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Green stores: an analysis of LEED-Certified fashion stores

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Abstract

The purpose of this study is to provide insight into green retail spaces for fashion brands. Particularly, in this study, we analyzed Leadership in Energy and Environmental Design (LEED)–certified retail stores of fashion brands. The LEED program, which is one of the most widely used green building certification programs in the world, is administered by the United States Green Building Council (USGBC). Using publicly available data from the USGBC, we analyzed patterns and characteristics of fashion stores that achieved LEED certification under the LEED 2009 for Retail: Commercial Interiors rating system (CI). A total of 199

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fashion stores that completed their LEED certification were used for the data analysis. A credit achievement pattern of each fashion store project was analyzed in six LEED CI assessment categories. A pattern emerged from the data analysis suggesting that for fashion stores, aesthetic considerations more often than not trump sustainability concerns. This has been highlighted in the low achievement in credit categories where surface materials are most visible or in categories where achievement would greatly alter space design.

KEYWORDS: Green Building, LEED, Retail, Store, Sustainability

Introduction

A growing number of industry analysts believe that instead of being a drag on profits, environmentally sustainable practices can provide competitive advantages to a company (Rosen 2001). This increased acknowledgment can be attributed to multiple factors, including market forces (such as unstable energy costs, positive industry and governmental recognition, and increasing environmental regulations), economic benefits (such as reduced energy costs), and other intangible benefits related to marketing and public relations (Yudelson 2009). Retailers have the means to affect numerous parts of a supply chain positively by embracing green retailing and environmental management practices. With an increased desire for an omni-channel business, retailers have gained significant influence in operations and supply chain management (Lai, Cheng, and Tang 2010). While the focus of environmentally sustainable retail practices has primarily been on supply chains and product development (Wiese et al. 2012), a shift in focus from these factors to the retail spaces themselves is necessary, especially because 20% of all carbon emissions derive from retail stores (Yudelson 2009).

Retailers face unique challenges and opportunities in building sustainable retail spaces as most retail locations are shared spaces either rented or remodeled from a previous tenant. Since these locations were built in a time when green and sustainable practices were not held with the upmost importance, most established features in the buildings do not sit on par with today's standards (Thompson 2007). Retail building types are differentiated from other commercial building types in regards to interior characteristics, hours of operation, parking and transportation, water and energy consumption (Yudelson 2009). For example, lighting specifically is an extremely important factor for retailers, and they use more lighting on average than an office building. In addition, the main goal of a retail space is to immerse consumers in the brand's viewpoint and persuade them to buy into this viewpoint. Most retailers would not sacrifice consumer engagement and brand aesthetic for sustainability.

The fashion market comes second in carbon footprint size, with the oil industry obtaining first place (Conca 2015). Fashion retailers have

increasingly addressed environmentally sustainable practices in their brand operating strategies. This has occurred at multiple levels within the industry, ranging from luxury brands such as Gucci to fast fashion retailers such as Zara and more traditional department stores such as Kohl's (USGBC 2014a). Although fashion retailers are increasingly using environmentally positive strategies to create value for their businesses, there has been little research into the means and methods of incorporating these strategies across companies and brands. Therefore, the purpose of this study is to provide insight into green retail spaces for fashion brands. Particularly, in this study, we analyzed Leadership in Energy and Environmental Design (LEED)-certified retail stores of fashion brands. The LEED program, which is one of the most widely used green building certification programs in the world, is administered by the United States Green Building Council (USGBC). Using publicly available data from the USGBC, we analyzed patterns and characteristics of fashion stores that achieved LEED certification under the LEED 2009 for Retail: Commercial Interiors rating system (CI).

Green retailing

Green retailing (GR) is defined as the retail sector's taking responsibility for environmental management by reducing the retailer's carbon footprint (Green Retailing 2011). GR practices can be implemented throughout the supply chain, in brick-and-mortar retail locations, and even through the information given to consumers about how the products and services are created and transported (Green Retailing 2011). Tang (2012) suggests that GR consists of three interconnected dimensions: internal improvement, external coordination, and supportive development. Internal improvement entails reducing waste emissions and the retailer's carbon footprint. External coordination involves the products as well as their life cycles, whereas supportive development looks towards the future and promotes long-term organizational growth and development (Tang 2012).

The current study investigates fashion brands' internal improvement-based GR, particularly their efforts to build sustainable stores. There has been little investigation of the sustainable initiatives of retail stores (Wiese et al. 2012). Hampl and Loock (2013) found that retailers' sustainability efforts are an important factor in consumers' store choice. When ranking the importance of specific attributes related to store choice, consumers listed assortment (e.g., organic or locally grown items) highest, followed by store location, treatment of employees, price, and power mix (cooling and heating systems, LED or low energy-use lighting, and energy-efficient transportation and logistical systems). The authors speculate that power mix ranks lowest because consumers do not readily notice it during their shopping experiences. Additionally, the authors surmise that product-related sustainability efforts—in this case, assortment—may have a greater effect on consumers compared to

operational efforts (treatment of employees and power mix). Another study by Arrigo (2018) showed that a luxury fashion brand used its flagship store to communicate the brand's commitment to sustainable practices. Effective means of conveying sustainability commitments in a luxury flagship store included an architectural design that followed an accepted sustainability standard and various methods of communication regarding the sustainability efforts (e.g., digital devices for in-store communication, employee training, and in-store events). For example, the flagship store of Burberry in London has monitors and televisions showing the brand's photos and videos illustrating its sustainability commitment.

There have been conflicting findings regarding the effectiveness of retailers' sustainability efforts (Orlitzky, Schmidt, and Rynes 2003). Although some studies (Klassen and McLaughlin 1996) showed the possibility of positive increases in consumer buying intentions, brand preference, recommendation intent, and overall company assessment, other studies (e.g., Koehler 2006) pointed to a more nuanced understanding in which positive associations are not guaranteed. A more recent study by Hofenk et al. (2019) found that retailers who carry a sustainably derived assortment and partake in sustainable distribution strategies are likely to receive more positive store evaluations, strengthened shopping intentions, more word-of-mouth communications among customers, and a willingness to pay more for these sustainably derived items. In a case study of Marks & Spencer's (M&S) sustainable store in the United Kingdom, Wilson (2015) noted that, although the sustainable store cost 7% more to create than a typical M&S store, its whole-life cost of maintenance was far less than that of a conventional store.

Leed Background

Issues of environmental sustainability have historically been limited to regional concerns and frequently only of alarm when an immediate crisis significantly altered the way of life of the surrounding communities. In his book *"The Global Environmental Movement: Reclaiming Paradise"*, John McCormick (1989) presents the historical context in which the current mindfulness of environmental sustainability is grounded and identifies the early 1960's as the beginning of the intensification of this awareness. From this point forward there has been a gradual perspective shift, where the holistic examination of the environment has occurred on a global scale and in terms of quality of life for all living species. Sustainable development is defined in the 1987 report *Our Common Future* (United Nation 1987) prepared by the World Commission on Environment and Development, and presented to the General Assembly of the United Nations as *"development that meets the needs of the present without compromising the ability of future generations to meet their own needs."* This document highlights that environmental health

and building development are inextricably linked - as one issue is examined, so must the other. This philosophy is pervasive in the various rating systems and methods used to evaluate sustainability.

A green building “uses design and construction practices that significantly reduce or eliminate the negative impact of the building on the environment and occupants” (Yudelson, 2009, p.45). Globally, many rating systems or assessment processes exist to guide the construction of green buildings. Several of these, such as LEED, Passive House Institute US (PHIUS), Building Research Establishment Environmental Assessment Method (BREEAM), German Sustainable Building Council or Deutsche Gesellschaft für Nachhaltiges Bauen (DGNB), High Quality Environmental (HQE), and Comprehensive Assessment System for Built Environment Efficiency (CASBEE) provide building or project certification to notify the public of a building’s environmentally responsible construction (Yudelson 2009). While the above referenced systems have differences, they all in general terms, have similar goals. The present study examined retail projects certified under the LEED rating system due to the availability of publicly accessible data concerning individual project paths to certification as well as the preponderance of the system use.

The USGBC is a non-profit organization established in 1993 for the promotion of building sustainability (USGBC 2017). The USGBC recognizes the interconnectivity of environments on a macro scale and individual building components and systems on a micro level. Acknowledging the great variation in building types and environments, there is degree of flexibility incorporated into the policies and recommendations put forth by the USGBC so that the greatest number of people can be positively impacted. One of the USGBC’s most notable contributions to the field was the creation of the LEED program. LEED, launched in 2000, is a building certification program which promotes the design, construction, and operation of green building environments. LEED is one of the most widely used green certification program in the world having over 92,000 participating LEED projects in over 164 different countries or territories. Each day an estimated 2.2 million square feet of building space becomes LEED certified (USGBC 2018). The program has evolved over time with its most recent version called “LEED v4” which was activated in November of 2013 (USGBC 2014b). However, for this study we used LEED 2009 (v.3) data as at the time of this analysis very few fashion retail stores were certified under the new system.

LEED certifications for green construction, building, and retail have all been increasing since 2000 (Yudelson, 2009). Influences for this have been a combination of consumer, community, and legal pressure. Retailers who have obtained LEED certification have a more positive brand awareness from the consumer’s point of view. Public relations also see a benefit from environmentally friendly practices. Companies

who market their certification create a more positive bond with their community. Recruitment and employee satisfaction also may increase due to more positive working conditions and an awareness of the company's positive impact on the environment. On average, LEED certified retailers can expect to see a decrease in operational expenses such as energy costs (Matisoff et al. 2014).

LEED certification process and criteria

Prior to the start of the certification process, it should be verified that the project meets the Minimum Program Requirements (MPRs). As outlined in the MPR supplemental guidance document (USGBC 2011), the MPRs are a set of characteristics or minimum requirements that must be satisfied in order for a project to qualify for LEED certification. For LEED 2009 the MPRs include the following. First, the project must be in compliance with all applicable laws and regulations related to the surrounding environment. Second, the project must be a finished building that has no expectation of future relocation. Third, a project must identify a logical site boundary. This typically includes a continuous parcel of land, which has the ability to support all of the usual building functions. Forth, the building must meet minimum floor area guidelines. Fifth, the building must meet minimum occupancy guidelines. Sixth, the project is required to share energy and water usage data for a minimum of five years after project completion. Lastly, the project must meet a minimum building footprint size to site boundary ratio.

Once it has been established that the MPR's are met, there are four main steps required for a building to attain LEED certification. First, the Green Business Certification Inc., the independent, third-party organization that provides the credentialing of LEED professionals and the certifications for LEED Buildings, must be notified of the intention to pursue certification. This is accomplished by registering the project through LEED Online. LEED Online is the main information sharing/repository/documentation platform owned by the USGBC. A registration fee is paid at this time. Second, through the LEED Online portal the project team will submit appropriate documentation in support of the credits pursued. Third, the GBCI will conduct a review – this may have several steps depending on the specific requirements of a project. Finally, certification stage, which may be as simple as accepting the level at which the project has been certified, or if there is a need for an appeal, this will occur during this stage (USGBC 2017).

For LEED rating systems, environmentally friendly practices must be incorporated through areas such as architecture, engineering, interior design, landscape and construction (Yudelson, 2009). The LEED 2009 rating system is organized into five key environmental categories as detailed in Table 1. The basis of the credit categories is the Environmental Protection Agency (EPA)'s environmental impact assessment Tool for Reduction and Assessment of Chemicals and Other

Table 1 LEED CI assessment categories.

Category	Primary Objectives	Major Concepts / Elements
Sustainable Sites (SS)	Environmental awareness and responsibility when selecting a building and location.	<ul style="list-style-type: none"> • Select a building located and constructed to minimize impacts to the environment. • Select an area with existing infrastructure and strong connectivity to multimodal means of transportation. • Locate in a neighborhood with a high degree of walkability. • Minimize impacts from automobile use.
Water Efficiency (WE)	Reduce water use as compared to a base-line calculation.	<ul style="list-style-type: none"> • Reduce tenant space water usage by installing low-flow fixtures, fittings, and appliances. • Reduce commercial process water usage by installing low-flow commercial equipment.
Energy and Atmosphere (EA)	Reduce environmental and economic impacts related to energy use.	<ul style="list-style-type: none"> • Optimize energy use by building systems and equipment. • Use a commissioning authority to ensure all building systems are working as designed. • Provide an ongoing method of verification and measurement of energy and water usage. • Eliminate the use of chlorofluorocarbons (CFC)-based refrigerants. • Use renewable energy. • Long-term tenant leases. • Maximize recycling / reuse of both building materials and every-day waste. • Use materials grown / extracted / manufactured locally. • Use rapidly renewable materials. • Use certified wood products.
Material and Resources (MR)	Reduce the usage of virgin materials. Limit the impacts of extraction, processing, and transportation of all materials.	<ul style="list-style-type: none"> • Establish and monitor minimum indoor air-quality standards for both the construction period and the occupancy phase. • Increase ventilation above minimum standards when possible. • Use low-emitting building materials, systems, and furnishings. • Limit exposure to environmental tobacco smoke (ETS) and pollutants. • Maximize lighting and thermal comfort. • Provide access to natural lighting and outdoor views. • Measurable design innovation. • Exemplary performance related to an existing LEED credit. • Attempt a LEED identified Pilot Credit. • LEED Accredited Professional is a significant member of the project team. • These are identified by regional USGBC councils or chapters. • These will vary by region.
Indoor Environmental Quality (IEQ)	Maximize the comfort and safety of the indoor environment.	
Innovation in Design (ID)	Provide a means for the use of innovative technologies and methods not currently specified in the LEED guidelines.	
Regional Priorities (RP)	Address environmental issues that are significant to a particular region.	

Environmental Impacts (TRACI). In order to make the TRACI categories more applicable to holistic building design, the LEED categories were modified to incorporate human wellbeing (Owens et al. n.d.). The five categories identify specific environmental problems and propose ways to minimize environmental impacts. These include sustainable sites (SS), water efficiency (WE), energy and atmosphere (EA), material and resources (MR), and indoor environmental quality (IEQ). The SS category addresses environmental awareness and responsibility when selecting a building and location. The WE category includes criteria to reduce water usage by installing low-flow equipment. The EA category intends to reduce environmental and economic impacts related to energy use. The MR category addresses elements to reduce the use of virgin materials and limit the impact of extraction, processing, and transportation of all materials. The IEQ category provides options to maximize the comfort and safety of the indoor environment. Two additional categories supplement the environmental groupings. The innovation in design (ID) category provides a means for the use of innovative technologies and methods not currently specified in the LEED guideline. Lastly, the regional priorities (RP) category recognizes the uniqueness of geographically specific environmental conditions and provides extra points for achieving credits that address regional priorities. Specific prerequisites and credits are required within these categories. Table 2 shows specific prerequisites and credits required within these categories. Through a weighted system of credit allocation in each category, a project's score is calculated by adding all of the points awarded via credits. The highest points a project can earn is 110 and a different level of certification is given based on the total points earned: certified for 40-49 points; silver for 50-59 points; gold for 60-79 points; platinum for 80-110 points (USGBC 2016). Most requirements for credit achievement are structured in a way that addresses projects located both within and outside the United States in an identical manner. In instances where the requirements cannot be met due to the unavailability of certain products or because of differences in product rating systems, a performance equivalent or equivalent standard may be accepted.

LEED and fashion stores

Fashion brands that are heavily investing in a greener footprint can be found in both the mass fashion and the luxury markets. For example, Kering's sustainability strategy involves a plan to reduce its greenhouse gas emissions by 50% by 2025. H&M has also committed to leading the change to circular and renewable fashion. Sustainable efforts of these brands help set themselves apart from their competitors. Acquiring LEED certification is clearly becoming a priority for fashion brands as a way to satisfy and connect with their progressive customer base (Atamian 2017). A leading trend for LEED certifications has been focused on the brand's logistics and distributions centers. LVMH,

Table 2 Credit achievements for LEED 2009 Retail: CI.

Sustainable Sites (Possible Points:21)			
Credit 1	Site Selection		1 to 5
Credit 2	Development Density & Community Connectivity		6
Credit 3	Alternative Transportation		1 to 10
Water Efficiency (Possible Points: 11)			
Prereq 1	Water Use Reduction-20% Reduction		
Credit 1	Water Use Reduction		6 to 11
Energy & Atmosphere (Possible Points: 37)			
Prereq 1	Fundamental Commissioning of Building Energy Systems		
Prereq 2	Minimum Energy Performance		
Prereq 3	Fundamental Refrigerant Management		
Credit 1.1	Optimize Energy Performance- Lighting Power		1 to 5
Credit 1.2	Optimize Energy Performance- Lighting Controls		1 to 3
Credit 1.3	Optimize Energy Performance- HVAC		5 to 10
Credit 1.4	Optimize Energy Performance- Equipment & Appliances		1 to 4
Credit 1.5	Optimize Energy Performance- Building Envelope		1
Credit 2	Enhanced Commissioning		5
Credit 3	Measurement & Verification		2 to 5
Credit 4	Green Power		2
Credit 5	On-Site Renewable Energy		1 to 2
Materials & Resources (Possible Points: 14)			
Prereq 1	Storage & Collection of Recyclables		
Credit 1.1	Tenant Space- Long-Term Commitment		1
Credit 1.2	Building Reuse- Maintain Interior Nonstructural Components		1 to 2
Credit 2	Construction Waste Management		1 to 2
Credit 3.1	Materials Reuse		1 to 2
Credit 3.2	Materials Reuse- Furniture & Furnishings		1
Credit 4	Recycled Content		1 to 2
Credit 5	Regional Materials		1 to 2
Credit 6	Rapidly Renewable Materials		1
Credit 7	Certified Wood		1
Indoor Environmental Quality (Possible Points: 17)			
Prereq 1	Minimum IAQ Performance		
Prereq 2	Environmental Tobacco Smoke (ETS) Control		1
Credit 1	Outdoor Air Delivery Monitoring		
Credit 2	Increased Ventilation		1
Credit 3.1	Construction IAQ Management Plan- During Construction		1
Credit 3.2	Construction IAQ Management Plan- Before Occupancy		1
Credit 4.1	Low-Emitting Materials- Adhesives & Sealants		1

Credit 4.2	Low-Emitting Materials- Paints & Coatings	1
Credit 4.3	Low-Emitting Materials- Flooring Systems	1
Credit 4.4	Low-Emitting Materials- Composite Wood & Agrifiber Products	1
Credit 4.5	Low-Emitting Materials- Furniture	1
Credit 4.6	Low-Emitting Materials- Ceiling & Wall Systems	1
Credit 5	Indoor Chemical & Pollutant Source Control	1
Credit 6	Controllability of Systems- Lighting & Thermal Comfort	1
Credit 7.1	Thermal Comfort- Design	1
Credit 7.2	Thermal Comfort- Employee Verification	1
Credit 8.1	Daylight & Views- Daylight	1 to 2
Credit 8.2	Daylight & Views- Views	1
Innovation & Design Process (Possible Points: 6)		
Credit 1.1	Innovation in Design: Specific Title	1
Credit 1.2	Innovation in Design: Specific Title	1
Credit 1.3	Innovation in Design: Specific Title	1
Credit 1.4	Innovation in Design: Specific Title	1
Credit 1.5	Innovation in Design: Specific Title	1
Credit 2	LEED Accredited Professional	1
Regional Priority Credits (Possible Points: 4)		
Credit 1.1	Regional Priority: Specific Credit	1
Credit 1.2	Regional Priority: Specific Credit	1
Credit 1.3	Regional Priority: Specific Credit	1
Credit 1.4	Regional Priority: Specific Credit	1
Total		110

Kering, and REI have all received LEED platinum certification for one of their logistics or distribution centers. Many of these structures are equipped with solar panels, water recycling systems, and geothermal heating (Kering 2013; Trebilcock 2016; Turini 2015). Furthermore, all of LVMH's logistics centers follow a standard for the environment with optimal working conditions for employees (LVMH 2015). Some fashion brands have modified their headquarters and corporate offices to comply with LEED standards. Tiffany received LEED platinum certifications for their corporate offices that reduce energy use and their environmental impact (Tiffany 2016). Bottega Veneta's new headquarters are equipped with 12,960 square feet of solar panels, a water recycling system, and limited external lighting all of which significantly aid in the reduction of polluting elements (Zargani 2013). In relation to retail space, some fashion brands attempted to reduce the environmental impact of specific store locations. For example, through LEED certification, Saint Laurent has implemented a new architectural concept to reduce the environmental impact of its stores and improved the energy efficiency of its stores by 37 percent between 2013 and 2015 (Kering 2016).

Nike has been recognized as a leader of LEED certification and successfully incorporated it into their overall operations. Nike purchased renewable energy for their corporate offices and installed solar panels and turbines in their corporate offices and logistics centers (Nike 2015). Specially, Nike Grind is a business implementation that takes used or unusable rubber from previous sneakers, apparel, and sports equipment and grinds them to create environmentally friendly store flooring. Nike also utilize materials derived from post-consumer waste in creating shelving, display tables, and checkout counters in the New York City Nike Lab store (Sebra, 2014). As shown in this section, the information regarding LEED-certified fashion stores is limited to trade publications where only specific brands are highlighted in brief reports. The current study attempts to provide more insight in the understanding of how fashion stores construct their green retail spaces through LEED certification process.

Methodology

The data were collected from the GBIG website (<http://www.gbig.org>), which provides individual green building activities and aggregated summaries of general project characteristics (geographical locations, certification details) and credit achievements for each category of the rating system. The LEED 2009 for Retail: Commercial Interiors (CI) rating system was selected due to its application to a large number of fashion stores located in the existing base building system. There were 1,395 projects that were certified LEED 2009 CI at the time of the study (November 2017), and we identified a total of 210 building projects by brands that sell fashion items including apparel, accessories, footwear, and beauty. We excluded 11 projects that were registered but had no

certification details. Therefore, 199 fashion stores that completed their LEED certification were used for the data analysis. As LEED project data change over time, the results of this study are limited to the time of the data (November 2017). A credit achievement pattern of each fashion store project was recorded in all LEED CI assessment categories except for the RP category as credits in this category simply represent bonus credits achieved in other categories of the LEED CI system and vary based on region-specific priorities.

Results and discussion

Sample characteristics

A total of 26 different fashion brands achieved LEED CI certification and Nike (50.8%) and Converse (21.6%) had most of the certified projects (Table 3). The majority of certified fashion stores were located in the United States (63.8%), followed by China (14.1%). The certified stores represented either specialty (46.2%) or factory outlet and clearance stores (53.8%). Within the United States, the highest number of certified stores were located in California (20.5%). As LEED 2009 was launched in April 2009, the stores included were certified between 2011 and 2017, and most of them were certified between 2014 and 2016 (77.9%). Fashion stores obtained different certification levels; the gold certification level was the most prominent, followed by silver (Figure 1).

Analysis of the credit achievement degree (CAD)

The number of achievable points varied in each of the six LEED categories, so the credit achievement degree (CAD) was calculated using the following equation: $CAD = CO/TC * 100\%$, where CO equals credit obtained and TC equals total credits in the assessment area (Wu et al. 2016). Table 4 shows the mean percentage awarded for each main LEED category. The standard deviation indicates the scattering of the data for this element in the sample. The results of within-subject ANOVA showed that ID and WE had significantly higher CADs compared to other categories, indicating that they are the most frequently awarded categories in LEED 2009 Retail CI for fashion stores. The fashion stores in this sample achieved 84.1% and 80.7% of the total credits in ID and WE. The high percentage of credit achievement could indicate that the credits in these criteria can be easily obtained. As the principle of point-chasing mentality suggests that builders tend to pursue the LEED points that are most easily achievable (Wu et al. 2016), we found that ID and WE were easily accessible categories for the fashion stores in this sample.

The ID category has two components, of which, ID 2: LEED Accredited Professional achieved 97.5% of the available points for the projects in this study (Figure 2). ID 1: Innovation in Design had an achievement rate of 77.3. High achievement in both credit categories is

Table 3 Sample characteristics (N = 199).

	Frequency	Percentage
Brands		
Nike	101	50.8
Converse (Factory and Outlet Stores)	43	21.6
Zara	11	5.5
Gucci	6	3
LL Bean	5	2.5
Levi Strauss	4	2
Bally	3	1.5
Massimo Dutti	3	1.5
Others	27	13.6
Store Type		
Specialty Store	92	46.2
Factory Outlet/Clearance Store	107	53.8
Country Location		
US	127	63.8
China	28	14.1
Spain	8	4
Canada	7	3.5
UK	5	2.5
France	4	2
Netherlands	3	1.5
Others	17	8.5
Top Ten US Locations		
CA	26	20.5
TX	11	8.7
FL	7	5.5
AZ	6	4.7
GA	5	3.9
IL	5	3.9
MD	5	3.9
NY	5	3.9
MS	4	3.1
NJ	4	3.1
Others	49	38.6

unsurprising as the very premise of the LEED certification process is based on the acceptance of new ways of approaching the built environment. Furthermore, the flexibility of credit achievement methods within this category is also a likely contributor to high attainment. The WE category is also an easily achievable category for fashion stores as it has only one prerequisite and required criteria to obtain water conservation goals. While water efficiency for fashion stores may not be a critical area compared to other types of retailers like restaurants, the LEED CI certified fashion stores in this sample easily achieved WE credits by utilizing high-efficiency fixtures to reduce water usage.

In the category of SS (Figure 3), about half of the projects obtained the SS2 (development density and community connectivity) and SS3 (alternative transportation) credits. Points in the SS2 can be achieved by selecting a building that is located either in a walkable community with

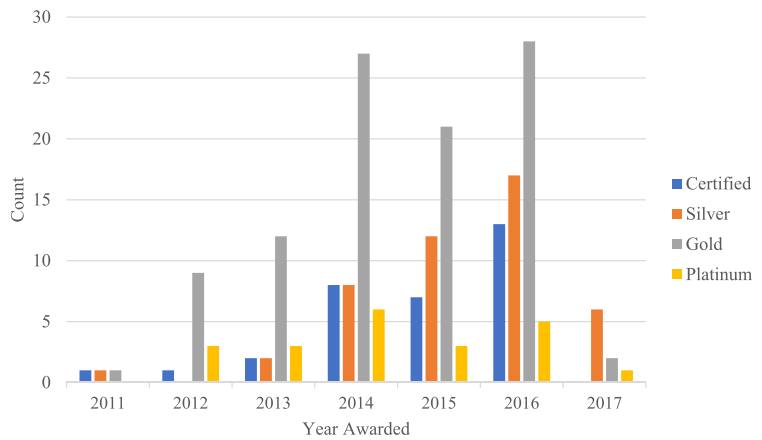


Figure 1

LEED certification level and year awarded.

Table 4 The CADs of LEED 2009 Main Categories.

	Mean	Std. Deviation	F	Bonferroni**
SS	46.73	31.90	165.86*	A
WE	80.72	35.45		B
EA	61.08	17.67		C
MR	27.03	15.34		D
EQ	52.20	13.83		A
ID	84.09	21.80		B

* $p < .001$.

**Means with the same letter do not differ significantly at the 0.05 level.

a minimum density of 60,000 square feet per acre or within a community with a high degree of neighborhood connectivity, which is determined by neighborhood density and access to basic services such as banks, libraries, and supermarkets. The SS3 alternative transportation intends to reduce pollution and land development impacts from automobile use (USGBC, 2016). There are multiple options to achieve points in this criterion including:

- locating the project with a certain walkable distance to public transportation,
- providing the necessary facilities for bicycle commuting (e.g., storage, showers, maintenance program),
- encouraging the use of low-emitting and fuel-efficient vehicles by providing preferred parking refueling stations, or providing the actual vehicles to a percentage of the workforce,
- reducing single occupant parking availability and preferred parking for car-pooling or the use of alternative transportation, and delivery service for retail customers.

The least obtained criteria within the SS category was SS1 site selection which deals with the location of the site. The maximum points in

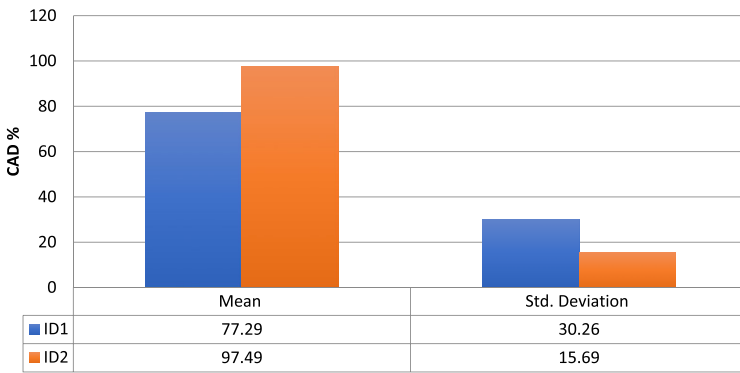


Figure 2
The CADs of Innovation and Design Process (ID).

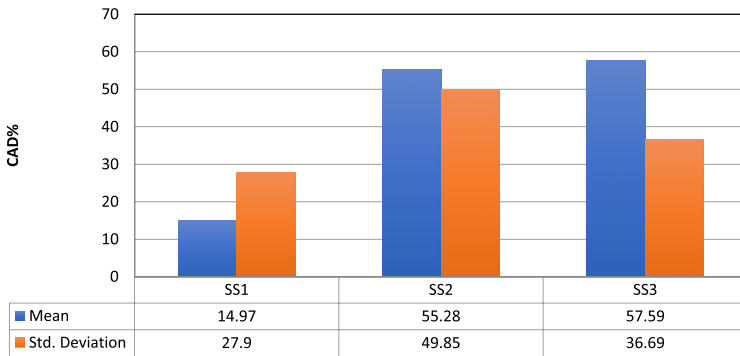


Figure 3
The CADs of Sustainable Sites (SS).

SS1 can be achieved by locating the project either in an existing LEED certified building or in a building that meets a set of characteristics to the improvement of the building’s site (e.g., brownfield redevelopment, stormwater management). As the LEED for Retail: CI mainly deals with tenant spaces in retail buildings, low credits obtained in this criterion indicates a lack of options available in sustainable sites of retail building for tenants to consider.

Due to the high emphasis on lowering energy use by governments, the EA category has the most amount of points (37 points) that a project can obtain. In general, the following options are suggested to achieve points in this category (USGBC 2016):

- reducing environmental and financial impacts by exceeding established benchmarks for energy conservation,
- employing a commissioning agent to confirm building systems and spaces are constructed and calibrated as intended,
- measuring energy and water usage and establishing a process for correcting results that are less than anticipated,
- utilizing renewable energy,

- optimizing energy usage particularly in the areas of lighting power and controls, heating, cooling, air conditioning (HVAC) systems, equipment and appliances, and the building envelope.

The EA category of fashion stores shows a wide range in credit achievement percentages, from the low-end achievement of less than 5% including EA5: on-site renewable energy (1%), EA1.2: Optimize Energy Performance – Lighting Controls (2%), and EA 1.5: Optimize Energy Performance – Building Envelope (4%) to the high-end achievement of more than 90% including EA 1.4: optimize energy performance-equipment and appliances (94%) (see [Figure 4](#)). The LEED certified fashion retail stores achieved the highest points in the area of equipment and appliances (EA 1.4) by utilizing Energy Star® (or equivalent) products. Energy Star Certification is a third party point system that ranks corporations and businesses based on their energy usage. This government backed program partners with the EPA to bring energy solutions to the market. To become certified, a score of 75 or higher must be obtained by the building. This score is reviewed on an annual basis to ensure corporations are continuously upgrading themselves with the most energy efficient products available (Yudelson 2009).

The results of the low-end achievement criteria show that lighting sensors and controls are not effectively utilized in fashion retail stores to promote the efficient use of natural light. Installing motion sensors which detect occupancy while controlling lighting can increase performance in the EA category. For example, lighting can play an important role in zoning the space. Dimmers, timers, and motion detectors can be installed in different locations to best fit the needs of the retailer while reducing energy costs. Changing rooms are a perfect area to install motion sensors (Yudelson 2009). Additionally, fashion stores rarely maximize building envelope performance or utilize on-site renewable energy systems. In each case, typically uncontrollable factors are influencing the retailer's ability to increase performance. The building envelope, which separates the interior from the exterior, is typically composed of exterior walls, foundation floors, roofs, and fenestrations such as windows, doors, and other penetrations. It may not be possible or permitted for the building envelope to be altered within the tenant space as additions to, or alterations of the envelope generally requires a whole building strategy which is likely out of the control of the tenant. In regards to on-site renewable energy, a similar situation arises where the available space for installing onsite renewable energy systems is likely out of the tenant's purview. On-site renewable energy systems such as wind and solar power require a comprehensive building strategy that tenants may not have the ability to influence or alter.

The MR was the least frequently awarded category and only 27% of the total credits in this category were awarded to the LEED certified fashion stores ([Figure 5](#)). Unlike other categories, the highest achieving credit

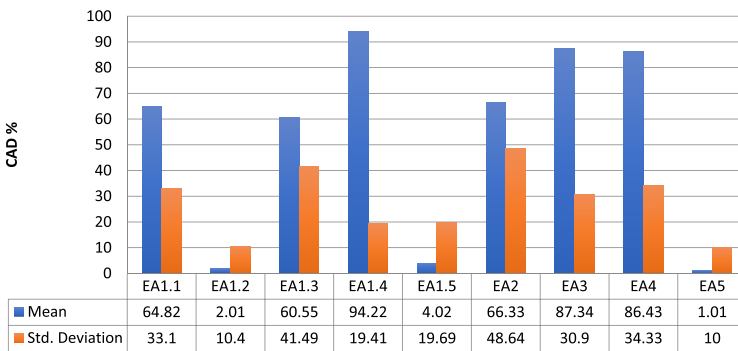


Figure 4
The CADs of Energy and Atmosphere (EA).

did not exceed 75%. The low end of credit achievement included MR 6: Rapidly Renewable Materials at 0.5%, MR1.2: Building Reuse – Maintain Interior Nonstructural Components at 2.0%, MR 3.2: Material Reuse – Furniture and Furnishings at 4.5%, and MR 3.1: Material Reuse at 6.3%. Because surface materials are highly visible their selection is greatly affected by the design aesthetics of a brand when creating a retail store environment. It is suggested that the low achievements in the MR category is based on the premise that in a retail environment when given a choice between brand image and environmentally sensitive material selection, the aesthetic considerations will typically guide the final decision. However, fashion stores can improve their performance in this category with the following considerations (USGBC 2016):

- reducing construction waste and environmental impacts by agreeing to occupy the same space for a minimum of 10 years,
- reusing existing building material related to interior systems or furnishings,
- promoting recycling in a system of construction waste diversion or specifying the use of recycled content in building materials and furnishings,
- specifying materials which promote sustainability such as the materials that are harvested and manufactured within the project region, rapidly renewable materials, and certified wood.

In order to increase the performance in this category, fashion stores need to have a more concerted effort to reuse existing material or to specify more sustainable materials from their store operation. It can be as simple as the recycling of paper or bottles, or more complex strategies including the use of recycled or refurbished store fixtures and the purchase of any store fixtures, flooring and décor with a highly-recycled content (Yudelson 2009). This will likely require a rethinking of the specific brand image or an alteration to established design aesthetics. While the reuse of a prior tenant's furnishings and materials may be challenging, if

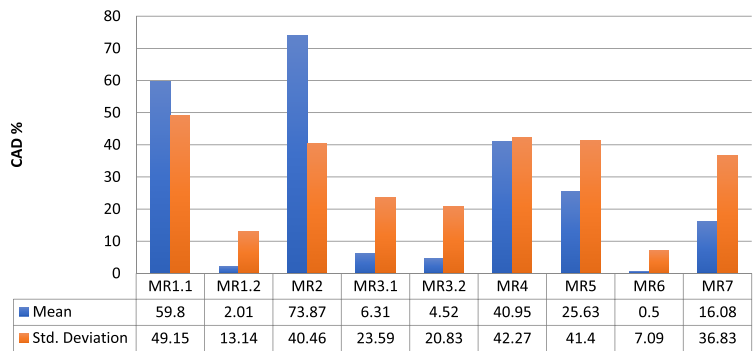


Figure 5

The CADs of Materials and Resources (MR).

these sustainability factors are identified early in the branding process, they will likely be easier to incorporate into interior design schemes.

There are 17 possible points within the Indoor Environmental Quality category (IEQ). In order to achieve points in this category, the following options can be considered (USGBC 2016):

- monitoring air quality and increase fresh air ventilation,
- developing and implementing an indoor air quality (IAQ) management plan for both the construction and pre-occupancy phases,
- reducing air contaminants by specifying materials that produce low levels of harmful gases,
- controlling and minimizing pollutants in the space,
- providing occupant control of lighting and HVAC systems,
- monitoring systems for thermal comfort,
- maximizing the use of natural light and provide good exterior views.

Similar to the EA category, IEQ shows a wide range in credit achievement percentages (Figure 6). These vary from a low of IEQ 8.2: Daylight and Views – Views at 1% to a high of 98% for IEQ 4.2: Low-Emitting Materials – Paints and Coatings. Additional low achieving credits include IEQ 8.1: Daylight and Views – Daylight at 1.5%. Additional high achieving credits are IEQ 3.1: Construction Indoor Air Quality – During Construction at 94.5%, IEQ 4.1: Low-Emitting Materials – Adhesives and Sealants at 89.0%, IEQ 7.1: Thermal Comfort – Design at 90.0% and IEQ 7.2: Thermal Comfort – Employee Verification at 88.0%. The common characteristic of both the low and high achieving credits is whether or not the prescribed methods of achieving points results in a visual impact. In the case of the high achievers, all credit categories address non-visible issues with low or no visual impact in regards to the design solution. Conversely, the low achieving criteria all relate to issues that require highly visual design solutions. In the case of IEQ 8.1 and IEQ 8.2, both require visual access to

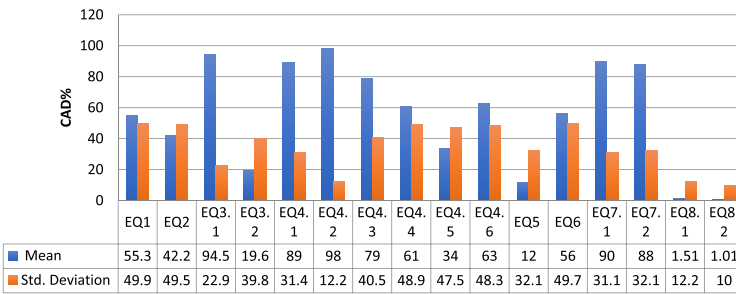


Figure 6
The CADs of Indoor Environmental Quality (IEQ).

the outdoors that may impinge on viable retail floor space or aesthetic decisions. IEQ 5 also has a visible design component, as the main entryways must include a minimum 10 feet (3 meter) long entryway system that captures dirt and pollutants. In order to address the lowest achieving credits in this category, a balance must be struck between usable retail space and access to natural lighting and good exterior views. This will likely require a more strategic placement of goods so that sightlines within the space are not obstructed. Furthermore, the design of exterior windows displays may need to be redesigned to allow good views to the exterior to remain.

Conclusion and implications

The analysis of the LEED Retail CI certified fashion stores provides patterns and characteristics of green retail spaces of fashion stores located in the existing base buildings. The results of this study show that the certified fashion stores have a wide range in credit achievement patterns in LEED assessment categories and criteria, from a low of 0.5% to a high of 94%. The criteria with more than 90% of credit achievement include:

- EA1.4 Optimize Energy Performance – Equipment and Appliances (94.2%)
- EQ3.1 Construction IAQ Management Plan – During Construction (94.5%)
- EQ4.2 Low-Emitting Materials – Paints & Coatings (98%)
- EQ7.1 Thermal Comfort – Design (90%)
- ID2 LEED Accredited Professional (97.5%)

The criteria with less than 10% of credit achievement include:

- EA1.2 Optimize Energy Performance – Lighting Controls (2%)
- EA1.5 Optimize Energy Performance – Building Envelope (4%)
- EA5 On-site Renewable Energy (1%)
- MR1.2 Building Reuse – Maintain Interior Nonstructural Components (2%)

- MR3.1 Materials Reuse (6%)
- MR3.2 Materials Reuse – Furniture & Furnishings (5%)
- MR6 Rapidly Renewable Materials (0.5%)
- EQ8.1 Daylight & Views – Daylight (1.5%)
- EQ8.2 Daylight & Views – Views (1.0%)

The results of the highest level of achievement in the LEED categories indicate that the certified fashion stores implemented an indoor air quality (IAQ) program during the project construction phase in order to protect and promote the health of both the construction workers as well as future building users (IEQ3.1: Construction IAQ Management Plan – During Construction). They also reduced the levels of volatile organic compounds (VOCs) which have the ability to negatively impact indoor air quality and may cause harm to building occupants (IEQ4.2: Low-Emitting Materials – Paints & Coatings). Over 97% of the certified fashion stores had at least one LEED accredited professional (LEED AP) as a principal project member (ID2: LEED Accredited Professional). The LEED certified fashion stores are also equipped with a minimum 70% of eligible appliances that meet Energy Star[®] standards (EA1.4: Optimize Energy Performance – Equipment and Appliances) and met HVAC system standards set by either the American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE) or by the International Organization for Standardization (ISO) (IEQ7.1: Thermal Comfort – Design). These highest achieving LEED categories share the characteristic that they have no appreciable effect on the visuals associated with interior atmospherics. While it is true that thermal comfort can have an effect on building occupants' response to a space, the way in which it is achieved does not necessarily have a strong visual element.

In contrast, the lowest achieving credit categories (less than 10% achievement) were identified as those where surface materials are most visible or in categories where achievement would greatly alter space design. These include categories related to use of daylighting (IEQ 8.1, IEQ, 8.2), material reuse (MR 1.2, MR 3.1, MR 3.2, MR 6), and good exterior views (EA 1.5). The lack of achievement in the daylight and views credit categories likely arises from conflicts between design strategy for the brand image and the methods required to achieve points. While previous research acknowledged positive impacts of daylighting on retail sales performance and shopper satisfaction (Edwards and Torcellini 2002; Heschong, Wright, and Okura 2002), daylighting could alter the color appearance of the merchandise to an unacceptable degree (Hinks and Shamey 2011). The use of artificial lights alleviates this issue and may explain why daylight use is so low. The same concept likely explains the lack of quality exterior views. First, in order to have exterior views, daylighting associated with window openings is a certainty, which subsequently leads to inconsistent lighting as described above. Second, when offering strong exterior views, a retailer runs the risk of

conceding too much floor space or display area in order to preserve good sightlines to the windows. Additionally, a similar issue arises with material reuse in that there is a loss of design control when forced to incorporate existing material into the space. This may be an issue of pure aesthetics, in that a particular shade of wood or texture of metal may not match the brand identity. Or, it may be a case where the reuse of furniture would be less the desired for the specific products sold by a particular retailer.

A pattern emerged from the LEED CI-certified fashion stores suggest that for fashion stores, aesthetic considerations more often than not trump sustainability concerns. The importance of the interior environment on brand image as well as the interrelationship of many design variables within a fashion retail space, lead to a situation where control of certain variables, specifically the visual surfaces in a space, becomes paramount. Considering the effectiveness of physical space as a means of brand differentiation (Bitner 1992), it is understandable why aesthetics would often take the lead when choosing interior design options in fashion stores. This significance of interior design variables is echoed by Arrigo's (2018) study where large scale interior elements such as lighting, furniture selection, product displays, space design and space allocation rank highest among non-human factors in ability to convey a sense of luxury. Atmospherics is very carefully considered as the deliberate design of a space in order to influence behavior (Kotler 1973). Specially, fashion stores typically fit into a "life-style" product category and in regards to the buying decision, the space in which the product is sold is just as important as the product itself. Additionally, Haug and Münster (2015) acknowledge the complexity of designing a fashion store environment and specifically identify the interrelationship of competing constraints as challenging. It may be reasoned that if the design process was complex prior to the addition of sustainability issues, it becomes increasingly difficult when the LEED certification requirements are factored in. Further investigation needs to be undertaken to better understand the relationship between environmentally sound design choices and interior design aesthetics. The findings of this study suggest that there is likely an area of conflict where brand strategy meets LEED requirements.

The findings of this study suggest that the low achieving LEED criteria can be improved by providing more flexibility in achievement requirements. In some regards, this is the aim of the most recent version of the LEED rating system called, LEED v4. Instead of identifying a specific environmental problem and approaching credit achievement with a set of prescribed solutions, LEED v4 attempts to derive solutions from the question "What should a LEED project accomplish" (Owens et al. n.d.). In categories where flexibility is high, such as Innovation in Design, achievement also tends to be high. A second possibility is to recognize inherent limitations within certain credit categories and then provide alternate methods of achievement. In this way, LEED certification

may be thought of not on a project-by-project basis, but as a basket of sustainable projects. As an example, if specific furniture reuse is an impossibility within one project, then potentially the furniture could be given to another user in exchange for credits.

There are several limitations of this study that deserve consideration. As previously discussed, the LEED rating system has gone through multiple iterations and within each iteration the building type categories have continuously shifted. Additionally, within each rating version, the credit allocation between the various building types is often inconsistent. While this can be accepted as a predictable consequence of an evolving rating system, it should be noted that it does create challenges when mining the data for comparisons between building types. Due to the aforementioned challenges, the following should be highlighted: First, 72.4% of the stores in the data set are either Nike or Converse brand properties. While this percentage is high and may skew the data towards certain corporate environmental design philosophies, it is unavoidable due to the limited number of fashion retail space certified to the LEED 2009 CI Retail standards. Second, 63.8% of the data set are from properties located in the United States. Again, while a more global representation would have been preferred, this is a function of the available data and is therefore unavoidable. More longitudinal studies with larger samples are needed to capture broader applications of LEED certification systems in the fashion industry and to verify if the patterns identified in this study apply to other contexts.

While the findings of this study provide a general overview of LEED Retail CI certified fashion stores, future research needs to investigate fashion brands' sustainable efforts in their various operational spaces (e.g., factory, distribution center, headquarter, store) and how different LEED rating systems and assessment categories are applied to their building projects. For example, another LEED rating system that applies to a large number of retail building projects is the 2009 New Construction (NC) Retail rating system which provides sustainable assessment standards for new retail buildings and major renovations of existing buildings (USGBC 2016). A comparison of LEED-certified fashion stores based on their use of existing retail space vs. new or major renovated retailer space can provide a deeper insight into opportunities and challenges that fashion stores can implement for their future retail development. In addition, further research with empirical case studies and interviews could investigate how LEED certified fashion stores actually benefit brands, employees and consumers and strengthen the understanding of LEED applications in the fashion industry. For example, Nike, as identified as the fashion brand most utilized the LEED certification in this study, can be further researched as a single and in-depth case study including interviews with managers, employees and consumers regarding their performance and satisfaction with the LEED certified store.

Disclosure statement

No potential conflict of interest was reported by the authors.

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