

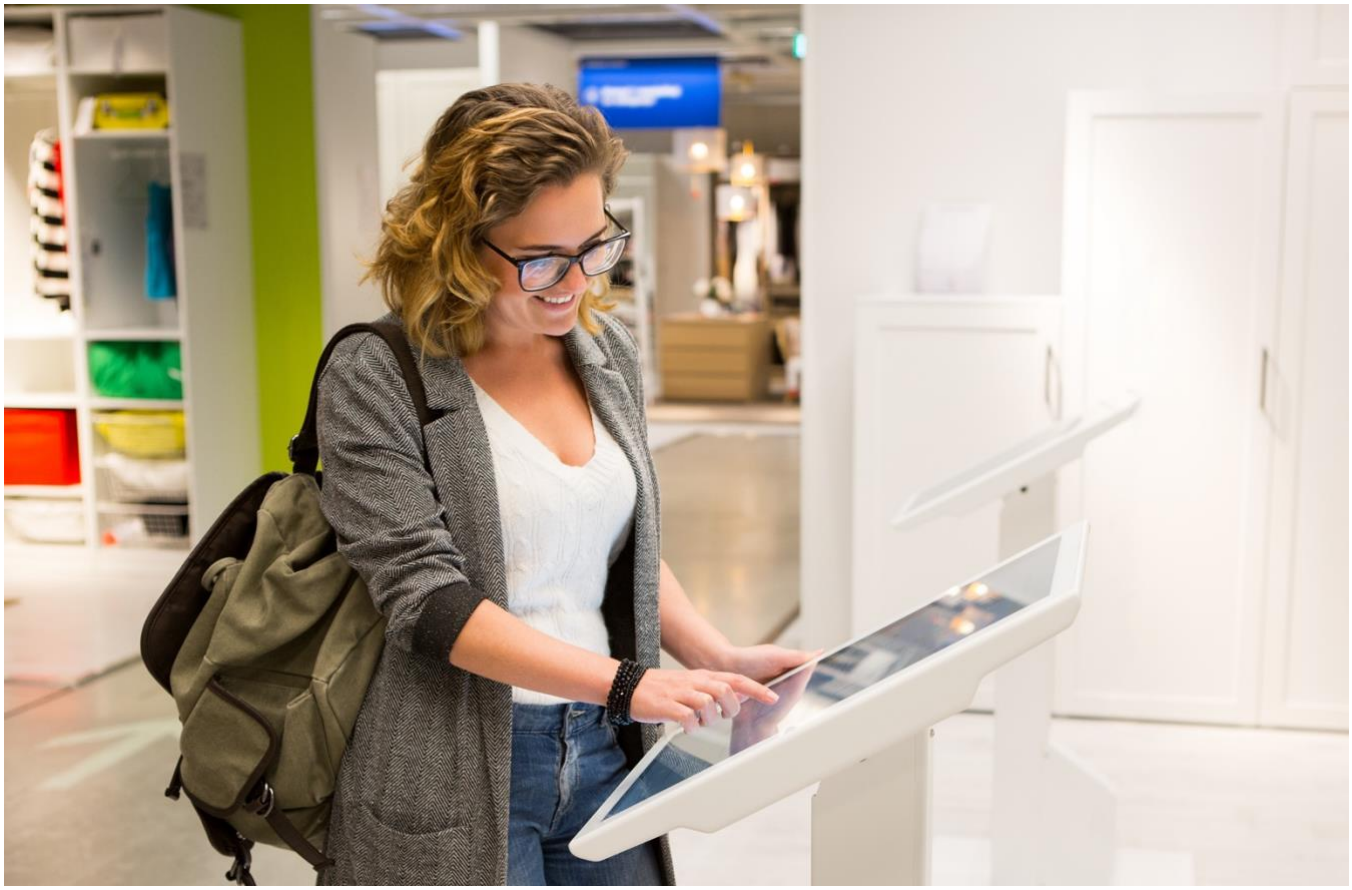
The benefits of these two approaches to densification take several forms. First, densification can lead to space savings (as well as fit-out cost savings) by reducing the number of desks that need to be maintained and equipped, either based on current usage or in anticipation of expansion needs. It must be kept in mind that these cost savings do need to be balanced against the need to invest in workplace technology, more collaboration spaces, and design improvements.

[9] See https://spacewell.com/resources/success-story/axa-smart-building/

[10] As noted by Rahaman et al., the failure to locate preferred seating not only loses time but can also produce other adverse outcomes like stress and reduced concentration. Similarly, survey results reveal that over-densifying such that workers are unable to find desks is negatively perceived and can also affect productivity by forcing employees to work in unsuitable areas like office cafeterias (van der Voort 2004).

Second, when densification involves a shift to more open seating with corresponding investment into noise remediation and modern design, it can be associated with higher levels of employee productivity, communication, innovation, and reputation. One natural experiment that compared employees in traditional cubicles to those who were moved to a modern, open-plan office found that, in addition to increasing workplace density by 14%, the change was associated with increased employee perception of organizational innovativeness and collaboration, along with greater satisfaction with co-workers.[11]

A survey of Australian office workers similarly found that employees in a flexi-desk environment reported more positive ratings in terms of overall building satisfaction and perceived productivity compared to fixed-desk employees in spite of a significant reduction in individual workspace.[12] One possible reason was that the densification associated with flexi-desking was accompanied by a substantial increase in the amount of collaboration spaces, a factor that likewise can contribute to increases in employee interaction.[13]



[11] It should be noted that the effects of the change were not strictly positive across the board, and factors like age played an important mediating role. McElroy and Morrow (2010).

[12] Kim et al. (2016)

[13] Hanc (2019)

Densification ROI Calculation

A rough calculation of the potential savings from densification starts with the current space allocation per person or per desk, compared to a target level. Those targets might vary across different offices based on business function or could be set according to benchmarks in different markets.

Tools like Cushman & Wakefield's *Global Occupier Metrics* calculator, for example, allows users to view local market best practices for net square feet per desk and is also able to estimate rent and cost per square foot based on primeness of location and quality of fit-out. Such tools allow occupiers to estimate both the potential rent savings from reducing the space per person as well as any necessary cost adjustments associated with fit-out improvements.

For example, assume a software company in Chicago with 100 employees currently allocates 150 square feet per desk in a location that represents the market average.

The company chooses to densify its offices to reach the 113 square feet per desk average. In this case, across all its employees, the company might expect to save up to 1,369 square feet.

It chooses to allocate 500 square feet of that saved space to new collaboration spaces as part of a strategy to encourage innovation and releases the remaining 869 square feet in its upcoming lease renegotiation.

The overall savings on rent in the market represent $19,987 per year, before taking into account the one-time fit-out costs from the redesign and any additional technological investments. Those additional costs, however, are at least partly offset by productivity improvements from the redesign, discussed in Chapter 2, "Experience."

Space Mix Optimization

Space mix optimization (or right-sizing), as used in this paper, refers to the reconfiguration of collaboration spaces like conference rooms or huddle rooms to align the size of the space with actual usage patterns. More generally, space mix optimization is the attempt to align demand and supply of space so that it is largely used at or near capacity. Space mix optimization is often pursued alongside both other space-saving approaches but may also be undertaken independently.

Notably, space mix optimization may result in a smaller office footprint, but it might also simply alter the space mix without affecting the size of the office. As a result, the savings from optimization can be more difficult to project than other space strategies.

Space mix optimization takes place by measuring how often and how intensively a space is used over time, typically by means of headcount sensors, although other sensor and monitoring options exist. Actual measures are then compared to both occupancy and utilization benchmarks to evaluate the combined performance of each space, which can help identify which spaces are underperforming and, ideally, also to understand why.

For example, conference rooms that are constantly in use but are occupied far below capacity could be an indicator of one of two problems: that employees are using conference rooms as private offices or that conference room capacity poorly reflects typical team size. In the former case, a solution would be to add more individual focus rooms for employees to use when they need privacy while the latter case might best be addressed by resizing or partitioning some of the conference rooms to accommodate smaller teams.

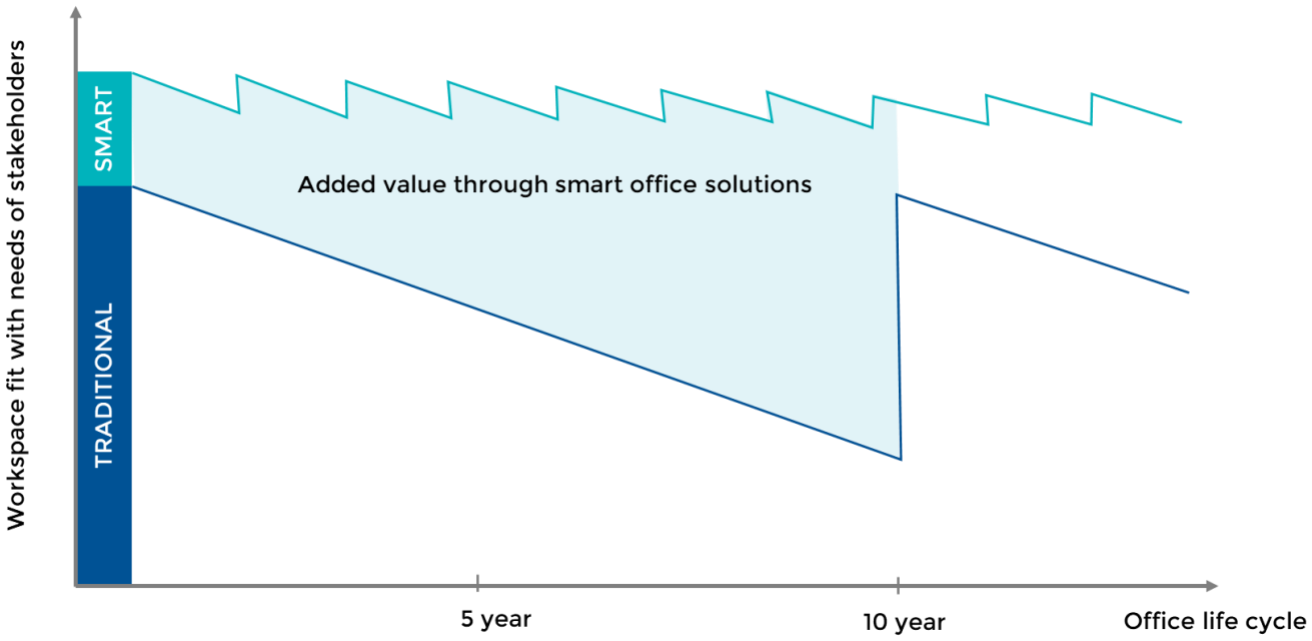
Conversely, if conference rooms are rarely used but are close to capacity when they are occupied, a natural next step is to analyze the purpose of those infrequent meetings. If rooms are only being used for quarterly all-hands meetings, for example, a company might be better off renting space in a nearby hotel for those quarterly events and giving up (through lease changes or subletting) their poorly used space.

While some degree of optimization is possible using user surveys and manual counting, these methods only capture information at a moment in time rather than on an ongoing basis. Manual optimization, therefore, is frequently a one-time or intermittent exercise. Sensors, on the other hand, are able to capture information about when and how long each space is being used, ensuring a more tailored work environment. As illustrated in the figure below, sensors allow for a better fit-out of the workspace from the beginning, and their added value increases over time.

In this smart workplace scenario, space mix optimization is approached as an ongoing, iterative process. When rooms are resized, added, or eliminated, those reconfigurations can result in unanticipated changes to employees' behavior. Employees who previously stayed at their desks for confidential calls instead of occupying conference rooms might gravitate towards newly added phone booths, revealing pent-up demand for different space types. In this case, the returns from space mix optimization might be reflected in productivity improvements as employees can match their space to their needs without searching for workarounds.

For a more detailed discussion of meeting employee space demands, see the following chapter on "Employee Experience."

Enabling Ongoing Optimization with Technology



Source: Rudy Clonen, Global Strategic Advisor, Spacewell

Employee Experience

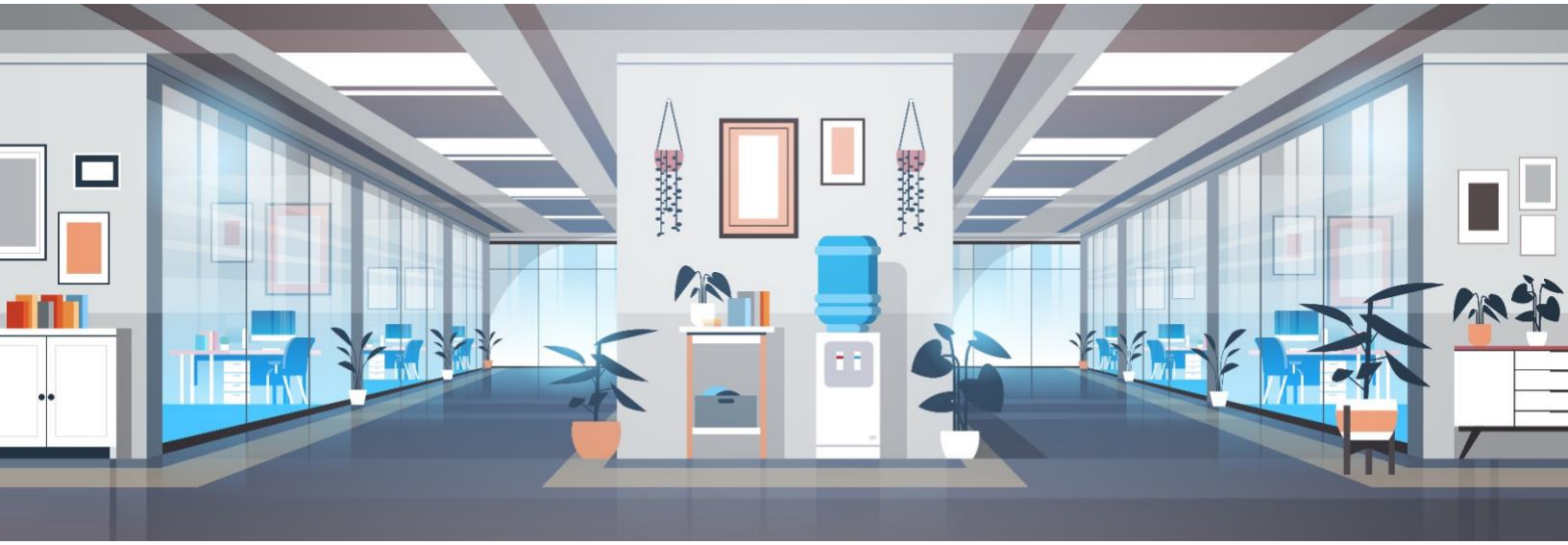
"Workplace Experience" has been a buzzword for some time, reflecting both alarmingly low levels of reported employee engagement, along with the potential benefits of high engagement in improving absenteeism, workplace safety, and work quality.[14] Although the employee or workplace experience is shaped by a wide range of factors, from work-life balance to diversity, some estimates suggest that the physical and technological environment each contributes up to 30 percent of the overall employee experience.[15] Investing in office design and the technological tools that help employees navigate features and amenities can therefore yield significant benefits.

Those benefits are particularly pronounced in knowledge industries where creativity, innovation, and intellectual engagement are huge drivers of value and where productivity is not always a direct reflection of time spent on a task. Leading technology companies like Google, Apple, and Facebook are famous for their corporate campuses and extensive amenities. By providing such rich working environments, these companies seek to offer their employees surroundings that motivate, foster creative "collisions" and collaboration, support different ways of working, and make it easy and attractive for employees to spend most of their time at the office.

For many such companies, workplace technologies operate in the background to help determine what's working, what could be improved, and to generally make things run more smoothly. While not all companies have the resources of a leading tech company, the power of workplace technologies to support employees applies even to those without a sprawling corporate campus. To justify such an investment, however, companies need to be able to communicate the potential ROI to internal stakeholders, which can often be a challenge.

This section draws on workplace research, particularly research focusing on flexible and agile spaces, to demonstrate how and – to the extent possible – how much enabling flexible office designs can enhance employee productivity. Smart workplace technologies are virtually essential to making such flexible concepts work smoothly, so at least some of those gains can be attributed to the technological investment, but it is important to note that smart workplace solutions can also yield returns in more traditional offices with assigned seating (although those returns are likely to look different).

The types of productivity enhancements associated with workplace experience and enabled by smart workplace technology fall into several categories: purpose, autonomy, communication, and reputation.



[14] Surveys suggest that only as few as one third of global employees are engaged with their organization. Gallup (2021)

[15] Morgan (2017)

Fit-for-Purpose Spaces

Purpose describes the way in which technology helps employees find and access the spaces and tools they need to complete different types of tasks in the office (this is also commonly described as an activity-based work environment, or ABW). Additionally, purpose can also include the ability to match employees with spaces that fit their personalities or needs (such as difficulty concentrating in noisy environments or environmental preferences), separate from the actual tasks they are performing. Aligning space with purpose is one of the central tenets of activity-based working but is also the governing logic of other types of flexible work, including hybrid work.

The fundamental idea behind purpose as a driver of value is that fit-for-purpose spaces allow each employee to be at their most productive throughout the day. Thus, taking a confidential call is easier in a quiet phone booth than in a crowded bullpen, while als o being more efficient than sitting alone in a conference room. Additionally, purpose-based technologies also assume that space needs are not constant over time, so assigning an employee to the right desk is not enough. Technologies thus need to be able to accommodate frequent changes and a wide range of space types.[16]

Survey data suggest that giving employees access to the right spaces can have a substantial impact on productivity. A recent survey of employers, for example, found that over sixty percent of U.S. respondents estimated that flexible choice of workspaces increased productivity by 20% or more.[17] Self-reporting by employees likewise suggests that as many as 1 in 5 experience productivity impacts from being able to access their preferred seating, in part because of the way different spaces affect communication patterns.[18]

Technology supports purposeful office design in two ways. From the end-user perspective, technologies like reservation apps help to match employees with spaces that meet their needs. Search tools can help users understand which spaces are available, what features exist in each space, and how to navigate to those spaces. Booking functionality allows users to make sure that they have access to the space in the moment or to plan ahead for their day. From the real estate manager's perspective, workplace technologies provide essential information about what spaces employees actually use so that they can optimize the space mix. Perhaps a building's focus rooms are booked back-to-back all day while large conference rooms sit empty, suggesting that there is a mismatch in the types of spaces being provided and what is actually needed.

[16] In fact, research suggests that one of the leading reasons why such designs fail is that there is insufficient diversity of distinctiveness of spaces (Becker 2004).

[17] IWG (2019)

[18] Rahaman et al. (2020)

Sense of Autonomy

Autonomy refers to the sense of efficacy that arises from employees' ability to choose their workspace in the office. In this view, productivity (along with benefits like talent retention) is not just enhanced by having well-designed spaces that support certain types of activities but is also the result of the feeling of empowerment and satisfaction that comes with choice. This positive feeling, in turn, results in greater performance.

The effects of autonomy are difficult to disentangle from purpose, but employee surveys do suggest that choice matters. One cross-sectional survey of 400 knowledge workers, for example, found statistical evidence suggesting that the effects of workspace operate indirectly through engagement and satisfaction.[19] Similarly, a survey of 20 Australian office buildings found that even building characteristics that were similar across flexible seating and fixed seating groups, such as indoor air quality and comfort, were perceived more positively by workers in flexible seating arrangements. In part, this may have been because employees could exercise their autonomy to choose specific spaces that suited their temperature or ergonomic preferences, which might otherwise be difficult if seating were assigned.[20] Even so, experiments testing the effects of disempowerment on the performance of office tasks found that it reduced feelings of psychological and physical comfort as well as organizational citizenship behavior, suggesting that at least a portion of the effect is psychological.[21]

The technological contribution to autonomy is much the same as in the case of purpose: it enables autonomy by making it easier for end users to understand the options and exercise a specific choice and it also supports managers in adapting the environment to reflect patterns of employee choices over time.

[19] Specifically, when both satisfaction and space were included in the estimation, the effects of the space itself disappeared, suggesting that engagement operates as a mediating variable. Olson (2015).

[20] Kim et al. (2016)

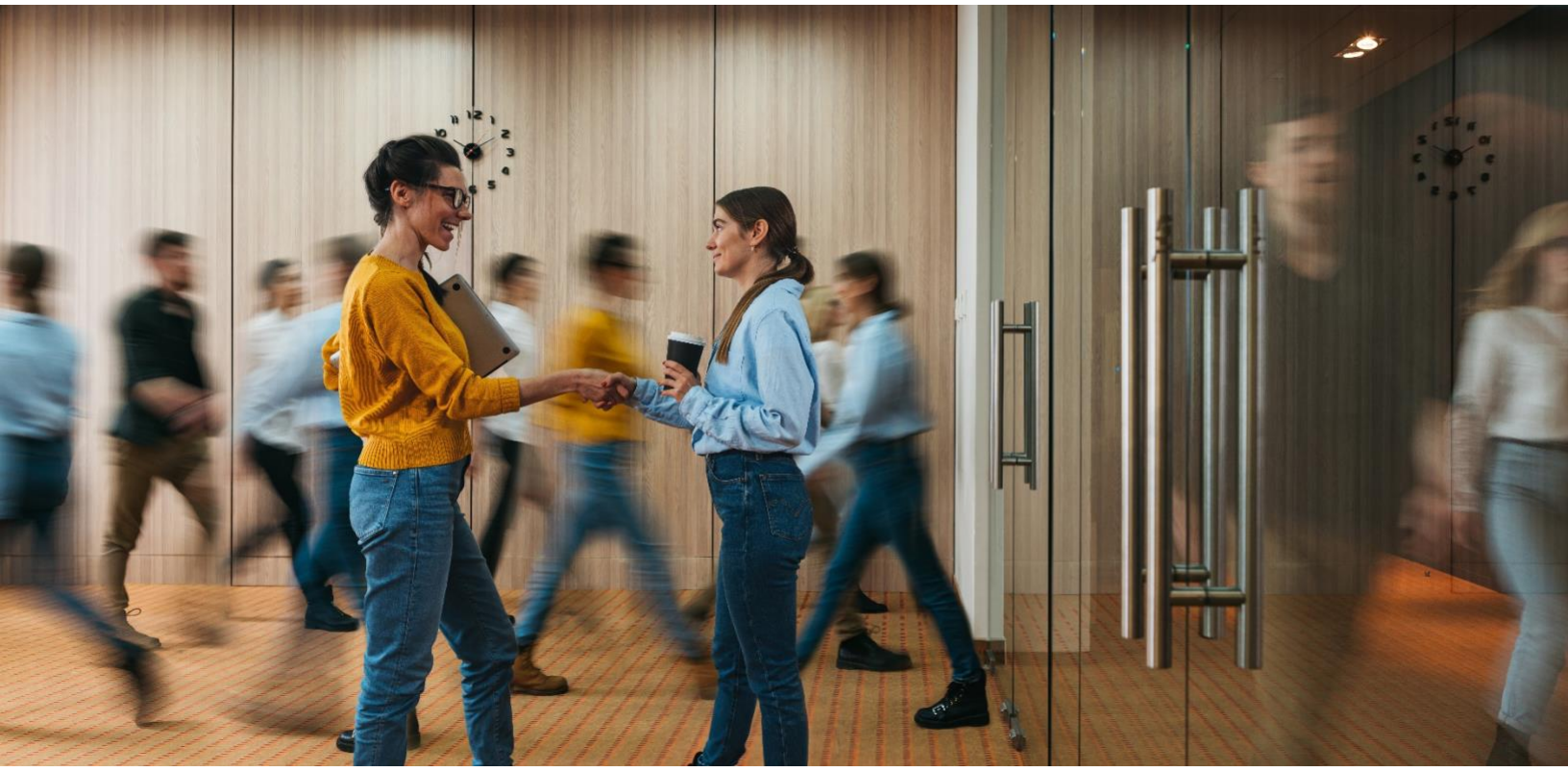
[21] Hanc (2019, p. 61)

Creative Communication

The concept of communication captures both serendipitous encounters that can spark creativity along with day-to-day teamwork and sense of community. In many respects, communication overlaps with purpose, as workspace choices are often chosen to reflect the need to exchange ideas or work in groups. However, communication can also be fostered separately from room configuration. Specifically, technology can enhance workplace connections by making it easier to find colleagues as well as to facilitate densification.[22]

Densification can be particularly influential in fostering communication given the importance of physical distance in the workplace. Research suggests that the probability of communication within an organization is closely tied to physical proximity, reaching an "end of regular communication" at just 50 meters. The negative effects of physical distance are especially severe for inspirational communication and, surprisingly, are not only limited to face-to-face communication but extend to other media types as well.[23] Using technology to reduce physical distance between team members can therefore have positive implications for teamwork and creativity across the organizations.

Elsewhere, sitting near other people has been found to improve coordination and foster a general awareness of what others are doing.[24] Field experiments even suggests that sitting in modern open office spaces rather than in more traditional, separated cubicles even enhances happiness with coworkers and overall commitment to the organization,[25] thus contributing to engagement and a sense of community. By facilitating densification without overcrowding (discussed in the previous chapter) and by providing easy ways for people to find each other across an office, workplace technologies thus have important benefits that are particularly pronounced in industries built on innovation and teamwork.



[22] Technology can also facilitate communication and lead to time savings in more mundane ways, from knowing how long it takes to get to your meeting room to knowing how long the line for the bathroom is.

[23] Allen and Henn (2007: 56, 58, 74)

[24] Allen and Henn (2007: 52)

[25] McElroy and Morrow (2010)

Reputational Benefits

Reputation encompasses both the ability of the corporate image to provide gains in terms of talent attraction and retention, as well as broader benefits in terms of morale. Having a high-performing workplace, which includes both space and technology, has been associated with a number of positive outcomes, including being perceived as more innovative and more likely to be recommended to others by current employees.[26] Other surveys have found that over 80% of businesses saw flexible working as part of their talent attraction and retention strategy in 2019, in large part because employees have signaled that it is an important factor in their choice of employer.[27] This number is likely to increase as employers seek to accommodate workers who are wary of returning to the office.

Such intangible factors are difficult to quantify in terms of ROI, but given the high cost of replacing employees, which studies have placed at 90-200% of an employee's annual salary,[28] improving talent retention can be an important factor in evaluating workplace technologies.

Finally, in addition to the four categories above that are associated with a high-performing flexible workplace, technology also serves as a powerful tool in terms of optimizing the work environment for performance on an ongoing basis. Specifically, the ability to monitor and analyze data about how employees interact with space is not limited to understanding what size conference rooms employees prefer, but it can also be used to gather systematic data on how employees respond to changes in fit-out. Thus, a final benefit of technology is its ability to enable active experimentation in the workplace.

[26] Gensler (2020)
[27] IWG (2019)
[28] Attema et al. (2018)

Limitations to estimating workplace experience effects

While the preceding section attempted to capture some of the gains from improving employee experience, projecting the return on smart workplace investments from this standpoint is complicated by a number of factors. First, productivity can be very difficult to quantify in the modern office: How does one measure the impact that a chance conversation has on product development? How can one capture the impact of avoiding minor annoyances like not finding a seat near the conference room where the big meeting will take place? One common approach to addressing this question is to focus on time savings from interventions like reservations systems, but they often underestimate the overall impact of having a well-functioning workplace by ignoring psychological and reputational factors.

An additional challenge is that workplace technologies tend to be rolled out in conjunction with other changes and that the causal impact is therefore difficult to isolate. Additionally, the effects tend to be varied, with some positive and occasionally also negative effects. If shared desks promote a greater sense of autonomy, enhance collaboration, but also feel smaller to employees, what is the overall productivity gain and how much can be attributed to the changing workplace concept compared to the software that enables that concept?

Finally, employees' workplace preferences are not uniform – interventions that are well-received by some groups are reviled by others. Surveys, for example, indicate that flexible seating is equally liked and disliked among employees,[29] so aggregated effects will depend somewhat on how much each of those groups are affected by the change. Likewise, some studies suggest that receptivity to flexible work concepts is affected by age, with older age cohorts preferring more traditional office configuration.

[29] Gensler (2020)

Employee Experience ROI Calculation

While these limitations make it difficult to anticipate the precise impact of the returns of smart workplace technologies on employee experience, existing research does strongly support the idea that there is a positive impact on productivity from deploying office concepts and supporting technologies that favor flexibility.

While the actual size of that effect is difficult to precisely estimate, an alternative approach is to think about a reasonable order of magnitude for the aggregated impact of technology applied to flexible working. If we know that fit-for-purpose spaces alone can result in self-reported performance improvements of as much as 20%, it is reasonable to assume that at least some of this benefit comes from the technology that supports the optimal use of these spaces. Taking a conservative approach, a reasonable estimate of the contribution of technology in a flexible workplace might be on the order of a 1-3% increase in employee productivity.

With such a range, we can then translate this productivity improvement in financial terms using estimates of profit per employee.

In Q4 2020, for example, the average revenue per employee in the property & casualty insurance industry was $1,315,102.[30]

If we apply the 1-3% range above, the potential revenue gain would thus be $13,151-$39,453 per employee per year from using smart workplace technologies.

Other sectors might see substantially higher or lower numbers, but if we assume the average density of 155.7 square feet per person typical for financial services, the breakeven figures for technology in this scenario would be $84-253 per square foot.

[30] For the total market, the commensurate range would be $15,945 to $26,576, as found in https://csimarket.com/Industry/industry_Efficiency.php?

Understanding Overall Returns from Smart Workplace Investments

The purpose of this paper has been to provide potential investors with the background to understand how workplace technologies focused on space management operate and what the extent of potential returns is likely to be based on reputable third-party research. While each section above outlines a simplified use case that draws on publicly available benchmarks or averages to illustrate the size of returns in different contexts, the reality is that calculations are likely to be far more complex in practice. A single company might be deploying solutions across multiple locations that all have different average rent, salaries, or employee numbers. Even within two sites owned by the same company in the same city, the outcomes could look quite different. For example, a pharmaceutical company might see significantly different returns from density and space mix optimization in an R&D lab staffed by scientists working in teams compared to a Sales office where reps are traveling most of the time.

Beyond the challenge of accounting for context, one additional difficulty in generalizing about ROI is that most potential adopters are likely to use the technology to support multiple use cases, such as a combination of footprint optimization and employee productivity optimization. Here, we caution potential adopters against assuming that the returns from both activities are strictly additive. Optimization is an ongoing process and is highly dependent on effective change management. Actions to improve one aspect of the workplace can occasionally have negative impacts on others, such as the way in which reducing the size of workplaces can save on rent, increase the likelihood of collaboration among team members, but also give rise to more noise.

Given this complexity, we have opted to conclude this paper with a series of simplified formulas for assessing the potential gains from deploying technologies for each optimization scenario rather than with a unified formula that exaggerates the potential for returns by simply adding each scenario. Potential adopters are encouraged to evaluate each of these scenarios if it is likely to apply to their portfolio and to use publicly available benchmarking data referenced in the previous pages as a point of comparison. These estimates can then serve as a point of entry for discussions with expert consultants, vendors, and other industry players to get a more accurate picture of what technologies would be the best fit for reaching those goals.

We follow a three-step process for estimating key information, outlined below.

1. Determine which optimization scenarios are likely to apply, both for Space (footprint, density, or space mix optimization) and for Experience. The formulas opt to focus on aggregated productivity gains from experience rather than on time increments no longer lost to searching (a common metric), as the former category more accurately reflects the types of experiential returns highlighted in this paper and a focus on time vastly underestimates the true value of workplace technologies on a building's end users.

2. Gather relevant inputs for the organization. Ideally this would include the following information for each location:

Office Size	Sq Ft
Office Location	City & Primeness
Office Fit-Out	$ per Sq Ft
Occupants	# of Employees
Salary	$ per Employee
Workday	# of Hours per Week per Employee
Space per Occupant	Sq ft per Employee (per Desk or Overall)
Rent	$ per Sq Ft
Productivity	Revenue per Employee
Space Mix	Desk-to-Collaboration Ratio
Density	Desk-to-Person Ratio

Publicly available sources for benchmarks and best practices can easily be found online. We recommend the following sources as a starting point:

- Cushman & Wakefield's Global Occupier Metrics database, available at https://occupiermetrics.com/
- JLL's Occupancy Benchmarking research reports, available at https://www.us.jll.com/en/space-utilization

In addition to these sources, there are also many proprietary databases and tools that are available through real estate service providers, consulting firms, as well as vendors.

3. Use the inputs from step two for the following calculations. In some cases, we offer multiple formulas for the same estimation as a way of considering the scenario from different angles. Keep in mind that the outputs of each calculation do affect each other and that the overall estimate might be somewhat lower or higher than the aggregated total.

Footprint Optimization Calculation

This calculation begins with two options for approaching the overall potential for reducing square footage.

Option A focuses on optimizing according to best practice square footage per employee or person to achieve a rough estimate of how much the aggregate square footage can be adjusted:

$$Square\ Footage\ Reduction\ \boldsymbol{Option\ A} = Current\ Sq\ Ft\ - (Best\ Practice\ Sq\ Ft\ per\ person\ \times people)$$

Option B focuses on identifying and eliminating the number of unused spaces, which is likely to lead to a better estimate (particularly for workplaces with a wide range of spaces or less-common arrangements such as lab spaces that might mean that the "best practices" space per person does not reflect the work environment).

$$Square\ Footage\ Reduction\ \boldsymbol{Option\ B}: Current\ Sq\ Ft - (\#\ of\ empty\ workspaces\ \times sq\ ft\ per\ desk)$$

Using the estimated square footage reduction from either Option A or B, it is possible to estimate the square footage savings using actual or estimated costs per square foot.

$$Square\ Footage\ Savings = Cost\ per\ Sq\ Ft\ \times Sq\ Footage\ Reduction$$

The final step in the calculation takes the potential savings to estimate an ROI or alternatively to calculate a breakeven cost of the technology per square foot to evaluate the options on the market.

$$Square\ Footage\ ROI = \frac{Square\ Footage\ Savings}{Technology\ Cost\ per\ Sq\ Ft\ \times Current\ Sq\ Ft}$$

Note: When we refer to the number of empty workspaces/desks in some calculations, this should be linked to the concept of "vacancy". Occupancy/vacancy varies throughout the day and, therefore, defining this value requires continuous monitoring (through technology). One should also take into account the notions of active occupancy (presence detected by a sensor) and passive occupancy (person is momentarily not at the desk but the desk is not available to others) to determine vacancy. For an in-depth analysis of vacancy, multiple variables need to be considered, including standard deviation as an indicator of the potential for improvement. A box and whisker plot is a helpful tool in this context.

Density Optimization Calculation

This calculation begins by calculating the estimated square foot reduction from increasing density. As with square footage optimization, we offer two different approaches to estimating this value. Option A focuses on desk-to-person ratios as a way of estimating the space savings from densification, whereas Option B looks strictly at space per person metrics, which often consists of an average of all types of spaces per person rather than just workspaces. In both options, we include a line item to account for the possibility that workplaces might want to partially compensate for densification by adding additional collaboration or other common spaces.

$$Density\ Sq\ Ft\ Reduction\ \boldsymbol{Option\ A} = (Desk\ to\ Person\ Ratio\ \times \#\ of\ Employees\ \times Sq\ Ft\ per\ Employee) - ((Benchmark\ Desk\ to\ Person\ Ratio\ \times Employees\ \times Sq\ Ft\ per\ Employee) + Additional\ Sq\ Ft\ for\ Collaboration\ Spaces)$$

$$Density\ Sq\ Ft\ Reduction\ \boldsymbol{Option\ B} = (\#\ of\ Employees\ \times Sq\ Ft\ per\ Employee) - ((\#\ of\ Employees\ \times Benchmark\ Sq\ Ft\ per\ Employee) + Additional\ Sq\ Ft\ for\ Collaboration\ Spaces)$$

Once the estimated square footage is calculated, potential savings can be calculated based on actual or estimated costs per square foot.

$$Density\ Savings = Cost\ per\ Sq\ Ft\ \times Density\ Sq\ Ft\ Reduction$$

Finally, the ROI takes into account the cost of technology or the calculation can be adapted to estimate the breakeven cost of potential technological investments.

$$Density\ ROI = \frac{Density\ Savings}{Technology\ Cost\ per\ Sq\ Ft\ \times Current\ Sq\ Ft}$$

Space Mix & Productivity Optimization Calculation

This calculation can be used either for estimating productivity optimization returns as well as space mix optimization returns, as the latter operates largely by way of improving the employee experience. To estimate the potential gains from productivity optimization, we present a single option that focuses on revenue per employee and apply a multiplier to this value. Sensitivity analysis can easily be performed by adjusting the multiplier.

$$Productivity\ Optimization\ Gains = \#\ of\ Employees\ \times (Revenue\ per\ Employee\ \times Est.\ Productivity\ Gain\ Percentage)$$

As with the preceding calculations, the ROI can be estimated with further information on the technology cost (which can be highly variable depending on the nature of the technology, both in terms of software and hardware), or alternatively investors can use this calculation to estimate a breakeven technology cost.

$$Productivity\ Optimization\ ROI = \frac{Productivity\ Optimization\ Gains}{Technology\ Cost\ per\ Sq\ Ft\ \times Current\ Sq\ Ft}$$

The calculation presented above focuses strictly on potential gains to employee revenue. Another common approach is to focus on time saved from the use of technology and aggregating it across the workforce. We omit this alternative because it fails to address the intangible gains from workplace improvements that are the core benefit highlighted in the research literature.

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