This paper is premised on a conceptual framework that attempts to draw theoretical and practical connections between sustainability, resilience and adaptation. The framework is explored through a case study of the corporate real estate (property) strategies of Goldman Sachs (GS) – a multinational investment banking and investment management company developed over the course of the consolidation and development of its corporate headquarters. This case seeks to identify the existence and nature of the relationships by and between sustainable corporate real estate strategies, resilient operations planning and the firm’s adaptive capacity. A secondary proposition seeks to evaluate whether the capacity of the firm to adapt and be resilient to changing conditions has been positively advanced by the firm’s sustainable corporate real estate strategies. The findings support the proposition that these connections do exist, as well as the proposition that sustainability was promoting adaptive capacity and operational resilience. However, it remains an open question to what extent these practices and capacities are deterministic of one another. This paper sets the stage for future research that seeks to measure and model organizational adaptive capacity and to understand the potential co-benefits that may serve the interests of firms who struggle to rationalize the costs of sustainability.

Keywords: adaptive capacity, business strategy, corporate governance, corporate real estate, organisational capacity, property development, resilience, sustainability

Introduction

When Hurricane Sandy hit New York City in 2012, news reports were quick to highlight a remarkable photograph by Eduardo Munoz that showed the office towers in Lower Manhattan under a veil of darkness, except for the brightly lit headquarters of Goldman Sachs (GS) located at 200 West Street (the ‘GSHQ’) (Reuters, 2012). How and why did this come to be? This article is premised on a framework that draws the theoretical connections between sustainability, resilience and adaptation. This framework is explored through a case study of the corporate real estate (CRE) strategies of GS – a multinational investment banking and investment management company. These CRE strategies were developed over the course of the consolidation and development of the GS corporate headquarters. The principal research question relates to a fundamental enquiry as to the substantive relationships by and between sustainable CRE strategies, resilient operations planning and the firm’s adaptive capacity. Pursuant to the conceptual framework, the core proposition is that there are positive relationships that do exist whether recognized or not by CRE actors (‘First Proposition’). By extension, a secondary proposition seeks to evaluate whether the capacity of the firm to adapt and be resilient to changing conditions has been positively advanced by the firm’s sustainable CRE strategies (‘Second Proposition’).

The conceptual framework seeks to advance a broader application of adaptation research in an attempt to draw a closer nexus between climate adaptation in the scientific literature (Swart, Biesbroek, & Lourenço, 2014) and economic and organizational adaptation in the literature of various business academies (Hallen, Johanson, & Seyed-Mohamed, 1991; Keeping & Shiers, 2009; Schindehutte & Morris, 2001; Warren-Myers, 2012). Much of the empirical and theoretical work in the management, marketing and finance academies relating to adaptation and adaptive capacity has only been superficially incorporated by climate adaptation researchers (Engle, 2011). This under-evaluated area of inquiry has the potential to serve
reciprocal advances in the respective fields – particular as private enterprise becomes more sophisticated in accommodating changes in business and environmental conditions, which are not necessarily mutually exclusive (Berkhout, Hertin, & Arnell, 2004).

Based on a single firm, this case is only the first step in addressing the validity and generalizability of the framework. However, this case provides a valuable narrative for a firm which is subject to very complex and constantly changing market and business conditions that necessitate constant adaptation. In addition, the CRE strategy is defined, in part, by fairly conventional sustainability goals and practices that suggest potentially more generalizable outcomes. By focusing on the firm’s CRE strategy, this case provides a window into many aspects of the firm’s adaptive capacity, which are insightful across disciplinary boundaries, including organizational culture, communications, intelligence and leadership (Allard & Barber, 2003; Martin & Black, 2006).

The findings of this case suggest that positive and practical relationships between sustainability, resilience and adaptation do exist. However, the extent to which specific actions or strategies are deterministic of outcomes or capacities remains the subject of future research. These findings provide the impetus for future research which will address not only the broader application of the framework but also the key research questions relating to the measuring and modelling of organizational adaptive capacity and the extent to which co-benefits exist between various actions and strategies defined or motivated by sustainability, resilience and/or adaptation. The answers to these questions are key for the advancement of CRE actors who will be called upon to maximize limited resources not only to manage risk but also to create value in the face of evolving economies and changing climates.

**Conceptual framework**

The conceptual framework developed herein attempts to resolve the theoretical conflicts between sustainability and adaptation by acknowledging that resilience and adaptation are theoretically dependent on sustainable resource allocation and are practically benefited by the diffusion of sustainable practices and innovations. It is also conceptualized that a robust adaptive capacity may also reciprocally promote the diffusion and execution of sustainable practices. To understand these conceptual underpinnings it is first useful to explore their practical execution.

Sustainable real estate (property) is defined by investments in technology and design that reduce consumption and promote efficiencies that limit a building’s consumption of resources and minimizes its waste to such an extent that the value created and/or money saved justifies the alternative investment. The practice of the design and management of sustainable real estate has been professionalized and codified over the last 20 years through various systems, including the US Green Building Council’s (USGBC) Leadership in Energy and Environmental Design (LEED) accreditation system (Del Percio, 2004). However, LEED – like many other comparable systems – has not received widespread support by the real estate industry for a number of reasons, including an ambiguous performance record and a failure to justify economically the low returns on cost. For this latter reason, the ambition of the current research to identify co-benefits is particularly relevant. While prescriptive systems have yet to be fully incorporated or developed, fundamental metrics and business cases for sustainable real estate investment have proliferated on a global scale, including those developed by the Property Working Group of the United Nations Environment Programme (UNEP) and the non-profit organization Global Real Estate Sustainability Benchmark (GRESB).

Concepts of adaptation in building design have transitioned from a holistic ethos of context and environment (Brand, 1995) to more technical approaches in adaptive engineered building systems, which have the capacity to transform to alternative operational domains based on changing environmental and user conditions (Brager & de Dear, 1998; Doumis & Caraiscos, 2009; Klein et al., 2012). However, the adaptive capacity of a building should be distinguished from that of an organization, which can be defined, in part, as the ability of an organization to transform its operations in response to known and unanticipated changes so as to promote the stable functions of the organization. The understanding of organizational adaptive capacities within the context of real estate management has largely been overlooked by scholars and practitioners. Despite the varying modalities of execution between sustainability and adaptation in real estate, they share a common goal in promoting efficient performance of a building over the course of the building’s life cycle, as well as in the promotion of positive health and environmental conditions for building users and associated environments.

However, CRE extends beyond considerations of the performance of a building in that it is often both the delivery of a product (i.e., real estate) and a service (i.e., facilities, IT, etc.). In this regard, CRE is closely connected to all aspects of a firm from the culture the organization engenders (Duffy, 1974, 2000) to the operations it supports through its facilities (O’Mara, 1999; Singer, Bossink, & Vande Putte, 2007). Therefore, it can be argued that not only is CRE closely connected with the operations of a firm, but also it is critical to the capacity of that firm to accommodate
changes in its operations and hence its business model(s). As firms are dependent on the evolutionary economy of markets, they are uniquely dependent on their CRE operations and strategies to respond, to adapt and to even add value (Krumm, Dewulf, & De Jonge, 1998; Lindholm, Gibler, & Leväinen, 2006; Reeves & Deimler, 2011). To this end, there has been no theoretical or empirical research into the relationship between CRE strategy and the adaptive capacity of a firm. Until now, these spheres of practice have been conceptualized to be independent of each other. The following framework seeks to resolve their theoretical conflicts in order to draw the practical connections by and between sustainability and adaptation, as well as the closely related concept of resilience.

Conflict in sustainability and adaptation

It is helpful to draw conceptual distinctions by and between sustainability and adaptation, as the contradictory and complimentary aspects of each line of thought are underappreciated by the science and business academies. In many ways, adaptation and resilience are the endpoint of a continuous environmental discourse that began with the environmental protection movement in the 1960s (Finkbeiner, Schau, Lehmann, & Traverso, 2010). Table 1 highlights the many aspects that sustainability and adaptation/resilience share, including a broader framework oriented towards resource trade-offs, cooperation and a focus on products, processes and innovation. In more immediate terms, the ends to these common values are seemingly drawn only by the distinction between climate mitigation and risk mitigation.

However, the conceptual conflict between sustainability and adaptation has been widely cited in various domains of scientific literature. While the definitions may vary significantly depending on the agency or application, in this context, sustainability is

a human intervention that is imposed on a system as part of a human activity and is totally controlled and managed by humans in order to preserve the system in a state that is desired.

(Voinov & Farley, 2007, p. 105)

The climate science academy defines adaptation as the ‘adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits mutual opportunities’ (International Panel on Climate Change (IPCC), 2007, p. 869). This adjustment is conceptualized as the ability of a host (e.g., firm) to transform across alternate domains of operation based on both internal and external designs (Keenan, 2014; Vogus & Sutcliffe, 2007; Woods & Wreathall, 2008). A more holistic definition of adaptation:

involve[s] both building adaptive capacity thereby increasing the ability of individuals, groups, or organizations to adapt to changes, and implementing adaptation decisions, i.e., transforming that capacity into action.

(Adger, Arnell, & Tompkins, 2005, p. 78, added emphasis)

As will be discussed below, it is the capacity of an organization to adapt that is the useful reference for this framework.

Resilience is defined as the elasticity function of a host to maintain its status quo operations based on internal designs (Gunderson, 2003; Laprie, 2008; Lee, Vargo, & Seville, 2013). Likewise, resiliency is conceptualized to have a threshold in that not all hosts can be ‘100

Table 1 Paradigm shift from environmental protection to adaptation

| Characteristics | Environmental protection | Sustainability | Adaptation/resilience |
|-----------------|--------------------------|----------------|-----------------------|
| Social construction | Control risks and immediate hazards | Triple bottom-line balancing | Manage risks and long-term hazards |
| Primary policy principle | Command and control | Resource tradeoffs (natural capital) | Resource tradeoffs (human and financial capital) |
| Actors | Governments and industry | Multi-actor | Multi-actor |
| Policy setting | Confrontation | Cooperation | Cooperation |
| Tasks | Individual solutions | System solutions for individuals | Individual solutions for systems |
| Principle for action | Reactive | Proactive | Reactive and proactive |
| Primary scope | Local, national | Global | Local |
| Focus | Production and single processes | Products and process networks | Products and process networks |
| Technology | Separate process, end of pipe | Integrated processes, innovations | Integrated processes, innovations |

Note: Adapted from Finkbeiner et al.
percent resilient to all changes [...] that threshold adaptation is the only option’ (Wiggins, 2009, p. 79). Therefore, the transformational capacity of adaptation mandates a new type of consumption and/or performance in an alternate domain in contrast to resilience that speaks of the elasticity of a host to revert to the status quo. For example, a coastal town may adapt by relocating to a new geography when sea level rise overtakes their resilient flood defences.

While resiliency and sustainability may be oriented towards the status quo operations of a system, resiliency is positioned within the conservation (k) phase of an adaptive cycle with the acknowledgement that there will ultimately be a release (Ω) of capital within the cycle (Holling, 1986).1 In the context of real estate, buildings have been argued to fall within an adaptive cycle as the building and its systems depreciate and/or are otherwise recapitalized with the acknowledgement that a building will eventually be torn down and the capital will be reallocated to a new development (Keenan, 2014). However, some researchers have suggested that sustainability is fundamentally oriented towards breaking the adaptive cycle. Voinov and Farley (2007, p. 106) argue that:

> Within the framework for the renewal [i.e., reorganization (α)] cycle, sustainability would conventionally be interpreted as the goal of breaking the cycle, of extending a certain stage in the system. [...] Many economists talk about sustainable growth, which implies an indefinite extension of the growth cycle. The more cognizant of the laws of thermodynamics recognize that all physical production requires raw material inputs, so that sustainable growth in the physical output of an economy is a thermodynamically impossible oxymoron. Sustainability in this case implies an indefinite extension of the conservation stage. Both approaches are in distinct contrast with the renewal cycle, in which growth and conservation are followed by breakdown, release and recombination.

As the authors highlight, empirical evidence suggests that perpetuation of the sustainability of one system often comes at the cost of decreasing sustainability in subsystems, global systems or both (Voinov & Farley, 2007, p. 107). More specifically, sustainable conservation may be maladaptive (Werners et al., 2013). Examples of this include scenarios where countries that promote sustainable timber practices end up deforesting other counties with less formal sustainability requirements (Mayer, Kauppi, Angelstam, Zhang, & Tikka, 2005; Perlez & Suhartono, 2006). To this end, some have observed that the efficiency-seeking applications of sustainability rarely keep up with the gains in consumption (Hockerts, 2001). Therefore, in these cases, to promote the stability of a global timber ecosystem, these countries must adapt by transforming to alternate domains (i.e., consume less timber). However, this counterpoint highlights the limitations of adaptation, as consuming less timber may result in consuming more plastics or steel, for example. Therefore, conversely, adaptation may conflict with sustainability in that alternative domains of operation and/or consumption may have unintended consequences for destabilizing other systems from which hosts (e.g., construction firms) may be dependent or co-dependent (Preston, Dow, & Berkhout, 2013).

Preston et al. (2013) conceptualize this adaptation frontier ‘not as discrete and static threshold, but rather an uncertainty or probability space characterized by a gradient that reflects increasing likelihood of crossing into an unsafe operation space’ (p. 1014), that might result in loss or failure. Therefore, adaptation may be reliant on the periodic sustainability of certain systems to provide the resources and capital for the adaptation processes that prevent the subject host and/or system from crossing the frontier that results in loss or failure. This same logic may also extend to resiliency, which is dependent on resource availability and allocation for the preservation of the status quo after slack has been consumed. In carrying forward the adaptation example above, it would theoretically require the sustainability of a regional labour economy to support the adaptive relocation of the coastal town. Figure 1 highlights both the resiliency threshold and the adaptation frontier as contextualized by the variability of sustainability that theoretically cuts across all states to influence the continuum by and between stability and failure. The nature to which sustainability influences these states is a core question at the heart of this research.

**Adaptation, resiliency and sustainability in business**

The concept of preventing loss or failure has been at the heart of the study of adaptation within the business academies. Early work in strategic organizational scholarship focused on the belief system of managers and the extent to which reorientation of management beliefs and styles contributed to the turn-around of firms in crisis (Grinyer & Spender, 1979; Miles, Snow, Meyer, & Coleman, 1978). The empirical research then shifted to a focus on (1) strategic management and marketing and the relationship between firms, suppliers and customers and (2) the firm’s capability to fit within a market niche or to localize global standards (Hallen et al., 1991; Lukas, 1999). The focus on the former aspect with regard to inter-firm relationships then shifted to further development in the processes of modelling the modes of negotiation and communication between firms, as firms adapted in parallel sequence to changing conditions in a market that were fairly uniform in their impact (Canning & Hanmer-Lloyd, 2002).
Similar analytical models were also applied in the evaluation of firms who were adapting to new markets – particularly markets oriented towards new technology and innovation (Andries & Debackere, 2007; Chesbrough & Rosenbloom, 2002; Di Valentín, Emrich, Werth, & Loos, 2012). The analytical elements within this literature revolve around the strategy of the firm, the capacity or resources to execute that strategy and the network or market intelligence gathering capacities of the firm (Di Valentín et al., 2012). This is in very close parallel to Keenan’s (2015) analytical framework for adaptive capacity, which is focused on a tripartite analysis of (1) the firm’s organizational and human intelligence, (2) the firm’s strategy and (3) the firm’s space of decisions. The ‘space of decisions’ is defined as the range of resources and capabilities which may be feasibly utilized to advance a particular intended or emergent strategy. As will be discussed, it is this framework from which the adaptive capacity of the subject firm will be referenced.

It is also worth highlighting the role of the application of resiliency in the business scholarship. In returning to the heuristic of resiliency relating to the elastic functions of a firm, resiliency has been co-opted in the literature with reference to a firm’s ability to manage crises and occurrences of shock or market disruption (Bhamra, Dani, & Burnard, 2011). This research has also been scaled up to analyze supply chain networks, such as the significant global supply chain disruptions following the Great Japan Earthquake of 2011 (Todo, Nakajima, & Matous, 2014). Resiliency case studies have even been extended to firms subject to a spate of data breaches (Müller, Koslowski, & Accorsi, 2013). Likewise, the crisis events of 9/11 and the recent global financial collapse have also spawned a global management consulting practice in enterprise resiliency (Jüttner & Maklan, 2011; Starr, Newfrock, & Delurey, 2003). A review of this literature suggests an analytical approach very similar to the intent of the early scholarship in adaptation relating to the temporality of crises but with the strategic elements of the later scholarship. Citing Comfort, Sungu, Johnson, and Dunn (2001), Bhamra, Dani, and Burnard (2011) summarize the practical and applied distinction between adaptation and resiliency when they postulate:
[W]hen an environment’s complexity increases, possibly through high impact or disruptive events, a system’s performance decreases, as the system is unable to process the amount and range of information to adequately establish the coordination required across the components of the system response. This is a result of the system requiring a significant increase in information exchange, communication, and coordination in order to integrate the multiple levels of system operation and decisions caused by the increase in environmental and system complexity. As a result of this, in order to establish a strategy for reducing risk in uncertain environments, [...] a system should create a balance between anticipation or preparedness [i.e., adaptive capacity] and resilience.

(p. 5385)

The practical application of organizational resilience relates to business continuity planning (BCP). As such, this case focuses on BCP as a proxy for the larger resilience of the subject firm. The authors above cite the necessity for information exchange and communication, which is also critical to a firm’s adaptive capacity. Therefore, a robust adaptive capacity may also strengthen a firm’s resiliency. The distinction is that BCP seeks to maintain the status quo operations of the firm – usually to a specific anticipated event or risk – and a firm’s adaptive capacity can be referenced to a dynamic transformational capacity to accommodate the often evolutionary and/or continuous changes in markets or even climate change. This important distinction in time, mode and frequency of risk is consistent with the emerging scholarship which attempts to balance resiliency and adaption of businesses in the face of systematic and periodic risks stemming from climate change (Akgün & Keskin, 2014; Linnenluecke & Griffiths, 2010, 2015; Thompson & Matthews, 2012; Weinhofer & Busch, 2013).

While the literature in adaptation and resilience in private enterprise is emerging, it is overshadowed by the dominant and comparatively more mature paradigm of sustainability. There are few consistently applied definitions of corporate sustainability and it has been questioned whether it is even desirable to have one (Constantinescu & Kaptein, 2015). To this end, sustainability in corporate governance is a significant area of enquiry well beyond the scope of this article (generally, see Crane & Matten, 2010). Some have even argued that corporate sustainability is obsolete as an independent construct as sustainable operations and strategies are simply just good business practices (personal interview with K. Parker, 4 February 2015). Based largely on the widely cited Brundtland Report (Brundtland, 1987), Hockerts (2001) opines that:

[a] strategy for corporate sustainability must meet the needs of a firm’s stakeholders without comprising its ability to also meet the needs of future stakeholders. Firms must develop a capability to anticipate change in the needs of their stakeholders. They must also acquire the capacity to adapt their strategy to the new requirements.

(p. 3, added emphasis)

It is with this definition that we come full circle in conceptualizing a link by and between sustainability and adaptation. Although sustainability herein is referenced to the strategies and applications of sustainable CRE, it is conceptually consistent to also conceive in broader terms that one function of sustainability is the requirement to adapt.

Applied relationship between sustainability and adaptation

In order to reconcile the theoretical conflicts between adaptation and sustainability, it is necessary to acknowledge for purposes of this framework: (1) that sustainability is not perpetual, as a sustainable host or system (i.e., building) fits within an adaptive cycle and (2) that adaptation – including the adaptive capacity of a firm – is dependent on the periodic sustainability of resources to offset the costs of change. If true, this framework would suggest some sustainability actions could promote the adaptive capacity of the firm because the firm’s ability to adapt to changing markets or environment is partially dependent on the sustained viability, flexibility and transformability of the firm’s real estate and facilities. In addition, as previously referenced, a robust adaptive capacity is also likely to promote a firm’s resilience. Finally, it is also logical to argue that a robust adaptive capacity could promote sustainability because it provides the intelligence and communications tools to identify what resources or investments should be sustained.

As represented in Figure 2, it is conceptualized that sustainability, resilience and adaptation are potentially in dynamic relation to one another along a continuum of stable and unstable states. The firm has been conceptually and graphically divided between CRE and revenue operations, as sustainable behaviour of revenue based actors within the firm are not subject to evaluation in the case. However, these behaviours are potentially important contributors to identifying and accounting for innovation and alternative values by CRE actors – a potentially valuable area of future research. Specifically, because sustainability is a known objective and strategy at the beginning of this research, it is propositioned that sustainable strategies could be a deterministic driver of the promotion of both adaptive capacity and resilient operations. This case seeks to explore the exact relationship of these
phenomena so as to highlight the potential validity and application of the conceptual framework.

**Research design and method**

The research design of the empirical portion of this research is based on an exploratory descriptive case study. This case study research was undertaken over the course of two-and-a-half years and involved alternating periods of internal and external investigation (Gerring, 2007; Yin, 2014). The initial exploratory intent of the case was narrowed after a year to focus on the sustainable practices and adaptive capacities of the firm consistent with the aforementioned propositions. Thereafter, the theoretical framework was developed and refined pursuant to a parallel review of literature that was reinforced by ongoing external theoretical and empirical research in adaptive capacity. The case study research was initiated with a review of internally and externally sourced documents relating to the design, construction, development and operations of the GSHQ and GS’s various global facilities. External interviews were undertaken with CRE professionals external to the subject firm on general topics relating to the positioning of the financial service industry’s CRE practices and strategies. These initial interviews ($n = 12$) were semi-structured and intended to provide context for understanding and interpreting the CRE strategy identified in the internally sourced documentation. These external interviewees were not made privy to the identity of the subject firm. The document review and the external interviews provided a foundation for developing a timeline and an initial narrative as to the nature of the design and development of the various facilities, as well as to some objective reasoning behind such actions. Documents included design guidelines, operations guidelines, contractor produced memorandum and reports, published press, internal communications and firm-generated presentations and media. Finally, detailed site visits to GS facilities were undertaken at different periods to observe operations and design elements.

The principal method for data collection came through a series of semi-structured interviews with a variety of firm personnel including the Global Head of Corporate

![Figure 2](image_url)

**Figure 2** Range of conceptual relationships evaluated between sustainable real estate, business continuity planning and adaptive capacity

- $\sigma$ = stable state / status quo
- $\sigma^*$ = alternate domain of consumption / operation
- $\alpha$ = unknown quality or quantity of sustainable real estate applications
- $f$ = host / firm
- $f^P$ = business continuity planning capacity
- $f^A$ = adaptive capacity
- $f_o^f$ = state of failure / loss
- $\square$ = Revenue Operations of Firm
- $\bigcirc$ = Firm Corporate Real Estate
Internally sourced data. Regulated through third-party interviews, although some internally collected data were generally not triangulated with data collected from internal interviews or through the document review. To clarify on data as they were collected through multiple interviews were undertaken to provide greater triangulation and internally sourced documentation. However, due to the proprietary nature of the subject of this case, internally collected data were generally not triangulated through third-party interviews, although some data from third-party interviews helped triangulate internally sourced data.

Case narrative
Urban strategy

In line with the tremendous economic growth in the US in the 1990s, GS had expanded its principal business operations into seven buildings accounting for over 278 000 m² in Lower Manhattan by the turn of the century. When GS went public in 1999, there began to emerge internal recognition that the firm must transition to become more competitive and efficient in the housing and delivery of its operations. The piecemeal legacy system of different divisions in different buildings resulted in highly inefficient use of space in older buildings with nearly unabated energy and infrastructure costs. In response, the initial strategy centred on a new consolidated corporate campus across the Hudson River in Jersey City, New Jersey, which began construction in early 2001.

However, the events of 9/11 ushered in a new era of contemplation as to the future of Lower Manhattan and GS’s position there. With the loss of nearly 1 million m² of space on 9/11, many firms had no other choice but to relocate to midtown and other suburban locations. As early as 2002, the firm had decided to make a commitment to revitalizing Lower Manhattan with the construction of a new headquarters building that would allow the firm to consolidate its operations. However, with the push to develop the GSHQ in Lower Manhattan, the firm was forced to down-scale its Jersey City campus development at 30 Hudson Street by nearly US$1 billion. The firm carried forward the concept of a campus by conceptualizing an integrated continuum between GSHQ and 30 Hudson Street, which would be connected across the Hudson River by firm-operated ferries. While the larger urban strategy highlights some of the initial logics (i.e., efficiency and consolidation) of the firm’s strategy, the more finite nature of the firm’s CRE strategy is best understood in the design and development of the GSHQ itself, as well as in guidelines and practices which would later be translated to facilities across the globe.

Consolidation strategy and firm culture

To lead this consolidation strategy, in 2002 the firm brought in a leading CRE executive from the Walt Disney Company. In shaping a transformational repurposing of CRE, facilities and services, the Global Head of CSRE immediately recognized the analytical capacity of the firm as a tremendous cultural strength that could be utilized to rationalize and communicate ‘the facts’. While the executive anticipated some measure of resistance to the consolidation efforts and the changes they engendered – particularly those relating to the consolidation of the workplace as strategized by the firm – this propensity for the facts helped create a pathway for effective change management. He highlighted the deeply engrained cultural attributes of the firm to ‘respect the facts’ and to harness its analytical capacity utilized in the markets to solve its own internal management and operations challenges.

To this end, six of the top level executives within CSRE regularly cited the cross-divisional aspects of the firm as being a major advantage in a variety of aspects ranging from planning and development of facilities to the contracting of third-party vendors. Although the firm is organized into revenue and non-revenue divisions with some measure of autonomy, interviewees consistently cited a general culture of collaboration, which was cited as flexibly moving across organizational delineations on paper. Several interviewees speculated that the ever-changing aspects of the diverse markets and lines of business of the firm contributed to the necessity to build a culture that facilitated the allocation and movement of resources by and between more conventional organizational structures. However, a senior facilities manager noted:

[t]his was not always the case [leading into the late 1990s] when different [units] of the firm operated almost completely independent of each other and often competed for resources and space.

While the culture of the firm was cited as amenable to change, the complexity of the larger consolidation strategy required an equally complex change management regime to execute. Therefore, it was one thing
to know and respect the facts and an entirely different process to communicate the relevance of those facts to the right people. A senior CSRE staff member observed:

[They] faced a significant pushback from senior staff who felt entitled to their personal space and this presented a challenge to the formulation and execution of any change management plan.

One fact at the core of the transition revolved around the costs to the bottom line of excessive consumption. The firm’s per capita occupancy expenses were nearly double those of the financial services industry in Manhattan. Prior to occupying the GSHQ and 30 Hudson Street, the per seat expense for occupied seats was approximately US$37,500 (PV) a year. By 2014, those costs were down to nearly US$20,000 (PV). The cost per occupied seat was an aggregate metric that accounted for energy, taxes and a weighted distribution of owned versus rented space. However, it was very clear that:

these [rented] buildings were older and simply didn’t have the infrastructure to support the IT [information technology] growth of the firm, and the expenses of upgrading the infrastructure were cost prohibitive given our lease structure

said a senior capital projects manager. Combined energy and IT costs were determined to be the underlying cost drivers for justifying the consolidation strategy. Therefore, the sustainability and resiliency of these systems were a top priority from the early stages of the conceptual design.

The consolidation strategy included the development of protocols oriented around a pyramid concept, which prescribed the allocation of personal and working space for every level of employee within the firm. Going forward, with very few exceptions, only the highest ranking partners of the firm would be able to avail themselves of a private office – and, only in one city. Thereafter, interior, yet senior positions, such as directors and vice-presidents would be obligated to work in a much more efficient modularized open-plan office setting. While this change faced some elements of pushback derived from cultural entitlements of senior employees, the clearly articulated facts relating to global standards, the anticipated efficiency of operations and the indirect costs of excessive consumption were communicated as part of the change management strategy.

It is worth noting that this pyramid protocol was observed to be one of the few highly rigid codifications of the CSRE strategy. Each of the foregoing plans and protocols were observed by interviewees as highly dynamic and in a constant state of evolution. For instance, ongoing data reporting and experimentation were often cited as drivers for modifications of the various guidelines, which cover all aspects of the workplace, workspace and facilities operations. Senior executives recited the positioning of a value system that allowed for a type of executive legislative intent to guide a fluid range of parameters for the guidelines and protocol. As such, the fixed objective structure existed to support and inform fluid subjective judgments. One of the guiding values which translated from the executive management down was the value system behind sustainability.

**Sustainability and efficiency**

Sustainability was broadly interpreted across CSRE division, with the most consistent heuristic relating to efficiency first and the moralism of environmental stewardship second. ‘From the point of view of [CSRE], the principal priority is to support the profitability of [the firm],’ explained the global head of CSRE. While sustainability within building design and performance was deemed critical, the firm also acknowledged the necessity for behaviour modification in the use of the facilities and the consumptions of services. This ambition even extended to the advancement of alternative, more efficient states of thermal conditioning. Each of these sustainability measures were evaluated in terms of the bottom-line implications, which were often represented as savings of cents on the square foot, with the acknowledgment that small incremental actions aggregated to significant savings. Ultimately, the energy costs post-consolidation were nearly cut in half when controlled for varying rates of technology usage.

Another value set that ran parallel to sustainability was flexibility and efficiency. As the firm had grown, contracted and adapted to various business models, CSRE metrics were highly sensitive to slack in the system. This was particularly relevant when, in 2008, the firm converted to a bank holding company. This conversion resulted in a new demand for compliance spaces for the physical separation of units out of the legal obligation to minimize the risk of potential conflicts of interest. One observed implication of this new category of space was its inherent lack of flexibility. To help manage both non-compliance and compliance spaces, reporting and internal controls initially designed to promote sustainable consumption were adapted. Therefore, if a unit was over-consuming what would later be determined to be under-utilized space, that division was financially responsible for that slack. ‘[Revenue units] could no longer simply have empty sections of floors for long periods of time when they were in a down cycle,’ observed one CSRE staff member responsible for reporting. This was a significant change from prior consolidation events where divisions would expand and contract into and out of
entire floors of office buildings with little internal accountability. This transformational event (i.e., bank conversion) for the CRE system highlights the relative robustness of the adaptive capacity of the firm to the extent that modularity of interior designs and operational controls were able to facilitate new space constraints as the business models adapted to changing market and/or regulatory conditions. Ultimately, this adaptation was benefited by interventions which were initially motivated by sustainability.

**Designing sustainability and efficiency**

In returning to the design of the GSHQ and 30 Hudson Street, these projects provided an opportunity to set design and operations standards that would become the framework for CSRE assets comprising over 1 million m$^2$ in 160 offices, in 98 cities across 31 countries. To promote greater degrees of flexibility and operating efficiency, every aspect of the size, timing, dimensions and materiality of the operations of the firm were measured. Contrary to the conventions of CRE, the firm identified these parameters prior to fully engaging architects. Engineering disciplines were brought in during the internal assessments to provide spatial parameters to the fixed systems. It was these parametric rule sets that would guide the designs of the architects. It was cited that the precision of these measurements in other global facilities developments would later shave many square feet off of ongoing designs and would result in millions of dollars of annual savings that would have been spent on un- or under-utilized space.

One application of these sustainability efforts led to the standardization of the workspace – often with some measure of material modularity. To accomplish this, various experiments with removing personal storage, trashcans and printers were undertaken at the time of planning. For instance, the contents of file cabinets were systematically surveyed and classified so as to better understand what aspects of the workflow absolutely required paper storage versus alternative digital storage. As a consequence, personal file storage was largely removed, and printers were set up for each work group. Systematically removing paper from the workplace reduced a tremendous amount of weight on the structure and reduced wear and tear on the facilities for the moving and storage of the paper. Second, it reduced the thermal mass and load of the building, as the costs of unnecessarily heating and cooling paper were significant. It was also speculated by some of the interviewees that, by forcing employees to get up and walk to critical storage and printing facilities, there were likely positive implications in terms of occupational health. Specifically, the levels of occupational health regulation relating to the workplace in London were observed to have positive reciprocal influences which translated to other office locations outside of London. While there were little empirical data to support overall productivity gains (e.g., fewer sick days) by encouraging physical activity, a positive implication for occupational health could have immediate implications for the resilient operations of the firm.

Beyond the workspace, the firm expended significant efforts in evaluating the dynamic operations of various units, including a sensitivity to each unit’s historic variability in space and service consumption. A process of reverse engineering workflows, consistent with contemporary space planning practices, were undertaken at a variety of scales. These performance parameters were integrated with the material prescriptions of the workspace to formulate a set of working operational plans that provided the basis for more sophisticated parallel processes of evaluation by various engineering practices ranging from electrical heating, ventilation and air-conditioning (HVAC). It was only after the operations planning and engineering performance requirements were resolved that architects were fully engaged.

During the process of developing the larger CRE strategy, an additional transformational change occurred: cloud computing. At the beginning of the process, computers were assumed to be fairly constant in their space, energy and support requirements. However, with the evolution of cloud technology, the decentralized processing technology and the requirements of greater robustness in BCP, the idea of the desktop computer soon became nearly obsolete. This significantly challenged the spatial and operational parameters of the workplace and the workplace. Again, this technological disruption highlights the relative robustness of the firm’s adaptive capacity by virtue of CSRE making a transition across multiple integrated operational platforms in a fairly short amount of time with little reported disruption to operations.

Integrated coordination between IT, facilities and operations was cited as critical to accommodating this change – particularly as it related to systematic calibration of building systems to accommodate alternative thermal and energy loads. A senior IT and facilities manager observed:

> [This] shift in understanding the implications of cloud computing happened late in the design process. But, the existing channels of [integrated] communication allowed us to make some accommodation – although many aspects were incorporated post-construction.

In fact, cloud computing was internally referenced as a sustainable application by virtue of the energy savings. Desktop computers simply consume a lot of energy and produce a lot of heat. This change was also internally referenced to promote flexibility for workplace
management. This allowed the firm to adapt by experimenting in some divisions with the policy of being seated in patterns consistent with temporary work groups or randomly assigned based on availability. Cloud computing also allowed for the promotion of working off-site which represented a larger CRE trend and was also internally referenced as a significant advantage for BCP. ‘During [Hurricane] Sandy, nearly everyone was able to work from home that week,’ noted one facilities engineer. This would not have been possible prior to not only cloud computing but secure cloud computing. However, interviewees expressed some ambiguity about the extent to which off-site working would proliferate or was otherwise desirable. Some argued for its efficiency and others argued that it thwarted the collectivity embedded in firm culture. To this latter point, off-site working may conceptually work to reduce the resilience of the firm.

While this process of seat assignment experimentation is still ongoing across various units, it was cited as having significant potential in helping units better manage their spaces, which are always subject to some measure of expansion and contraction incidental to changing market conditions. This type of experimentation speaks to the larger fluidity of protocol and guidelines, which were cited as adaptable to changing circumstances. ‘The [firm] prefers guidelines over rigid protocols,’ noted a CSRE staff member. With the design and development of GSHQ as a platform for memorializing, validating and calibrating these practices, their dynamic nature is interpreted, as will be discussed, as an outcome of the arguably robust adaptive capacity of the firm motivated by sustainability.

Discussion

This case features several moments of shock (i.e., Hurricane Sandy) or transformational change (i.e., banking conversion and cloud computing), which highlight the conceptual connections referenced in the framework. Perhaps the clearest connections are defined by actions motivated by sustainability logics which promote operational resilience. The material, operational and computing actions at the scale of the workspace and workplace all lead to greater flexibility that promotes resilient operations. Whether it is a more tenuous connection between physical activity and absenteeism or a very clear connection between computing and remote working, actions motivated by sustainability that promote the stability of workers and their work promote resilience. Likewise, the firm’s adaptive capacity defined in terms of cultural elements that promote cross-cutting analysis and communication also positively promoted resilience, as exemplified by the cited collaboration in successfully weathering Hurricane Sandy. However, these very same sustainability and resiliency attributes can be said to reciprocally promote adaptive capacity. Therefore, it is necessary to explore the parameters of the firm’s adaptive capacity before understanding its complex relationship with the sustainability aspects of the CSRE strategy.

Adaptive capacity

Consistent with Keenan’s (2015) framework for adaptive capacity, the findings of the case can be broken down into several analytical elements. First, the organizational and human intelligence of the firm were observed to be robust. Interviewees regularly cited the cross-divisional capacity of the firm to utilize its analytical power to addresses problems for which the investment in such analytical functions was not originally intended. An example of this includes traders using algorithms to better understand and model internal circulation to maximize efficiency and minimize trip times. Other aspects relate to the culture of the firm to respect ‘the facts’ and to reduce systematically management biases in favour of objective analysis based on a vast collection of data – often premised on an experimental basis. As one CSRE staff member responsible for data collection observed:

...we aren’t quite sure what to do with all of this data sometimes. […] But, we are constantly thinking of new ways to make the data [we have] useful without being a burden on other [units] to comply with additional reporting.

These phenomena highlight a cultural element of the firm that suggests that information may be more readily transmitted across heterophilous units of the firm and filtered between signals and noise. This cultural of collaboration was cited as being solidified as a consequence of the sustainability driven CRE strategy that fostered open exchange. Collectively, these attributes speak to a robust organizational intelligence for identifying and managing change.

The other two analytical prongs of the cited adaptive capacity framework – strategy and space of decisions – are limited in this case to the CRE strategies and not the strategies and operations of the revenue side of the firm. In addition, the decision space which gave parameters to the range of resources available for the execution CSRE’s strategies was referenced by internal and external interviewees and reviewers to be on par with other similarly scaled firms. This highlights a limitation to Keenan’s analytical framework in that a strategic evaluation of adaptive capacity is only somewhat useful for evaluating in isolation in absolute terms (unless a particular innovation is discovered) and is most useful or relevant when referenced to specific experiences and/or strategies across multiple firms (Keenan, 2015). However, this limitation sets the stage for future research which could evaluate these.
Sustainability supports adaptive capacity

Consistent with the Second Proposition, evidence suggests that sustainability driven strategies did promote the adaptive capacity of the firm. This relationship was reinforced by horizontal communication and organization, but the initiating motivation was from top-down leadership. As a matter of corporate governance, GS made a commitment to incorporate sustainable practices across the firm and specifically in its CSRE division. This was more formally made with the utilization of LEED and its international equivalents in its design and construction of facilities, including the GSHQ. However, there were many other elements of sustainability which were not codified in LEED. A senior facilities engineer noted: ‘We were very aware of the systematic limitations of LEED and we thought we could build a system that was far superior [in its performance].’ Collectively, these sustainability actions were rationalized primarily in terms of bottom-line economic and resource efficiencies. As previously noted, outdated leased facilities with inefficient energy performance were a primary cost driver for consolidation and a subsequent important value for future design. This case highlights a number of sustainability applications which arguably advanced the adaptive capacity of the firm.

As listed in Table 2, the first example of sustainability relates to the planning of design and workplace standards which reduced paper, furniture and material consumption. The process of planning a workflow and workspace around less paper actually advanced the adaptive capacity of the firm. This was highlighted with the disruptive transition to cloud computing. Although sustainable workplace planning did not originate cloud technology incorporation, it helped make the transition much smoother by conditioning behaviour and designing a workspace and workflow for a purely digital interface. This correlation was observed by a number of interviewees. Likewise, the incorporation of cloud computing was internally rationalized as sustainable by virtue of the reduction in power consumption. As a consequence, it was believed that the adaptive capacity of the firm was enhanced for a number of reasons. First, it allowed greater flexibility within the firm to move people around as projects and work groups evolved and changed. Second, it allowed a greater transmission of information across the firm. Prior to consolidation, it was not uncommon to have ‘entirely separate server systems [for different units] that were not interoperable,’ as one IT engineer reflected.

A similar set of logics can be extended to the sustainable designs of having less furniture and utilizing current furniture more efficiently. The modularity of the furniture advances the adaptive capacity of the firm by virtue of a great flexibility and predictability for moving people around as operational changes so dictate. It allows spaces to be more easily manipulated so as to also accommodate people who may otherwise have more static space constraints, as was the case for the aforementioned compliance spaces. A CSRE staff member responsible for seat assignments commented:

> Our playbooks [i.e., guidelines] for operations were integrated right down to the [modular] furniture on the floors […] and this allowed us much more flexibility in planning for [unit] needs over varying time frames.

The sustainable reduction in consumption that advanced adaptive capacity occurred at two additional scales. First, the larger urban strategy for campus consolidation greatly reduced consumption in terms of per capita energy, water and material consumption. However, it also made for a much more efficient platform for flexibly managing the repositioning of people who are all subject to the same ecosystem of performance, measurement and reporting. Arguably, the result is a more robust capacity to accommodate change by being able to more flexibly move people to new or different workspaces and workplaces as business models change, as cited in the conversion to a banking corporation. This exact same logic extends to the scale of the workplace standards, as mediated by the occupancy management system. For instance, as different divisions expand and contract with the changes of the markets, so too can the firm more readily adapt to these fluctuations.

Second, the integration of design and operations to maximize, in part, the designed efficiencies and sustainability of the building also promote the adaptive capacity of the firm. This happens because the design process is predicated on a rule set that acknowledges the dynamic operations of the firm which are in a constant state of change. Second, this integration (which is evidenced by a fluid evolution of guidelines and standards) allows for an adaptation to future changes whether radical or transformational. For instance, without the sustainability measures put in place as a consequence of this integration, it was speculated that the bank conversion would have resulted in additional redundant space consumption and that Hurricane Sandy would have resulted in greater economic losses because many fewer people would have been able to work remotely.

Likewise, the integration of engineered systems, facilities and CRE management in an effort to promote sustainable and efficient operations can also advance
adaptive capacity. In theoretical terms, it allows for a greater range of strategic options. For instance, sustainability elements of managed life cycling of material facilities, which promotes less waste and more efficiency in the building, arguably advances the adaptive capacity of the firm as there is more predictability in the performance and availability of spaces to accommodate change. Simply knowing in almost real time what space is available as result of regular data collection is valuable in its own right. For example, if there is a floor scheduled to undergo a replacement of a particular system which would otherwise impact operations, the precise management of the life cycling of systems allows for minimal disruption and would cue CSRE not to make a particular adjustment in space allocation that conflicts with the system maintenance.

Sometimes we go ahead and replace carpet ahead of its useful life, if we are already replacing other [elements] on a floor […] thanks to the integration of [our] inventory management system with operations noted an asset manager. This interaction happens at every scale from the small disruption of replacing carpet to the moving of units of the firm for larger systematic interventions, as happened with the bank conversion. In this sense, the physical adaptive capacity of the building relates very clearly with the adaptive capacity of the firm (2014).

A general application of designs to reduce the consumption and to promote the efficient use of energy also advanced the resiliency of the firm by reducing the overall energy load of the GSHQ for on-site power generation, thereby lengthening the duration of onsite operations in the event that external power sources are compromised. As mentioned in the introduction to this article, this was the case during Hurricane Sandy when the firm was able to weather initial power outages that provided the time to fully implement its BCP functions prior to removing the building from the power grid. Energy management also speaks to how elements of adaptive capacity relating to the integration of power management, facilities and operations also advance the sustainable operations of the larger designed energy system, as well as the resiliency of the overall operations of the firm. As extreme weather events become more regular as part of a transformational change in the environment, maintaining moments of resiliency will be dependent on the adaptive capacity of the firm.

Reciprocal influence: adaptive capacity and sustainability

The evidence supports the First Proposition that there is an applied relationship between sustainability, resilience and adaptation. The evidence also supports the Second Proposition that sustainability advanced the adaptive capacity and resilience of the firm. From a macro-

### Table 2 Parallel relationships between sustainability, resilient operations and adaptive capacity

| Sustainability applications | Climate mitigation implications | Resilient operations | Adaptive capacity |
|----------------------------|---------------------------------|---------------------|------------------|
| Less paper                 | Less consumption of trees       | BCP: remote working | Cloud computer allows non-spatial workplaces |
| Less furniture             | Less material consumption       | n.a.                | More flexible utilization of spaces as business changes |
| Less power consumption     | Less air pollution and carbonization | BCP: greater autonomy for on-site generation | Less operating overhead and organizational constraints |
| Consolidated campus plan   | Lower per capita consumption    | n.a.                | Greater flexibility for managing human resources |
| Workplace standards and occupancy management system | Lower per capita consumption | n.a.                | Greater flexibility for managing human resources |
| Preventive maintenance and life cycle management | Less material waste | BCP: more easily recover when events cause material loss or damage | Maximum facilities utilization |
| Integration of design and operations planning | Less building materials and operational consumption | BCP: greater working knowledge of system dependencies and vulnerabilities | Asset management and new construction; can more readily accommodate change in business operations |
| Organizational integration of facilities and engineered systems | Less buildings materials and operational consumption | BCP: greater working knowledge of system dependencies and vulnerabilities | Asset management and new construction; can more readily accommodate change in business operations |
perspective, CSRE’s strategy framed largely by sustainability set in motion connections across the firm in terms of data, intelligence and communications that had not previously existed. However, GS did not intentionally promote sustainability with the knowledge that it might advance their adaptive capacity. On the contrary, only a handful of the observed connections were internally recognized by individual actors. The challenge to understand intent or motivation also reflects practical limitations to case study methodologies for understanding corporate strategies (Mintzberg, 1978; Snow & Hambrick, 1980). While sustainability is referenced as a deliberate strategy by the firm, adaptive capacity was not. Therefore, an analysis of the results of this case may be biased towards interpreting sustainability as the mechanism for driving the positive relationships because the investigator is focused on data collection that memorializes the intent of the subjects. Likewise, it is conceivable (1) that negative relationships and/or feedback loops may exist and (2) that unobservable exogenous factors may have deterministic impact on influencing the observed outcomes.

There were a number of observations that suggest that adaptive capacity may have also reciprocally advanced sustainability. For instance, in the above cited example relating to the integration of engineered systems and facilities, it could be argued that the adaptive capacity of the firm – for example, the previously referenced robust organizational intelligence – could be a contributing factor for integration in the first place as it sets in motion the process of identifying what should be sustained under what conditions. This argument could also be extended to the integration of design and operations planning that might have been a consequence of a robust adaptive capacity of CSRE to be able to consolidate a single decision space based on superior cross-cutting intelligence. This possibility for conceptual reciprocity raises the question as to whether it is useful or desirable to frame an initiating or deterministic factor or whether the relationships herein should be referenced in isolation to their outcomes. However, it can be argued that framing initiating factors may lead to normative development of operational models that promote both adaptive capacity and sustainability – particularly if co-benefits can be underwritten into the initial investment calculus. Therefore, this case demonstrates that sustainability did in fact promote the adaptive capacity of the firm; but, future research may be able to more definitely demonstrate how otherwise robust adaptive capacities may or can lead to greater sustainability.

Conclusions
The findings of this case are the first steps in uncovering the wide-ranging implications, if not validity, of the theoretical framework that attempts to demonstrate the potential for the practical connections between sustainability, adaptation and resilience. Consistent with the First Proposition, the demonstrated co-benefits by and between these strategies and capacities are likely to be strong motivations for future research to develop methods for identifying and valuing innovations that have broader implications than initially intended. This is particularly important at a time when the economics of sustainability struggle to find value beyond the immediate returns on cost. The findings also highlight the multifaceted dimensions of framing a firm’s adaptive capacity. The integrated data-driven management of people and facilities is a likely key factor for promoting the organizational transformations necessary to accommodate structural changes in technology markets and eventually even climate change. These organizational transformations also highlight the reciprocal advancement of resilience in the face of known and anticipated shocks.

Future research is tasked with giving definition to the measurement and modelling of organizational adaptive capacity. This case suggests that modes of intra-organizational communication and intelligence are likely a compelling place to begin the normative development of operationalizing adaptive capacity – particularly within the context of CRE, which is uniquely positioned to cut across all aspects of firm operations. Future research will need to identify biases and preferences of management or internal organizational structures. These biases have the potential to distort the intelligence processes for identifying, preparing for and responding to change. As demonstrated in the case, the role of leadership within executive hierarchies is also likely to have major role in overcoming institutional constraints in everything from burdensome data collection to a broader management of risk. As firms expand their existing adaptation units from a focus on supply chains to internal operations, these research questions will require new methods such as simulated stress testing to advance an understanding of adaptive capacities not as means to merely manage risk but as a means to identify opportunity.

A number of changes were identified here that illustrate the radical and transformational changes facing firms. As the values of sustainability continue to permeate corporate governance and management, this paper has highlighted the extent to which sustainable processes may have transformative impacts in adapting to change in both material and organizational terms. In addition, a case was made for the theoretical and empirical possibility that robust adaptive capacities may also promote the execution of sustainable practices. As these dynamic relationships are explored in future research, CRE is the prime beneficiary of this knowledge by virtue of its central role in firm operations. With CRE on the front lines of the intersection of changing markets and environments, it could very
well serve as the future platform for both the maintenance and survival of firms as they both sustain and adapt.

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**Supplemental data**

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*Endnotes*

1 The four phases of the adaptation cycle are exploitation (r), conservation (k), release (Ω), and reorganization (a) (Holling, 1986).

2 CSRE is the non-revenue division of the firm in which all cited interviewees and their respective units fall. It is also in charge of service delivery in addition to facilities and other more conventional CRE functions. References to CRE strategy made herein are a reference to the strategies made by the CSRE.