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# Market Adoption of Healthy Buildings in the Office Sector: A Global Study from the Owner's Perspective

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Our paper aims to examine the healthy building adoption patterns by first asking two critical questions that are relevant to the market conditions: What are healthy buildings? What is their financial value for tenants and owners? We then synthesize the existing academic and industry literature. We find some early evidence of a real estate price premium for specific indoor environment quality (IEQ) and design features. In terms of health-focused building certification systems (BCSs), no empirical and quantitative research has been done on the financial performance of healthy buildings, except for theoretical models. We then proceed to conduct interviews with executives of 15 real estate corporations across the globe to understand the perspectives of real estate owner operators and their strategies for this emerging market. The interviews results confirm that the scarcity of empirical evidence that links healthy building attributes to financial returns inhibits the adoption of healthy buildings in mainstream designs. Moreover, differences in the adoption patterns of healthy buildings are due to the building ownership structure at the firm level, tenants, end-users and

building conditions. The strategies of firms in pursuing a healthy building range from risk mitigation to proactive pursuit of new growth opportunities. Private equity funds and real estate investment trust (REIT) firms tend to focus on risk mitigation, while direct real estate investment firms are more likely to carry out the latter to position themselves as a leader within the real estate industry.

## Keywords

Healthy Buildings, Building Certification System, Value Proposition, Real Estate Value, Healthy Office, IEQ

## 1. Introduction

The history of sustainable development in the real estate industry teaches us the critical role that market mechanisms play in changing the behavior of real estate industry decision makers (Anderson *et al.* 2019; Eichholtz *et al.* 2010; Nelson *et al.* 2010; Miller *et al.* 2008). In the past five decades, sustainable real estate development and investment have developed from a niche concern of the environmental movement in the 1970s to a mainstream product for real estate development and investment in the 2010s, thanks to various national or global sustainability measurement innovations that provide clear market signals and incentives for producers and consumers, such as building certification systems (e.g. Leadership in Energy and Environmental Design (LEED), Energy Star, WELL Building Standard).

To date, most in the real estate industry have pursued sustainability on the grounds of energy savings or CO<sub>2</sub> emissions reduction (i.e., green buildings). Numerous studies have provided robust evidence on the existence of price premiums associated with green buildings. While the financial benefits of green buildings have been well documented and quantified, the financial implications and market mechanisms of healthy buildings have only recently attracted the attention of practitioners and researchers as part of sustainable real estate practices (Dodge Data & Analytics 2018). Compared to their conventional green building counterparts, a much more comprehensive approach to indoor environmental quality (IEQ) and occupant-centered comfort is taken with healthy buildings. Since 2016, human health and well-being have gradually become the subjects of an intentional and increasingly institutionalized focus across the entire real estate industry (Worden *et al.* 2019).

IEQ can create numerous benefits for building occupants and the broader economy, as modern humans tend to spend more than 90% of their time indoors (Klepeis *et al.* 2001). The physical, social, and economic characteristics of the buildings where we live, work, and play in can be predominant predictors of

our health outcomes (Allen and Macomber 2020). In this sense, healthy buildings may be also a solution to combat the urgent sustainability challenges that face our society, such as prolonged high levels of outdoor air pollution, recent cross-generational demographic trends surrounding health and well-being, and high carbon emissions from the building sector (Cedeno-Laurent *et al.* 2018). The recent COVID-19 pandemic has substantially increased attention to health-centric topics globally in all industries, thus increasing the salience and relevance of healthy buildings in the real estate industry.

Against this background, this paper focuses on the views of real estate owner operators towards healthy buildings. In 2016, three industry-initiated surveys were carried out to obtain the perspectives of building owners on healthy buildings (Laquidara-Carr 2016). They involved 53 Canadian building owners and 150 American and Canadian building owners. More than half of the surveyed owners do not know the financial benefits of their healthy building(s). For owners who reported increased building value, rent premiums, or quicker leasing, the financial performance of their buildings is not clearly quantified. As interest in the topic of healthy buildings and adoption of health-focused BCSs have sharply increased since 2016 (McArthur and Powell 2020), have the perceptions of building owners changed in 2020? If yes, how do the evolved perceptions affect the market adoption of healthy buildings?

This paper offers new evidence on the healthy building market and its adoption in the office sector. We have conducted in-depth interviews with 28 executives from 15 real estate development and investment firms with assets distributed across the globe on their views toward healthy buildings in the office market and investment strategies for these buildings. Among all of the different types of buildings, office buildings are the “first mover” in the advancement of healthy buildings. Over 70% of buildings that have obtained WELL or Fitwel certifications are office buildings (see Table 1).<sup>1</sup> Our findings will provide useful insights for decision makers in the real estate sector when they draft their next-step strategies – from building developers to owners and operators, tenants corporations, regulatory institutions, rating/certification organizations, and other real estate value chain players.

The remainder of this paper is organized as follows: Section 2 synthesizes the existing evidence on the financial value of healthy building attributes. Section 3 introduces the interview methodology. Section 4 discusses the interview findings. Section 5 includes the conclusion section.

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<sup>1</sup> In recent years, WELL adoption has expanded from office to retail, and residential ventures to a broader range of building types, including health care, industrial, education, hospitality, senior living, and fitness; non-office sectors have limited market penetration (Urban Land Institute 2020b).

**Table 1** Projects Registered for WELL/RESET Certification by Building Sector, As of Nov. 16, 2020

Rating/ Certification System	Year Founded	Total Number of Projects as of Q4 2020	Number of Office Projects	Office as Percentage of Projects
WELL v2	2018 (pilot)	889	647	72.8%
WELL v1	2014	1213	874	72.1%
RESET	2013	81	71	87.7%

*Data source:* International WELL Building Institute and RESET website

## 2. Current Landscape of Healthy Building Adoption: A Synthesis of Academic and Industry Literature

When thinking about the market adoption of healthy buildings, we can learn from what has happened to its “older sibling” – green buildings, which have an initial and primary focus on energy efficiency and emission reduction. The adoption of green buildings follows the law of diffusion of innovation (Moore 2009) as shown in the bell-curve areas of adoption. The green building movement started with visionary real estate companies as early adopters who were trying to stay ahead of market trends by incorporating corporate social responsibility (CSR) initiatives into their business practices. There are two critical market conditions that enable green building adoption to cross the chasm from an early market to a mainstream market. The first condition is that a common benchmark was developed for measuring and assessing green building performance and standards. With the introduction of green building certification systems (BCSs) such as Energy and Environmental Design (LEED), Energy Star, and BREEAM around 2000, the adoption of new green buildings and the green retrofitting of old buildings accelerated year-over-year during the 2010s (Dodge Data & Analytics 2018). The second condition is that empirical evidence on the financial return on investment (ROI) of green buildings can be clearly measured. The tipping point of the adoption of green-certified buildings from an early to a mainstream market was made possible through clearly measured economic outcomes in the marketplace (Miller *et al.* 2008; Eichholtz *et al.* 2010; Nelson *et al.* 2010). The financial value for adopting green-certified buildings has since been empirically documented by an increasing pool of empirical research (Chegut *et al.*, 2014; Eichholtz *et al.* 2013; Fuerst and van de Wetering 2015). In the last decade, investments on green buildings have been conducted by the more pragmatic and conservative majority of the mainstream market. Knowledge of the financial benefits justifies the return on investments and can thus enable “chasm crossing” from an early market to a mainstream market.

We believe that these two conditions will also indicate the adoption cycle of healthy buildings. To this end, we synthesize the literature on the two above

topic areas in three steps: (1) what are the healthy building attributes? (2) What are the value proposition and financial benefits of healthy building attributes for tenants? (3) Can such tenant value be capitalized into real estate asset value and other associated benefits (such as higher occupancy rate) to owners? We have reviewed academic papers as well as industry publications and building standards. In total, we have identified about 100 academic publications and 30 industry publications from 16 institutions, including leading real estate associations, nonprofits, real estate companies, and government entities; and 29 BCSs.

## 2.1 Measuring Healthy Building Attributes in Real Estate Market

In both the academic and industry literature, attributes of healthy buildings can be categorized into 2 groups. First and foremost, healthy buildings are measured with industry IEQ attributes, such as indoor air quality (IAQ), ventilation, lighting, view, noise, heat, moisture, dust, pests, and biophilia (Grayson 2019; Allen and Macomber 2020; Simons and Throupe 2005; Benson *et al.* 1998; Benjamin *et al.* 2001; Lee and Yoo 2020; Szczepańska *et al.* 2020; Hamilton *et al.* 2016; Kuehnel and Moeckel 2020; Kim *et al.* 2007). The second category of attributes revolve around design (interior layout), active design, look and feel, amenities, location, etc. (Grayson 2019; Pivo and Fisher 2011).

Since healthy building attributes can be created in a myriad of ways, market-led and voluntary BCSs provide the most comprehensive operationalized measurement. BCSs have been instrumental in raising awareness, educating the market, and driving the adoption of IEQ best practices. Standardized measurements of building metrics are critical for all decision makers in the real estate value chain.

While not primarily developed to promote health and wellness, some green BCSs give significant credit to buildings that have positive physical, social, and/or psychological benefits for the building occupants (McArthur and Powell 2020). There are broad alignments between health and environmental agendas (World Green Building Council 2016; Klimovich *et al.* 2017). Besides energy efficiency gains, green buildings are more comfortable to work in (Singh *et al.* 2010) and more beneficial to the health of their occupants (Liang *et al.* 2014). There is often a “virtuous circle” of good design that works for both people and the planet (World Green Building Council 2014). For example, developers can improve both the environmental and health impacts of a building and the construction value chain by using sustainable, non-toxic building materials and products (Gordeljevic and Jevtic 2018).

However, green buildings do not necessarily create healthier indoor environments for their occupants (U.K. Green Building Council 2017; World Green Building Council 2014). Most green BCSs address different aspects of

the health and well-being of occupants in one way or another, but in general, they lack a comprehensive and thorough approach. For this reason, BCSs that specialize in health were developed to offer a better insight into the well-being of occupants (Potrč Obrecht *et al.* 2019). The entirely health-focused BCSs that entered the market in recent years include the Assessment Standard for Healthy Buildings, ((ASHB) founded in 2017), Fitwel (founded in 2016), WELL (founded in 2014), and RESET (founded in 2013).

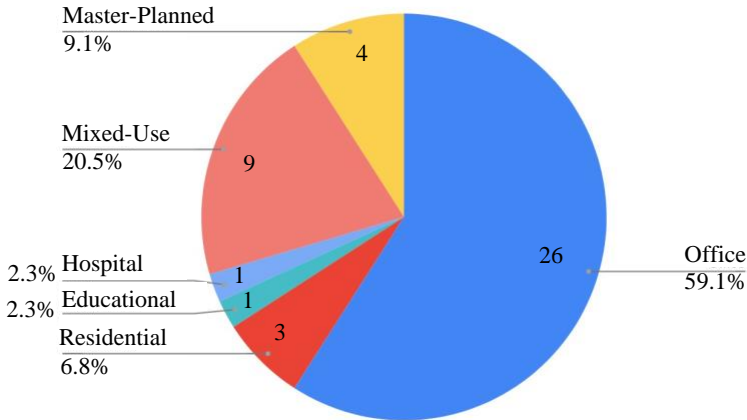
Health-focused BCSs differ from green BCSs on three fronts. First, healthy BCSs are much more comprehensive in scope than green BCSs in addressing health-related IEQ (McArthur and Powell 2020). For instance, the criteria of WELL include 105 health-related sub-items. ASHB, another health-focused BCS, has 102 sub-items (Xie and Gou 2020). Second, health-focused BCSs emphasize occupant services – a range of services and programming that a building owner or tenant organization can provide to increase the health and well-being of building occupants, including fitness and wellness activities, classes, and groups; mental health management services; on-site childcare and healthcare; healthy food and beverage catering; community-building programs; etc. Third, unlike green-certified buildings, the adoption of health-certified buildings is driven by a combination of building owners (or managers) and tenants (who want to work, live, and play in healthy spaces). In terms of total, global project count, building tenants have pursued WELL certification four times more often than owners. In terms of total square footage globally, owner-pursued projects account for three times as much square footage as tenant-pursued projects (Urban Land Institute 2020b).

Early evidence of the financial value of healthy buildings for tenants and owners is currently fully based on industry-initiated case studies. We have identified a total of 44 industry-initiated healthy building business cases in the industry literature published between 2013 to 2020 (Bernstein *et al.* 2014; Carter and Jeffery 2015; Jones and Laquidara-Carr 2016; World Green Building Council 2016; Laski 2018; McCormick 2018; Kramer *et al.* 2014; Urban Land Institute 2020a; World Green Building Council 2013). In total, 40 cases are at the building scale, while four cases are at a master plan scale. The 40 cases are predominantly in office buildings (Figure 1). Almost half of the cases at the building level (19 out of 40) rely solely on green rating/certification to measure “healthy” features (Figure 2). One fourth of the cases rely on both green and health BCSs. Only three cases are built on data from purely healthy building (i.e., Fitwel or WELL) certification as a benchmark of a healthy building. Finally, eight cases do not specify how they measure the features of healthy buildings (Figure 2). Those eight cases measure a “healthy building” based on amenities (e.g., fitness centers) and physical design elements (e.g., biking paths) while some mentioned IEQ. Reasons for this could be that (1) amenities and physical design elements are more easily understood by tenants, and require less explanation than IEQ, and/or (2) amenities and physical design elements can also be marketed/advertised rather easily. The majority of cases

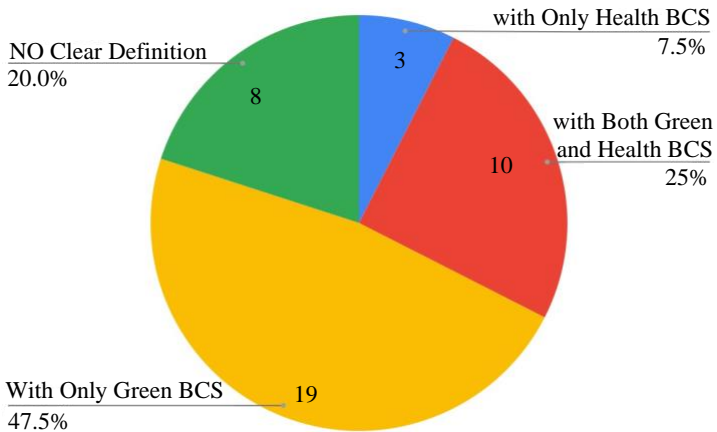
(i.e., 28 out of 40) report tenant value measurement and 17 out of 40 cases report owner value (Figure 3).

See Appendix 1 for the full list of industry initiated healthy building business cases published between 2013-2020.

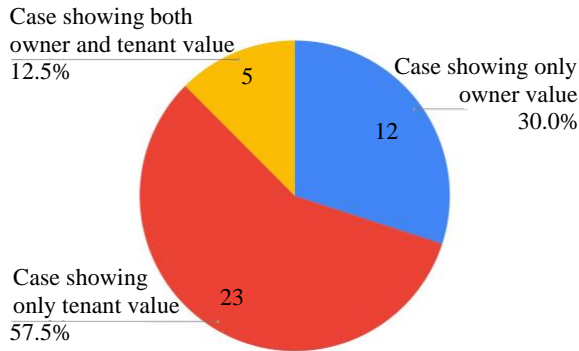
**Figure 1 Forty-four Industry-Initiated Case Studies (2013-2020) by Building Type (40 cases are at the Building Scale, 4 Cases are at the Master Plan Scale)**



**Figure 2 Forty Industry-Initiated Case Studies (2013-2020): How a Healthy Building is Defined**



**Figure 3 Forty Industry-Initiated Case Studies (2013-2020): Tenant and Owner Values**



## 2.2 Financial Benefits to Building Tenants

Measuring the monetary value of health and well-being benefits is much less direct than converting energy-saving to dollar-saving green-certified buildings, and thus has an added layer of complexity when evaluating financial returns (Baum *et al.* 2020). Human productivity is dependent on multiple factors, including interpersonal relations at work, workplace policies, team dynamics, and personal life (Klimovich *et al.* 2017). Until now, empirical scientific research on healthy building value propositions for tenants has mainly measured value via IEQ metrics. In theory, the monetary benefits of IEQ outcomes can be derived from the links among improved human health, well-being, and productivity outcomes, which can be further quantified in terms of the business costs of tenants. Along this line, the value propositions for employer organizations can be measured by additional revenue margins made from employee productivity gains (Fisk and Rosenfeld 1997), reductions in absenteeism and/or sick leave taken (Myatt *et al.* 2002; Milton *et al.* 2000; Palacios *et al.* 2020; Wargocki *et al.* 2006; Seppänen and Fisk 2004) and overall healthcare cost premiums, fewer employee medical and physical complaints (Milton *et al.* 2000; Lee and Brand 2010), talent acquisition (Carter and Jeffery 2015; Reiss and Costello 2007), employee retention/reduced turnover (Buckley *et al.* 2004; Attema *et al.* 2018). As the operating costs of a typical business are 90% staff, 9% building rent, and 1% energy bills, even a small improvement in employee health, sentiment, or productivity is likely to represent a much greater financial gain for the employers (World Green Building Council 2014).

Most of the existing studies that focus on the financial value of healthy buildings are simplified assumptions, as opposed to empirical models based on real world measures, and mainly used to estimate the tenant value of hypothetical healthy buildings. For instance, Muldavin *et al.* (2017) use ROI models to determine the financial benefits of increased worker productivity in



a hypothetical, 200,000-square foot, WELL certified building owned and occupied by a bank. They estimate financial benefits that accrue from WELL certification produce returns (IRR) of 298% over five years, assuming productivity gains of only 0.5% and reductions in health insurance costs, turnover, and absenteeism (Muldavin *et al.* 2017). A recent report (Attema *et al.* 2018) uses sensitivity analysis of enhanced employee productivity, reduction in employee separation rate and annual employee sick days to estimate the financial value of tenants. The analysis applies financial calculations to findings of over 60 robust research studies on the effect of high-performance buildings, and finds owner-occupants and tenants could gain USD 3395 per employee in annual profit (assuming a conservative USD 20 per square foot cost premium for the new construction and retrofitting of high-performance buildings). These analyses are reminiscent of the pro formas (Allen and Macomber 2020) and created to demonstrate the bottom line returns of increased productivity, reduced medical costs, and other human/employee benefits for a hypothetical tenant company and landlord in a healthy office building. While the methods and models used in the above publications have quantitative merit, they still rely on strong assumptions, not empirical evidence.

Early quantitative evidence of the financial value of healthy buildings for tenants and owners mainly consists of industry-initiated case studies. Of the 40 available cases, 28 report a measurement for tenant value. Among the 28, 24 cases rely on pre- and/or post-occupancy surveys of tenants (office employees or residents) to record absenteeism, productivity, satisfaction, turnover, etc. Other cases report estimates of tenant value based on the in-house tracking work of companies and measurement of metrics such as employee sick days, satisfaction, recruitment, and retention. Only 6 of the 28 cases quantify tenant value in financial terms. In those six cases, the number(s) are based on a self-reported/in-house estimate. There are clear methodology limitations in such industry-initiated case studies. Tenant value measured by pre- and post-occupancy surveys and employee/resident self-assessments are prone to bias, person-specific outcomes, and other methodological flaws. One notable case is National Grid, which conducted a range of cognitive performance tests on staff before and after AECOM radically redesigned its headquarters with health in mind. National Grid found an 8% improvement in staff performance, which equals to £20 millions (~\$23.75 million USD) of increased productivity per year (Carter and Jeffery 2015). While this number is still an estimate, National Grid is a rare example of a tenant attempting to scientifically measure and quantify the financial value that it receives from a healthy office (World Green Building Council 2014).

### **2.3 Real Estate Value Premiums for Healthy Buildings**

While there is a rich body of empirical and quantitative research on the real estate price and rent premiums of green-certified buildings, one cannot easily

disentangle the financial value of health benefits from the overall green premium (which is not independently measured). Considering the financial returns of IEQ as an independent merit, rather than as a subcomponent of a green-certified building, is still quite new (Jones and Laquidara-Carr 2016).

Some nascent research links one or a few specific features of IEQ to higher rental or asset price premiums and higher willingness to pay (Pivo and Fisher 2011; Simons and Throupe 2005; Benson *et al.* 1998; Hardin and Cheng 2003; Benjamin *et al.* 2001; Lee and Yoo 2020; Szczepańska *et al.* 2020 Hamilton *et al.* 2016; Kuehnel and Moeckel 2020; Kim *et al.* 2007). However, those empirical studies only focus on one specific IEQ feature at a specific time and in a specific setting, such as indoor air quality, acoustics, light quality, view or safety. To date, there is no empirical research that provides clear evidence that buildings with a comprehensive set of healthy building features, as certified by a health-focused BCS (i.e., Assessment Standard for Healthy Buildings (ASHB), Fitwel, RESET, or WELL) can command real estate price or rent premiums. Similar gaps exist for studies that pertain to the potential maintenance and upkeep costs of health-certified buildings.

While the industry-initiated case studies lack rigorous methodology, they have access to sensitive financial data. Of the 40 industry-initiated cases, 17 report a measure of the real estate value of the owner. Measures of owner value reported in those 17 cases include asset value, rent premiums, higher net operating income (NOI), internal rate of return (IRR), quicker leasing/higher absorption rate, higher occupancy and vacancy rates, improved tenant acquisition, reduced liability from underperforming buildings, and improved branding/marketing. Six of those 17 cases do not quantify real estate value, but mention “command top of market rent”, “rents exceed pro forma projection”, “additional permanent financing”, “successful at attracting and attaining tenants”. Of the 17 cases, 11 quantify financial value, but the numbers are either self-reported or in-house estimates from interviews, and the calculation methods are not clearly elaborated. One third (or 4 of the 11) of the cases do not specify how they define healthy buildings. Six of the 11 cases rely solely on green rating/certification to measure “healthy” features. One case uses both green and healthy BCSs. Only 3 of the 40 cases have only Fitwel or WELL rating/certification as a benchmark of a healthy building. In those 3 cases, the owner value is not quantified financially.

The lack of empirical research that shows buildings with a health-focused BCS command real estate price or rent premiums is one of the key adoption barriers of health-focused BCSs by the mainstream market. A 2020 industry survey (Urban Land Institute 2020a) shows the most frequently reported motivator for the implementation of healthy practices by the respondents is an anticipated increase to their project ROI. The academia faces challenges in measuring real estate value due to small samples of panel data. As the market for healthy buildings is still in the early stages, there are not enough market comparables

yet for buildings with health BCSs to prove their real estate value premium (e.g., lower vacancy rates or higher rents). This is the classic dilemma of advancing from the early market to the mainstream market. The pragmatic early majority is driven by a strong sense of practicality; they will not buy a product until it is established, yet the value of a product cannot be measured until it is purchased to a certain scale. Winning early majority customer segments is fundamental to substantial growth.

The above synthesis of the academic and industry findings offers us an initial assessment of the emerging healthy building market landscape and adoption patterns. To summarize, the market adoption of healthy buildings is still in a very nascent stage. From the early studies on various types of property, the office sector signals the most quantifiable financial benefits. Academic research on the value propositions of healthy buildings for tenants have mainly measured value at the IEQ level. The monetary benefits of IEQ are derived from the links among improved human health, sentiment, and productivity outcomes, and further quantified in the business costs of tenants.

All these findings help to explain why the market adoption of health-focused BCSs in the office sector is leading the curve. However, the empirical financial valuation of health-focused BCSs is lacking. Owners mainly adopt health-focused BCSs for a few select benefits: (1) improving their reputation with clients and customers, and positioning themselves as a leader within the real estate industry; (2) serving as an asset label to leverage in marketing; (3) exemplifying environmental, social, and corporate governance (ESG) and/or CSR initiatives; and/or (4) being a point of pride that unites project teams around an environmental/health/wellness agenda (Allen and Macomber 2020; U.K. Green Building Council 2017). These benefits are strategic in nature and fit the psychological profile of visionary early adopters. Visionaries drive industry development because they see the potential for an order-of-magnitude ROI and are willing to take significant business risks with unproven products in order to achieve breakthrough improvement in product and service quality, and therefore gain a competitive edge. They are typically the least price-sensitive and have budgets that allow them to allocate generous amounts toward the implementation of a strategic initiative. In other words, early adopter office landlords and tenants evaluate the superiority of healthy building offerings over current alternatives and foresee a potential order-of-magnitude financial value in attracting and retaining talent, enhancing employee productivity, and reducing absenteeism.

### **3. Interview Design**

Since the office sector is leading the curve in healthy building adoption, our interview sample selection focuses on the behavior of large real estate companies in the office sector. We have identified leading real estate firms that

own and actively operate and manage commercial office properties. We balance our sample of firms across regions in Asia, Europe and North America and ownership structures that range from direct real estate investment, private equity (PE) funds to real estate investment trust (REIT) firms. We try to obtain a similar proportion of ownership type of firms in each region<sup>2</sup>.

We sent invitations with a description of the study and our set of main interview questions to 17 firms. Among these 17 firms, 15 participated in the follow up interview process<sup>3</sup>. All interviews are conducted by one of the co-authors, virtually via video-conferencing or on the phone between July and October 2020. The full list of interviewed corporations is shown in Table 2. Six of the interviews involve more than one individual at the same time. Two of them involve more than one individual at different times. In total, we conducted interviews with 28 executives from 15 leading real estate corporations who own and actively manage office buildings in Europe, Asia, and North America (Figure 4a).

**Table 2 Summary of Interviewed Firms and Interviewees**

	Firm Name	Number of Firms	Number of Interviewees
Asia	China Resources Land	5	1
	Topchain Group		3
	Hongkong Land		4
	Nan Fung China Group		1
	City Developments Limited		1
North America	Tishman Speyer	6	4
	Hines		1
	AEW		2
	Rudin Management Company		1
	Boston Properties		2
	Oxford Properties		2
	Edge Technologies		4
Europe	HB Reavis	3	
LaSalle Investment Management	1		
Schroders	1		
Total		15	28

Most of the interviews lasted about 60 minutes and were recorded after receiving permission from the interviewee(s). The interviewer asked a set of

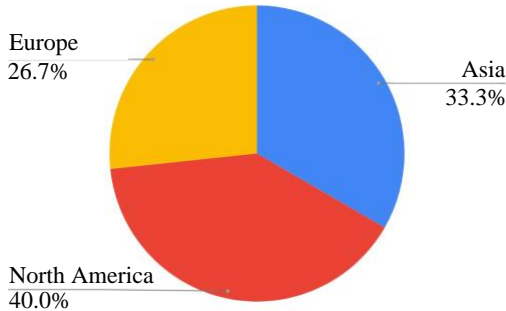
<sup>2</sup> Eleven of the 15 corporations have global office portfolios. The business unit of the interviewees typically focuses on their home country.

<sup>3</sup> This research is approved by the MIT Committee on the Use of Humans as Experimental Subjects (COUHES), case no. E-2671.

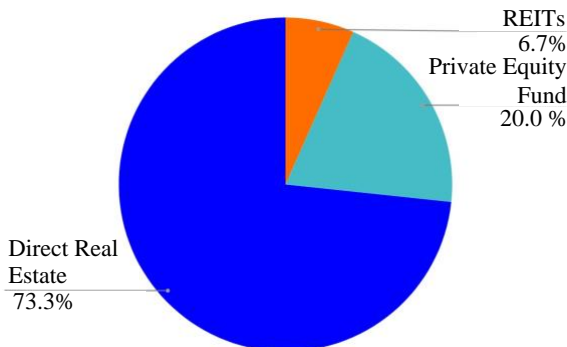
pre-designed questions regarding the owner-specific perspectives of healthy buildings, and the real or perceived value propositions for tenants and owners and their priority and strategy towards this emerging market.

**Figure 4** Characteristics of Panel of Interviewees

(a)



(b)



**Notes:** Figure shows the two main differentiating factors of the companies that form respondent panel: (a) Region where they (mainly) operate and (b) their equity structure.

The portfolios of the five Asian firms are mainly in mainland China, Hong Kong (China), and Singapore, and had a total of USD 76 billion in assets under management at the time of the interview. The portfolios of the six North American firms are primarily in the United States (i.e., New York City, Boston, Los Angeles, San Francisco, Washington, DC, etc.) and Canada (i.e., Vancouver, Toronto, etc.) with over USD 200 billion in assets under management. The portfolios of the four European firms are predominantly in the Netherlands, Slovakia, Poland, the United Kingdom, Germany, the Czech

Republic, and Hungary, with approximately USD 60 billion<sup>4</sup> in combined assets under management. Most of their business models involve a variety of financing characters, i.e., direct real estate investments, PE funds, and real estate securities such as REITs. As the financing structure may affect the firm behaviors, we categorize the firm character according to the business unit of the interviewee or the predominant business model of the firm. One firm is predominantly REIT; 3 are PE funds (making development and investment decisions on behalf of passive investors) and 11 are direct real estate investment firms (Figure 4b).

These 15 firms form our panel of informants that is used to investigate the perspectives of building owners on: (1) the financial value of healthy building attributes, (2) the key drivers for their adoption of healthy buildings; and (3) their current strategies to position themselves competitively for the future.

After completing the interviews, we used online applications to transcribe them, with Otter.ai for the English interviews and IFLYTEK for the Chinese interviews, and then reviewed each transcription individually to ensure reliability. Finally, we used Atlas.ti to thematically code all of the interviews.

We developed four groups of codes (i.e., keywords or inferred keywords) that correspond with the four main question blocks used in the study to characterize the views and strategies of the respondents in the area of healthy buildings (see Figure 5 for an overview of the thematic codes). The first group of codes describes the attributes that the participants use to measure healthy buildings in practice. In total, we have identified four codes. The second group of codes describes how the interviewees describe tenant-value drivers, which contains five codes that describe the value propositions of tenants. The third group of codes describes the topic of owner value. Finally, in the fourth group of codes, we include the strategies of the firms and their priority assessment of healthy buildings.

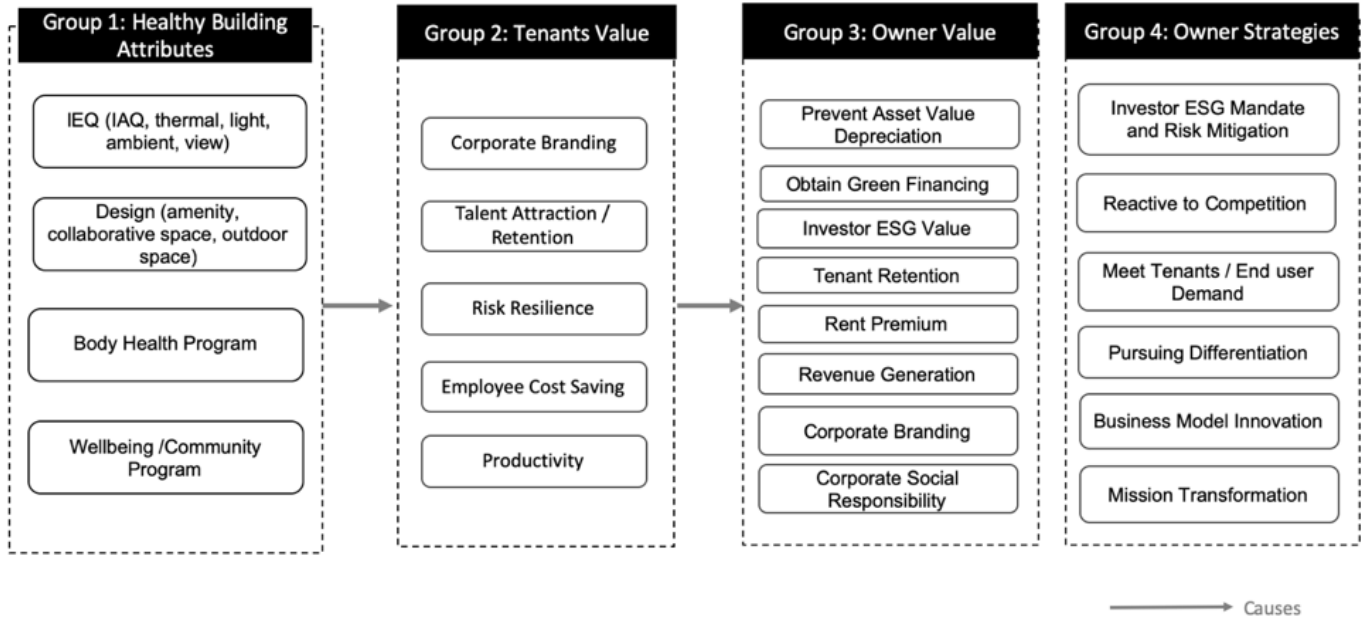
Once the codes were sorted, we then listed the firms according to their region and real estate ownership structure to identify patterns and heterogeneity. We label the five Asian firms as A1 to A5, six North American firms as NA1 to NA6, and four European firms as E1 to E4. Second, we categorize all 15 firms into REIT, PE fund, and direct real estate investment firms. The findings are presented in the next section.

The template interview protocols are provided in Appendix 2.

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<sup>4</sup>The rough estimate is based on the information on the website of the firms, their 2019 annual report and estimates provided by the interviewees themselves. The estimate only includes coverage of the home country division of the interviewees, not the assets under management in the global portfolio of the firms.

**Figure 5 Overview of Four Groups of Thematic Codes**



## 4. Results: Interview Findings

### 4.1 Healthy Building Attributes and Value Proposition

We identify three ways that the interviewed firms define or measure healthy buildings in practice: 1) BCSs; 2) occupant health and wellbeing indicators; and 3) specific attributes that make their buildings healthy.

First, all of the interviewees refer to rapidly evolving BCSs and industry publications as key sources to form their perception of “healthy buildings”. However, there are salient differences across the interviewees on the use of these standards. Three (out of 15) of the firm interviewees rely on traditional green BCSs to define healthy buildings in their portfolios. They use a combination of green and healthy buildings interchangeably without differentiation. For these firms, health is viewed as a subcomponent of green buildings due to the overlapping nature of green buildings and healthy buildings. They view the new healthy building trend as an extension of established green concepts. On the other hand, 12 (out of 15) firms have registered or are considering registering their buildings with health-focused BCSs (i.e., ASHB, Fitwel, RESET, WELL). In their interviews, they stated that healthy buildings should be measured independent of green BCSs, although they admit that most of the time, they are complementary to each other, as most of the health-certified buildings are also green-certified. They differentiate “green” as a design and development phase effort by emphasizing its hardware provision and the associated energy-efficient parameters, while “healthy” is more of an operational phase effort with a focus on end-user centered services and program planning with its own new value proposition. When asked in the interviews, these 12 firms stated that green building attributes are as important as healthy building attributes, if not more important.

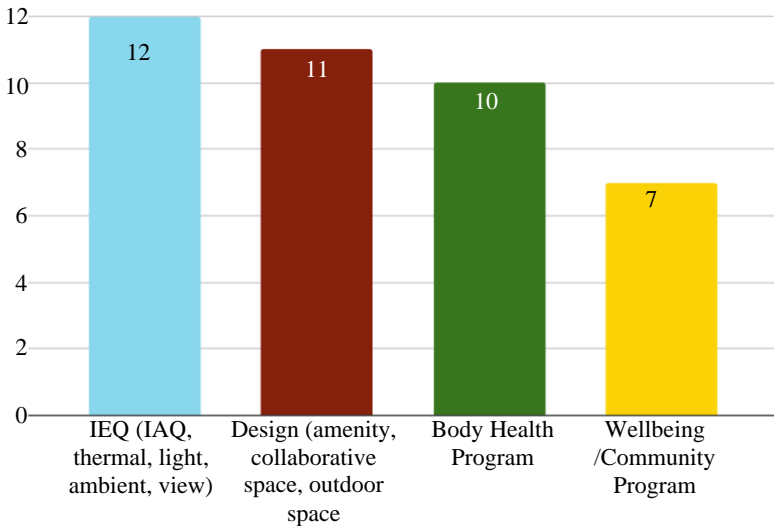
Secondly, a shared view among all of the interviewed firms is that a healthy building should have human-centered outcomes. All firms use occupant satisfaction/well-being/comfort metrics to evaluate their buildings. They stated that the subjective perception of the users plays an equally important role in measuring the IEQ of a building. Firms use the following terms: “feel safe”, “feeling of well-being”, “happy”, “enjoy work”, “wanting to come to work”, and “zero COVID transmission cases” to indicate their evaluation of healthy buildings independent of whether their buildings are labeled with green or health-focused BCSs (see Appendix 2 for original quotes).

Thirdly, aside from BCSs, occupant health and wellbeing outcomes, all of the interviewees mentioned detailed attributes of a healthy building. We group those attributes into four categories (Figure 6): *IEQ* (including IAQ, light, view, thermal comfort, and biophilia), *design-based interventions* (including amenities, outdoor and collaborative space), *body health programs* (exercise, healthy food, etc.) and *well-being/community building programs* (events that promote community and well-being of occupants). The first two categories of



attributes – *IEQ* and *design* features, align with the existing literature which we mentioned in Section 2.1. The last two categories of attributes – *health* and *wellbeing programs*, are not studied in neither the academic nor the industry literature.

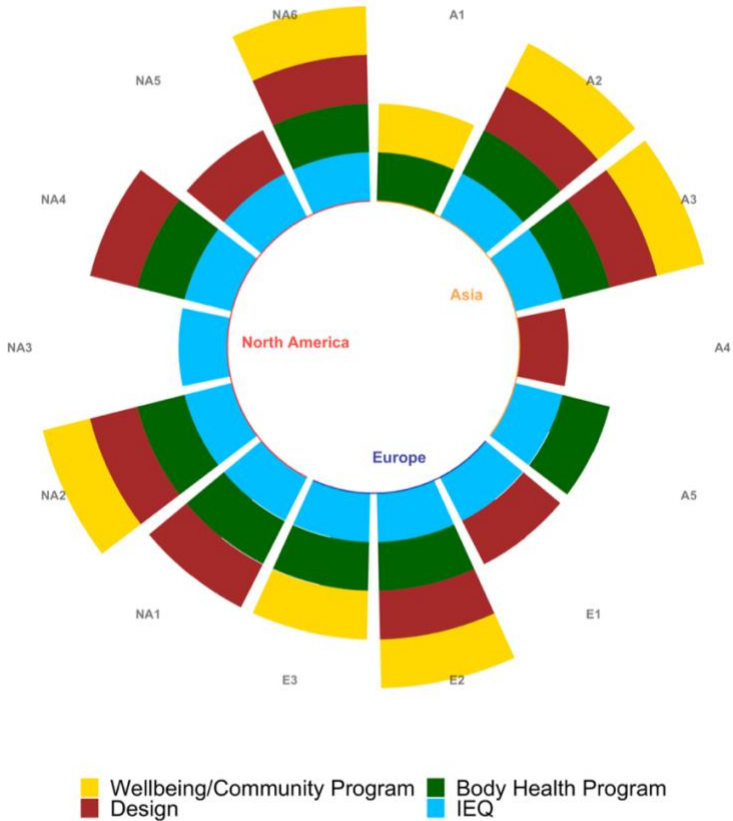
**Figure 6** Number of Companies Adopting Healthy Building Attributes



The firms pursue various unique combinations of healthy building attributes (see supplementary Table 1 in Appendix 3). In our interviewee panel, 12 firms emphasize IEQ metrics, with IAQ being the most mentioned focus area, followed by light, view, and thermal comfort in the building. Eleven firms measure a healthy building through change in building design, which includes the presence of amenities, and collaborative and outdoor space to support both physical and mental health, thus reducing employee stress and increasing employee satisfaction. Ten firms invest in body health programs and frequently mentioned diversified options for food, exercise, and interactive activities, as they think buildings should make occupants healthier physically beyond the baseline provision of no harm or sickness. Seven firms address the presence of social impacts and sense of community as aspects they consider in a healthy building. Figure 7 shows the combinations of attributes of the 15 firms to the four categories of attributes. The pattern totals eight combinations of the 15 firms.

Geographic location matters mainly through the lens of external environmental quality. For instance, office building owners in polluted Asian cities as well as Vancouver and California – where there are seasonal wildfire risks – put indoor air quality as a top priority.

**Figure 7 Combinations of Healthy Building Attributes**



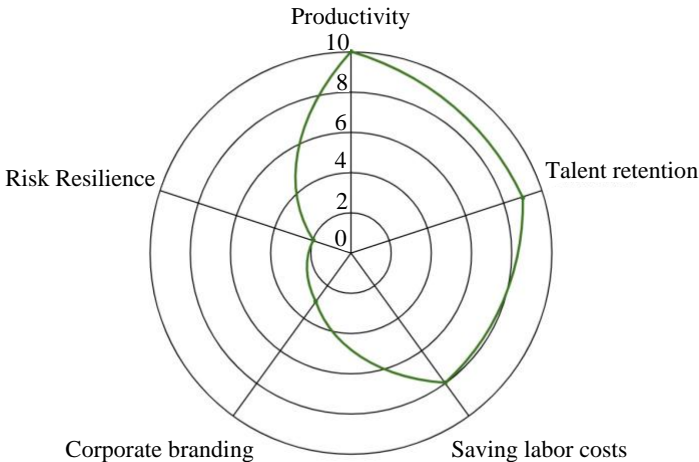
## 4.2 Benefits and Financial Value for Tenants and Owners

When we asked the interviewees with a global building portfolio (N = 13) if healthy building attributes differ in different national markets, the unanimous answer is that healthy building attributes show fewer country or regional differences and greater variations based on the primary targeted type of tenant. The office tenants who value either health-certified buildings or end-user driven performance tend to be high-paying, high-skilled service companies who are competing for talent (elite knowledge workers) and prioritizing employee performance. Office building owners with the majority of their tenants from the following sectors expressed the need to accommodate the preference of their tenants for healthy building features: finance, consulting, information and communications technology (ICT), and other high-tech multinational enterprises (specific names that were mentioned in the interviews include Google, Facebook, Microsoft, Amazon, Coca Cola, JP Morgan,

Deloitte, Salesforce, BP, etc.). Green and health-focused BCSs have become a pre-lease condition for such anchor-tenants and therefore a “must-have” for building owners. One firm stated that they perceive very strong demand from their potential tenants for a healthy building certificate like WELL. To secure and retain their desired tenants, they moved quickly to adopt such a health-focused BCS even without carefully estimating the real financial returns.

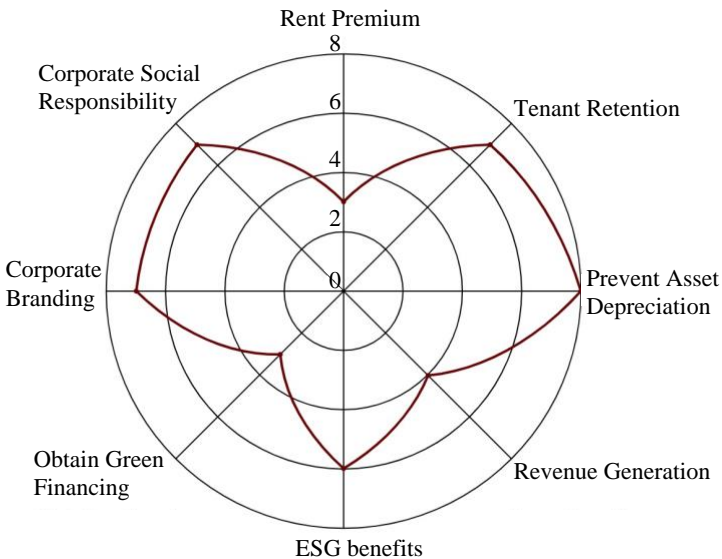
The interviewed firms mentioned five main benefits in the value proposition of their healthy building investment for their tenants: end-user productivity, saved employee healthcare costs, talent attraction and retention, corporate branding, and risk resilience (Figure 8). The first three value propositions (productivity, employee cost saving, and talent attraction and retention) can directly lead to financial benefits for tenants, while the other two (corporate branding and risk resilience) are indirect benefits. Productivity is the most mentioned value proposition to the tenants (10 out of 15 firms). Companies who are renting their buildings seek reductions in sick-leave, improvements in employee mental health, and productivity. Most of the interviewees addressed the improvement in productivity by referring to the positive relationship between CO<sub>2</sub> and cognitive function, mostly referencing academic research by Harvard (Allen and Macomber 2020) and the Urban Land Institute (ULI). Nine firms mentioned talent attraction and retention, as handling turnover is costly for their tenants. The interviewees stated that new generations of highly skilled labor are more concerned about healthy building provisions when selecting an employer.

**Figure 8 Value Proposition to Tenants**

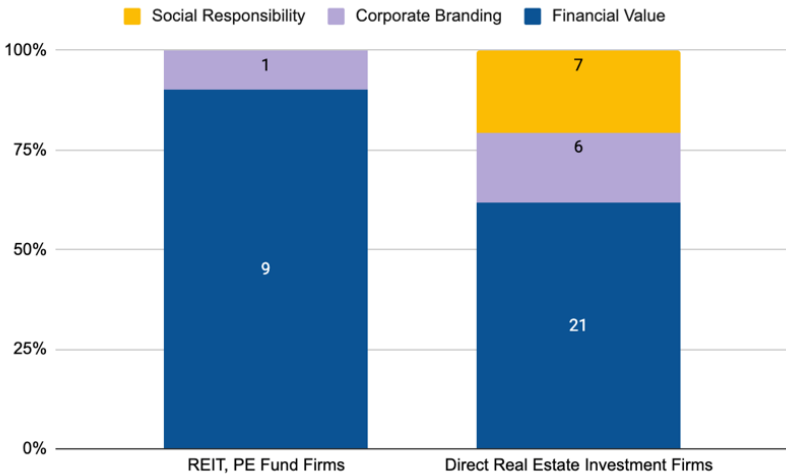


Do these compelling value propositions transfer into value for owners? We find eight major values for owners mentioned by the interviewed firms. These 8 values are listed in Figure 9a (also see supplementary Table 2 in Appendix 3). Six of these values are financial values. Among the six financial values, four of them are asset-level, and two are firm-level. Aside from financial values, there is one branding value<sup>5</sup> and one social value. Currently, owners do not adopt healthy buildings primarily because they believe this will create short-term profit (i.e., rent premium, new revenue), as only three firms believe there is a rent premium for healthy building investment. They do so mainly because they think adoption will first increase their competitiveness in the long term (i.e., prevent asset depreciation); secondly, doing so improves their reputation with clients (i.e., corporate branding). Thirdly, they believe adoption is the right thing to do (i.e., CSR). This is due to the short time horizon of healthy building investment, and the complexity of factors that influence market rent. Among them, the REIT and PE fund firms are more incentivized towards financial value, especially their investor ESG benefits and the prevention of asset depreciation in the medium to long term (Figure 9b). For the direct real estate investment firms, their motivation seems more balanced among consideration of the financial, branding, and social values of investing in healthy buildings. Although health is considered to be a social impact, we notice that its value proposition shares commonality across the Asian, European, and North American markets.

**Figure 9a Value for Owners**



<sup>5</sup> Firm value describes factors that help end-users to build reputation, trust, and marketability to clients and key stakeholders.

**Figure 9b Heterogeneity in Values**

### 4.3 The Spectrum of Strategies of Owners: From Reactive Risk Mitigation to Proactive Exploration

During the interviews, we asked the firm interviewees to rank their healthy building priorities over their overall business strategies on a 1-to-6 scale, with “1” being the lowest priority and “6” being the highest priority<sup>6</sup>. The self-ranking of priority correlates well with the spectrum of their strategy. A higher ranking means that the firm adopts a more proactive strategy (see supplementary Table A1 in Appendix 3).

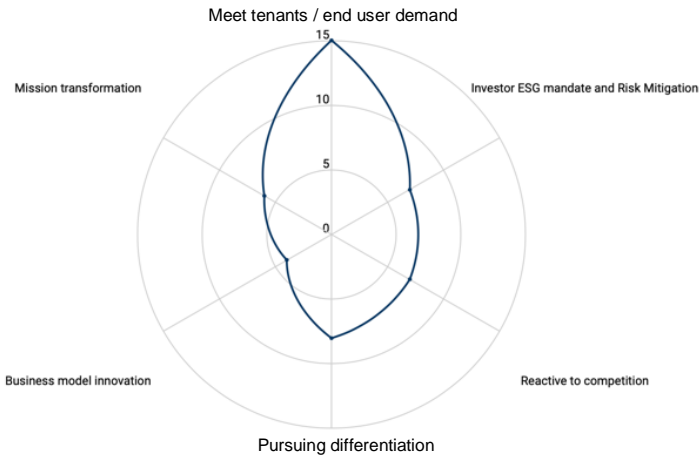
We code their narratives on healthy building strategies and activities into six themes (Figure 10a). Three of these strategies involve reactive risk mitigation. The other three strategies involve proactive exploration of new opportunities. Reactive risk mitigation includes three major strategies. The first is meeting tenant/end-user demand. This is where the bulk of the owner's attention is currently focused. Firms measure building end-user needs via surveys and interviews, and develop performance-driven metrics. They focus on what the end-users would care most about in order to retain them. The second strategy is reacting to investor ESG demand with more strict scrutiny of future risk management plans, especially during the COVID-19 pandemic. The third strategy is reacting to competition. They need to keep pace with the rising standards for healthy buildings to mitigate the risk of losing tenants, reduced

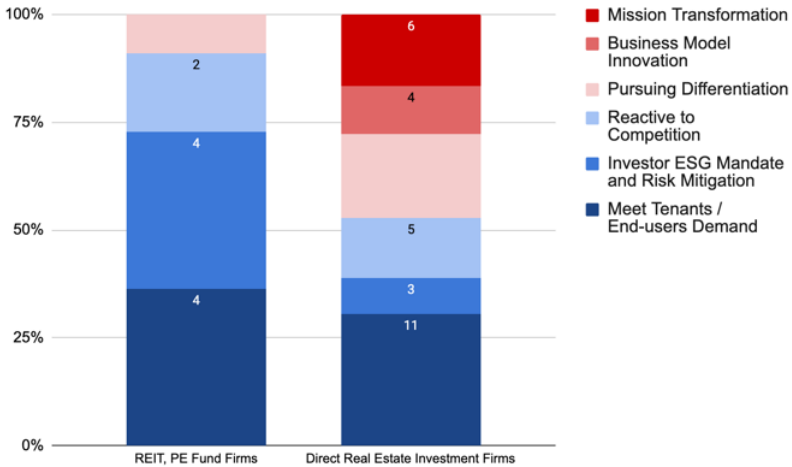
<sup>6</sup> As the interviews took place during the COVID-19 pandemic, interviewees from four companies rated the priorities of healthy buildings during and before the pandemic. To construct the final scores displayed in Table A2, we only use their pre-pandemic scores.

rent in the short to medium terms, and a discounted market price in the long term.

For the proactive exploration of new opportunities, there are three strategies. The first is pursuing differentiation. The firm interviewees think that healthy buildings can be differentiated from the buildings of their competitors through stronger branding and product quality in order to potentially outperform the market. The second proactive strategy is business model innovation, which involves the redefinition of the business scope. Landlords position themselves as place-makers who provide value added services, such as community building and creating business ecosystems that promote a healthy lifestyle. Landlords work closely to integrate the human resources (HR) strategies of their tenants, provide value-added talent attraction, and offer a variety of flexible service options to support the business needs of their tenants. Some landlords provide education workshops to tenants on the prospects of healthy buildings and enable them to obtain relevant certifications more easily. The third proactive strategy is mission transformation. Simply put, landlords are driven by “doing the right thing”. They go beyond the question of operational excellence and further explore if their buildings truly serve the deep development of human health and well-being.

**Figure 10a Strategy Spectrum of Owners**



**Figure 10b Strategies of Owners**

**Notes:** Red hues indicate (proactive strategies), and blue hues indicate (reactive strategies)

Figure 10b shows the variations in the perspectives of the REIT and PE fund firms versus those of the direct real estate firms. The former two are predominantly motivated by asset financial performance and their perspectives are primarily oriented toward risk mitigation and adaptation from investor ESG benchmark requirements, COVID-19 risk mitigation plans, and preventing asset depreciation from competitors and customer demands. They aim to achieve top-of-market standards while only implementing what could be justified by financial models. Three of the four REIT/PE fund firms, compared to just 1 of the 11 direct real estate firms, mentioned the jump in healthy building priority due to COVID-19; they prioritize healthy buildings as a short to medium term response under the pressure of retaining tenants. The REIT/PE fund firms tend to operate on quantitatively measured financial ROI, as indicated or demonstrated in the following quotes: “I think we are a financially engineered, ROI-focused industry. It’s how we make decisions”; “We have to assess the cost and benefit of everything”; and “Without a business case, without actual numbers, a payback which makes sense, nobody will invest in it”. Besides investment return targets and sustainability goals, fund managers need to fulfill their fiduciary responsibility.

Direct real estate firms tend to adopt proactive strategies besides risk mitigation. Nine of the 11 direct real estate firms are motivated by a combination of tangible financial returns and intangible competitive advantage and social value. They experimentally and intuitively make decisions in this emerging market. They are comfortable operating on belief and intuition, as indicated in these quotes: “Lead the way”; “I think you have to believe it and we do...”; and “We really believe in this (...) and we approach every single point of detail with this

in our mind”. Some of them believe that a “healthy” brand or quality may even “outperform the market by creating alpha in the investment”. Proactive firms tend to believe there will be a health-driven market in three to five years, and proactively invest resources to advance their practices and become pioneers in that market. They are currently driven by both believing in long term financial value and social value to lead industry best practices. Meanwhile, they view tenant needs as the main driver, especially retaining talent by creating a better workplace environment.

All of the firms express the importance of quantifying the financial values of the owners. However, they do so for different reasons. The REIT/PE fund firms need to justify ROI. For the direct real estate firms, qualitative or theoretical values are acknowledged but quantification of financial values is required to make healthy building investment sustainable in the long term. Their owners also tend to experiment with many innovations. They need to trade-off among the vast number of choices and achieve cost efficiency. Lack of data and business cases is the main barrier for justifying the value of healthy building investments, as it is challenging to robustly prove the impacts of end-user, tenant, and real estate values.

## 5. Conclusion

Although a standardized definition of healthy building is lacking, the shared understanding of a healthy building lies in its human-centered outcomes. In our interviews, the diversified approaches of the interviewee firms to healthy buildings indicate the complexity and heterogeneity in adopting healthy building attributes. Our global comparison of real estate firms shows little heterogeneity in regional geography. The heterogeneity is instead reflected at two levels: the firm and building levels.

At the firm level, ownership structure (i.e., REIT, PE fund, and direct real estate investment firms) affects the psychology of the adopter differently. The REIT and PE fund firms tend to adopt strategies driven by risk mitigation as their decision-making process is ROI-engineered. The direct real estate firms tend to be more proactive, as they are comfortable acting on “beliefs”. Therefore, their decision-making process may be more friendly to innovations. They are not satisfied with only meeting increasing standards; they wish to lead the market and the standards. A typical mentality is captured by the quote: “from a strategy perspective, we don’t just aspire to meet the standards, we aspire to sort of set the standards”. These market-leading firms are straddling both financial and social values. They are willing to invest in the short term because they think it is the right thing to do and, simultaneously, believe that they have a way of capturing some of the value propositions in the medium and long terms.



The adoption of healthy building attributes is currently driven by a combination of 1) the belief of building owners in the financial benefits of such attributes in the long term, 2) improving their corporate reputation in the eyes of their clients, and 3) social responsibility (“the right thing to do”). This finding is consistent with those in the literature review. Like most social impact assessments, while it is possible to use cost-benefit analysis for healthy buildings, it is difficult to convert many health and well-being benefits into monetary numbers. The existing literature has theoretically measured the financial value of human sentiment and productivity in the office sector, although empirical quantitative studies on real estate value premium are lacking. This presents a barrier for the mainstream market adoption of health-focused BCSs.

At the building level, the differences are driven by two forces. The first is end-user demand, i.e., the industry of the tenants, their way of working, their prioritizing of employee performance, etc. Healthy buildings require landlords to be more closely engaged with the end-users. All of the interviewed firms are working closely with their tenants and end-users to implement healthy practices in building life cycle activities – from design and construction to operation and occupant services. This work involves a variety of considerations, such as creating a physical environment, understanding healthy lifestyles, and building a sense of community. For early adopter tenants (i.e., large multinational enterprise tenants), obtaining health-certified buildings is becoming a prerequisite, and therefore drives the owners to adopt health-focused BCSs early on. The second factor which is at the building level is building conditions; i.e., age of the building, design and mechanical systems, etc.

Ten (of the 15) interviewed firms express that their healthy building strategies vary across their portfolio according to the different building conditions, markets, ownership, and tenant demands. A variety of factors make it difficult to apply universal standards and strategies of healthy buildings. The heterogeneity implies that healthy building attributes cannot be fully captured by the current BCSs. Their market adoption must embrace diverse pathways.

We acknowledge that our research informants are mainly large real estate market players and may present the perspectives of early adopters instead of mainstream players. Furthermore, our analysis mainly focuses at the firm level. Future research on healthy building adoption can be further advanced at both the firm and building levels. At the firm level, when more data are available in the future, one can link quantitative analyses of healthy building adoption with firm decision making mechanisms and how ownership structure affects the decision making process of firms. At the building level, one can further analyze within the portfolio of a firm, how the tenant industry, end-user reference and physical conditions of a building affect the differences in healthy building attributes. These future research topics would continue to provide more insights into a fuller picture of the market adoption of healthy buildings and potential diverse pathways among landlords across building type.

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## Appendices

### Appendix 1 Industry-Initiated Healthy Building Business Cases (2013-2020)

Case Study	Publication	Location	Use	Project Type	Owner(s)	R/Cs Used to Define HB
1 Pacific Northwest National Laboratory	World GBC 2013	Richland, WA, USA	Office (lab)	Retrofit	PNNL (appears to be owner-occupier)	-
2 Refurbishment Reaps Rewards (The GPT Group)	World GBC 2013	Sydney, Australia	Office	New	GPT (appears to be owner-occupier)	Australia Green Star - 6-Star (highest rating)
3 Saint-Gobain	World GBC 2016	Malvern, PA, USA	Office	New	Saint-Gobain (appears to be owner-occupier)	LEED - Platinum (Core & Shell and Commercial Interior)
4 Skanska	World GBC 2016 McCormick 2018 (ULI)	Doncaster, UK	Office	New	Skanska (owner-occupier)	BREEAM - Outstanding
5 Delta Development Group	World GBC 2016	Leiden, the Netherlands	Office	New	Delta Development Group	BREEAM - Excellent
6 stok + BIOME	World GBC 2016	San Francisco, CA, USA	Office	Retrofit	-	-
7 Medibank (Spotlight: Australia)	World GBC 2016	Melbourne, Australia	Office	New	Medibank	Australia Green Star - 6 Star (highest rating)
8 Toronto & Regional Conservation Authority (TRCA)	World GBC 2016	Toronto, Canada	Office	New	TRCA (appears to be owner-occupier)	LEED – Platinum WELL
9 TD Bank Group (TD23)	World GBC 2016 Jones and Laquidara-Carr 2016)	Toronto, Canada	Office	Retrofit	Cadillac Fairview	WELL - Gold (v1) LEED - Platinum

(Continued...)



(Appendix 1 Continued)

	<b>Case Study</b>	<b>Publication</b>	<b>Location</b>	<b>Use</b>	<b>Project Type</b>	<b>Owner(s)</b>	<b>R/Cs Used to Define HB</b>
10	Electrical and Mechanical Services Department HQ (EMSD)	World GBC 2016	Hong Kong, China	Office	Retrofit	EMSD (appears to be owner-occupier)	BEAM Plus - Platinum
11	Shatin Communications and Technology Centre (SCTC) (Spotlight: Hong Kong)	World GBC 2016	Hong Kong, China	Office	New	Hong Kong Jockey Club	BEAM Plus - Gold
12	DLR Group	World GBC 2016	Chicago, IL, USA	Office	New	-	LEED - Gold
13	One Carter Lane	Laski 2018 (WorldGBC)	London, UK	Office	New	-	BREEAM - Excellent SKA - Gold WELL - Gold LEED - Gold
14	Sherwin-Williams Centro America HQ	Laski 2018 (WorldGBC)	San Salvador, El Salvador	Office	Retrofit	-	LEED - Gold
15	Plantronics Office Park at 20 20, Delta Development Group	Laski 2018 (WorldGBC)	Hoofddorp, the Netherlands	Office	New	Plantronics (was the single tenant in one building within a larger office park; bought the building from Delta and became the owner-occupier)	BREEAM-NL - Excellent Leesman+ WELL (registered)
16	Kay Jewelers Pavilion, Akron Children's Hospital (HKS, Inc.)	Laski 2018 (WorldGBC)	Akron, OH, USA	Hospital campus	New	-	LEED - Gold for Healthcare (2009)

(Continued...)

(Appendix 1 Continued)

Case Study	Publication	Location	Use	Project Type	Owner(s)	R/Cs Used to Define HB
17 Double Cove (Henderson Land Development)	Laski 2018 (WorldGBC)	Hong Kong, China	Mixed-use Multifamily Residential	New	Henderson Land Development	LEED - Gold for Neighbourhood Development HK-BEAM - Platinum (v4/04) China Green Building Design Label - 3-Star
18 American Society of Interior Designers (ASID) HQ	Laski 2018 (WorldGBC)	Washington, DC, USA	Office	New	-	LEED - Platinum for Interior Design + Construction (2009) WELL - Platinum
19 Landsec Workplace	Laski 2018 (WorldGBC)	London, UK	Office	Retrofit	Landsec	BREEAM – Outstanding WELL - Silver
20 DPR Construction Office (stok)	Laski 2018 (WorldGBC)	San Francisco, CA, USA	Office	New	DPR	LEED - Platinum (v4) and Net Zero Energy
21 69 Robertson Street (Floth Sustainable Building Consultants)	Laski 2018 (WorldGBC)	Brisbane, Australia	Office	New	Floth	Australia Green Star - 6-Star Design & As Built NABERS IE - 6-Star WELL, Green Star Performance
22 Arup Boston Office	Laski 2018 (WorldGBC) McCormick 2018 (ULI)	Boston, MA, USA	Office	Retrofit	Oxford Properties Group	WELL – Gold LEED - Platinum (ID+C: Commercial Interiors v4) Fitwel - 3-Star
23 Zev Yaroslavsky Family Support Centre	Laski 2018 (WorldGBC)	Los Angeles, CA, USA	Office (government)	New	Los Angeles County (government)	LEED - Gold (2009)

(Continued...)

(Appendix 1 Continued)

	<b>Case Study</b>	<b>Publication</b>	<b>Location</b>	<b>Use</b>	<b>Project Type</b>	<b>Owner(s)</b>	<b>R/Cs Used to Define HB</b>
24	CBRE at MNP Tower	McCormick 2018 (ULI)	Vancouver, Canada	Office	New	Oxford Properties Group	WELL - Gold (Core & Shell and Commercial Interior) LEED - Gold WELL - Silver
25	CBRE at 145 King West Street	McCormick 2018 (ULI)	Toronto, Canada	Office	Retrofit	QuadReal Property Group	WELL - Silver
27	Genentech Building 34 ("the Hub")	McCormick 2018 (ULI)	South San Francisco, CA, USA	"Amenity building"	New	Genentech (owner-occupier)	WELL - Gold (pending) LEED - Gold (v4)
28	National Grid Warwick Office	Carter and Jeffrey 2015	Warwick, UK	Office	Retrofit	National Grid (appears to be owner-occupier)	-
29	Kensington High School for the Creative and Performing Arts	Bernstein et al. 2014 (McGraw Hill Construction)	Philadelphia, PA, USA	Educational	New	The School District of Philadelphia	LEED - Platinum for Schools (v2, 2011)
26	Hollywood Proper Residences	McCormick 2018 (ULI)	Hollywood, CA, USA	Residential Hotel	New	Kilroy Realty Corporation	WELL - Silver Multifamily Residential
30	ECO Modern Flats	Kramer et al. 2014 (ULI)	Fayetteville, AR, USA	Multifamily Residential	Retrofit	Robert Dant, Specialized Real Estate Group	LEED - Platinum
31	Innovation Park	Kramer et al. 2014 (ULI)	Charlotte, NC, USA	Office	Retrofit	BECO South LLC	-

(Continued...)

(Appendix 1 Continued)

	<b>Case Study</b>	<b>Publication</b>	<b>Location</b>	<b>Use</b>	<b>Project Type</b>	<b>Owner(s)</b>	<b>R/Cs Used to Define HB</b>
32	1221 Broadway	Kramer et al. 2014 (ULI)	San Antonio, TX, USA	Mixed-use: Multifamily Residential and Office	Retrofit	AREA Real Estate	-
33	Jackson Walk	Kramer et al. 2014 (ULI)	Jackson, TN, USA	Mixed-use: Retail and Multifamily and Single-family Residential	Retrofit	Healthy Community LLC	-
34	The Century Building	Kramer et al. 2014 (ULI)	Pittsburgh, PA, USA	Mixed-use: Multifamily Residential, Office, and Retail	Retrofit	TREK Development Group	LEED - Gold
35	Via6	Kramer et al. 2014 (ULI)	Seattle, WA, USA	Mixed-use: Multifamily Residential and Retail	New	Pine Street Group LLC	-
36	The Interlace	Kramer et al. 2014 (ULI)	Singapore	Mixed-use: Multifamily Residential and Retail	New	CapitaLand Singapore Limited (CLS)	BCA - Gold Plus (Design)
37	Park 20 20	Kramer et al. 2014 (ULI)	Haarlemmermeer, the Netherlands	Mixed-use: Office, Retail, and Hotel	New	Delta Development Group	-
38	Via Verde (South Bronx)	Kramer et al. 2014 (ULI)	New York, NY, USA	Mixed-use: Multifamily Residential and Hospital	New	Phipps Houses Jonathan Rose Companies	LEED - Gold
39	The Pearl	ULI 2020	Silver Spring, MD, USA	Multifamily Residential	New	The Tower Companies	Fitwel - first ever multifamily certification + early adopter of the Fitwel Viral Response Module

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(Appendix 1 Continued)

	<b>Case Study</b>	<b>Publication</b>	<b>Location</b>	<b>Use</b>	<b>Project Type</b>	<b>Owner(s)</b>	<b>R/Cs Used to Define HB</b>
40	Ponce City Market	ULI 2020	Atlanta, GA, USA	Mixed-use: Retail, Office	Retrofit	Jamestown L.P.	LEED - Gold x3
41	Grow Community	Kramer et al. 2014 (ULI)	Bainbridge Island, WA, USA	Mixed-use master-planned community: Multifamily and Single-family Residential	New	Asani Development	One Planet Community (endorsed)
42	Selendra Rise	Kramer et al. 2014 (ULI)	Casey, Australia	Mixed-use master-planned community: Single-family Residential and Commercial	New	Stockland	-
43	Rancho Sahuarita	Kramer et al. 2014 (ULI)	Tuscon, AZ, USA	Mixed-use master-planned community: Single-family Residential, Retail, and Educational	New	Sharpe & Associates Inc.	-
44	Mueller	Kramer et al. 2014 (ULI)	Austin, TX, USA	Mixed-use master-planned community: Multifamily and Single-family Residential, Retail, and Office	New	Catellus Development Corporation City of Austin (joint project)	-



**Table A2 Values of Owners**

Firm	Financial Value (asset level)				Financial Value (firm level)		Corporate Branding	Social Responsibility
	Rent Premium	Tenant/Rent Retention	Prevent Asset Value Depreciation	Revenue Generation	Investor ESG Benefits	Obtain Green Financing		
NA5					√		√	
NA3		√	√		√			
E3		√	√		√			
E4			√		√			
NA1	√	√					√	√
A2							√	
A4		√					√	
A1		√	√	√		√	√	√
NA4				√				√
A3	√						√	√
A5			√		√	√		
NA2		√	√					√
NA6		√	√		√		√	
E1				√		√	√	√
E2	√		√	√				√

**Table A3** Strategy Spectrums of Owners

Priority (Adjusted)	Firm	Risk Mitigation			Opportunities Exploration		
		Work Closely with Tenants /End-users	Investor ESG Mandate and Risk Management	Reactive to Competition	Pursuing Differentiation	Business Model Innovation	Mission Transformation
3	REIT and NA3	√	√	√			
3	PE Fund NA5	√	√	√			
3	Owners E3	√	√		√		
3	E4	√	√				
4	Direct A4	√		√			
4	Real NA1	√			√		
4	Estate A2	√			√		
5	Owners A1	√	√		√	√	
5.5	NA4	√		√		√	√
6	A5	√	√	√			
6	A3	√			√		√
6	NA2	√			√		√
6	NA6	√	√	√	√		√
6	E1	√			√	√	√
6	E2	√		√		√	√