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The Adoption and Diffusion of Pro-Environmental Stadium Design

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Abstract

Research question:

Owners and architects face mounting pressure to incorporate environmentally sustainable features in new arenas, ballparks, and stadiums. In this study, we apply Rogers' (1962, 2003) innovation-of-diffusions framework to highlight the key influencers and factors contributing to the decision to adopt pro-environmental initiatives.

Research method:

We conducted interviews with 13 senior architects whose portfolios collectively contained over 25 eco-friendly sport facilities spanning Europe, Australia, Africa, and North America. The facilities discussed were used for a variety of leagues and events, including FIFA World Cup, the Olympic and Paralympic Games, college football and basketball, MLB, and the NFL. The data were transcribed and analyzed following the open, axial, and selective coding sequence.

Results and Findings:

The results of the study indicated that owners and quasi-owners reviewing green-facility proposals considered the input of several groups, including the design firms, the media, political leaders, environmental activists, and local citizens. According to interviewees, the primary incentives for owners and quasi-owners to adopt sustainable designs were economic savings over the life of the facility, perception-management opportunities, and demonstration of their innovativeness. Finally, facility designers predicted the diffusion of pro-environmental sport facilities would continue in the immediate future.

Implications:

Innovation diffusion is driven by early adopters, who prioritize an innovation's relative advantage and compatibility over its complexity, lack of trialability, and lack of observability.

Additionally, pro-environmental facilities are being used by organizations to demonstrate both environmental stewardship *and* their cultures of innovation. Future research should explore both the decision-making process and barriers to sustainable-design adoption in further depth.

Keywords: *environment, stadium construction, design, decision-making, public policy*

The Adoption and Diffusion of Pro-Environmental Stadium Design

In recent years, the issue of environmental sustainability has emerged as a popular topic of conversation within the sport management literature (e.g., Casper & Pfahl, 2012; Chard, Mallen, & Bradish, 2013; Inoue & Kent, 2012; Mallen, Adams, Stevens, & Thompson, 2010; Trendafilova, Babiak, & Heinze, 2013). Increasing awareness of the intersection of sport and the environment has not been limited to the academy, as sport leagues and organizations at all levels have begun championing pro-environmental initiatives in an effort to promote their businesses and inspire social change among their fans (Trendafilova & Babiak, 2013). A growing trend in collegiate, professional, and international sport is the incorporation of pro-environmental elements in the designs of new or renovated arenas, ballparks, and stadiums (Porteshawver, 2009). In this study, we consider the rise of sustainable design in sport as an example of innovation diffusion and provide a qualitative account of the considerations managers make when deciding whether to adopt an innovation. This perspective is informed by the testimony of stadium-design professionals, who are active in the earliest stages of a facility's conception.

The increasing rate at which sport organizations have adopted sustainable facility designs suggests the industry is on the brink of what Rogers (1962, 2003) referred to as innovation diffusion. An innovation—exemplified in this study as the incorporation of pro-environmental design—is defined as "an idea, practice, or object that is perceived as new by an individual or unit of adoption" (Rogers, 2003, p. 2). The rate of adoption by other organizations is known as diffusion, or a "process by which the adoption of innovation by member(s) of a social system is communicated through certain channels and over time triggers mechanisms that increase the probability of its adoption by other members who have not yet adopted it" (Rogers, 2003, p. 20). The diffusion-of-innovations theory has served as a fundamental theoretical basis of innovation-

adoption and -diffusion research in various disciplines, including management, marketing, public administration, communications, social psychology, technology, and sociology (Gopalakrishnan & Damanpour, 1997; Ramamurthy & Premkumar, 1995; Tornatzky & Klein, 1982). Despite its prominence in other disciplines, however, there has been little attention paid to innovation adoption and diffusion in the sport management literature (e.g., Caza, 2000; Hoeber & Hoeber, 2012; O'Brien & Slack, 2004).

By adopting new ideas early, an organization may obtain or maintain a competitive advantage over competitors that delay adoption. Of course, embracing such a pioneer philosophy can carry considerable risk, as investing in unproven products or strategies can lead to lost capital and person-hours if an idea is trendy for only an abbreviated time or if it fails altogether. One particular innovation in sport—the incorporation of sustainable design in major arenas, ballparks, and stadiums—is being approached with decreasing apprehension as more and more teams and leagues adopt pro-environmental strategies. Reflection on the reasons some organizations elect to adopt sustainable practices while others are more reluctant has been largely speculative. With the benefits of hindsight and the perspectives of these facilities' chief designers, however, we endeavor to conduct a more comprehensive examination of the structures and philosophies underlying a case of innovation diffusion. Below, we provide a review of the applicable literature related to innovation diffusion and pro-environmental behavior in sport. The concepts discussed in the literature review are then integrated with the narratives provided in this study. We conclude with a discussion of this study's theoretical and practical implications and present an agenda for future research.

Theoretical Foundation

Innovation Diffusion

In this study, we focus on the process of innovation *adoption*, or the "decision to make full use of an innovation as the best course of action available" (Rogers, 2003, p. 177). Adoption represents just one element of the larger diffusion process. Within the context of sustainable design (i.e., the innovation), a decision-maker's agreement to incorporate pro-environmental features into a new facility represents innovation adoption, while the subsequent spread of eco-friendly stadiums across a league or leagues signifies diffusion. In this section, we describe the multifaceted process of diffusion and summarize how diffusion theory has been applied to the sport management discipline in the past.

Elements of diffusion. As discussed in the introduction, the diffusion process involves four unique elements: the innovation itself, the communication channels, time, and the social system. The diffusion of an innovation is the product of many adoptions occurring, each of which involves the interaction of the four main aspects (Straub, 2009). These elements are detailed further below.

The innovation. Rogers (2003) identified five analytic classifications of the attributes influencing whether an innovation was adopted: (1) relative advantage, (2) compatibility, (3) complexity, (4) trialability, and (5) observability. First, relative advantage refers to "the degree to which an innovation is perceived as better than the idea it supersedes" (p. 15), in which the greater the perceived relative advantage of an innovation, the more rapidly it will be adopted. Second, compatibility is "the degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of potential adopters" (p. 15); if an innovation does not fit into an individual's existing understanding or values, it will be more slowly adopted. Third, complexity is the perceived difficulty associated with using the innovation; the easier new ideas or technologies are to understand, the more quickly they will be adopted. Fourth,

trialability is the degree to which an innovation can be assessed before being fully adopted and implemented; an innovation that can be trialed indicates less uncertainty to the individual considering it for adoption. Fifth, observability is concerned with how the results of an innovation are visible to others; if it is easy for individuals to observe the results of an innovation, then others are more likely to adopt the innovation. Rogers argued that as each of these attributes increased, so did the innovation's rate of adoption.

As the results of this study will indicate, however, early adopters must be willing to take some risks when an innovative product or strategy does not meet all of the above five classifications. For example, when a new technological innovation is introduced, early adopters might have insufficient information about how it should be properly integrated. Furthermore, it might not be possible to "test drive" a new idea before implementation.

Communication channels. The second element of Rogers' diffusion of innovation theory is communication channels. The communication process involves four components: the innovation, a party with expertise of the innovation, a party without expertise of the innovation, and a channel connecting the two parties. In general, either mass media or interpersonal channels are the most common ways of communicating for the information exchange between people. Rogers focused on the importance of interpersonal channels, which are more effective in adopting a new idea or product.

Time. Adoption and diffusion are framed through the context of time (Straub, 2009). For example, the frequency of adoption and ultimate diffusion of an innovation can be measured by fluctuations in the number of adopters. Rogers (2003) suggested three dimensions of the time aspect, including the innovation-decision process, adopter categories, and the rate of adoption, each of which are highlighted below.

The innovation-decision process. According to Rogers (2003), the innovation-diffusion process involves eliminating ambiguity about an innovation's pros and cons. This process indicates the timeframe from the potential adopters' first recognition of the innovation through their final decision of innovation adoption or rejection. The decision-making sequence begins with the initial knowledge of the innovation. Next, the organization considers its options, while peers or consultants may cause influence (either intentionally or unintentionally). After deliberation, a decision is made to adopt or reject. If the innovation is adopted, the organization moves into the implementation stage. Finally, confirmation of the decision is sought.

Adopter categories. In sum, there are five categories of adopters: innovators, early adopters, early majority, late majority, and laggards (Rogers, 2003). As the first member of a group to adopt an innovation, innovators tend to be venturesome and undeterred by risk. They are able to cope with a higher level of uncertainty than their peers. Early adopters tend to be open to change, but are less willing to take risks with an innovation decision. Members of the early majority typically make up one-third of all members of a social system (defined below). The late majority also consists of one-third of the members in the system. Due to their skepticism about the innovation, they tend to accept an idea once most others in their system have adopted it. Thus, in their decision-making process, the pressure of peers and the weight of system norms are essential sources motivating them to adopt innovations. Finally, the laggards tend to adopt only after observing innovation successes from other members of the social system, thereby resulting in a long innovation-decision period. In this study, we focus our attention on the innovators and early adopters.

Rate of adoption. Rogers (2003) defined the rate of adoption as "the relative speed with which an innovation is adopted by members of a social system" (p. 221). This rate is measured

by the number of innovation adopters for a given period of time. Most innovation processes follow an S-shaped rate of adoption, in which only a few individuals initially adopt the innovation (i.e., innovators), more and more individuals join as time moves on, and eventually, the adoption-rate trajectory begins to decline as fewer and fewer individual non-adopters remain.

Social system. The social system is the last element of the diffusion process. Rogers (2003) defined the social system as "a set of interrelated units engaged in joint problem solving to accomplish a common goal" (p. 37). Rogers argued that since all diffusion occurs within a social system, innovation diffusion is influenced by the social structure or norms of the system. For example, each MLB baseball team constitutes a unit of a shared social system. These units tend to share a common goal linking them together.

Innovation diffusion theory within the academy. Despite the popularity of innovation-diffusion theory in other disciplines, it has been largely absent from the sport management literature. An early exception is Loy (1968), who analyzed the socio-psychological influencers of elite swimming coaches' early adoption of an innovative training method. He concluded that factors such as educational status, occupational status, and creativity were positively related to innovation adoption. A more recent study by Newell and Swan (1995) contained a framework describing the innovation process in the context of sport organizations. In their framework, interorganizational networks, the roles of key agencies, change process, and outcomes of change were found to be the main determinant factors influencing the diffusion and appropriation of innovation in sport organizations. Elsewhere, Caza (2000) engaged in ethnographic case study to explain why one of an amateur sport organization's innovations failed while others were adopted. Additionally, several works by O'Brien and Slack (2003, 2004) have focused on the evolution and diffusion of English rugby union.

More recently, Hoeber and Hoeber (2012) classified three determinant categories (i.e., managerial, organizational, environmental) influencing the innovation process and identified which determinants were most critical at each particular stage of innovation. Relying on interviews, focus groups, and observations, the authors found multiple determinants (e.g., leadership commitment, pro-innovation characteristics, organizational capacity, simple organizational design, involved and interested external parties) during the innovation process. In this study, we employ a similar approach in order to better understand the decision to incorporate eco-friendly features into a sport facility. As demonstrated in the next section, myriad sport industry sectors across the globe are in the early or advanced stages of pro-environmental-innovation adoption and diffusion.

The Rise of Sustainable Stadiums

Although some pro-environmental initiatives have been practiced at local levels for some time, one of the earliest formal initiatives bridging sport and environmental consciousness began in 1994, when the United Nations Environment Programme (UNEP) began working with the International Olympic Committee (IOC) to reduce the environmental impact of the Olympic and Paralympic Games (UNEP, 2005). Beginning that same year in Lillehammer, the IOC began concerted efforts to increase the pro-environmental standards of its showcase events (IOC, 2012). As their environmental focus has advanced over time, the Olympic and Paralympic Games tout greater ecological stewardship every two years (Gray, 2012). In 2013, the IOC held its 10th World Conference on Sport and the Environment in Sochi (IOC, 2013).

Given the particularly harmful effects mega events have traditionally had on the environment, both FIFA and the IOC now require all candidates seeking to host the organizations' flagship events make sustainable design a focus in their facility proposals (FIFA,

n.d.; Swan, 2012). For example, of the 37 athletic facilities planned for the 2020 Olympic and Paralympic Games in Tokyo, 15 are existing venues; by limiting the number of new constructions, the harmful environmental consequences associated with construction and land use (as well as the added cost) will be minimized (Martin, 2013).

In collegiate and professional sport, team- and league-wide initiatives have coincided with the development of eco-friendly building certification systems worldwide (Hershkowitz, 2013). For example, in April 2013, Thyagaraj Stadium (Delhi) received a gold rating by the Indian Green Building Council ("Delhi's Thyagaraj Stadium," 2013). In Europe, Croke Park (Dublin) and the Millennium Stadium (Cardiff) each met the British Standard for Sustainability Management Systems for Events (BS 8901; British Standards Institution, 2013). Furthermore, while not a certification system, the International Organization for Standardization (ISO) provides a number of international standards designed to improve efficiency. These standards include ISO 14001 for environmental management and ISO 20121:2012 for event sustainability management, both of which have been met by several professional teams and events (Lambert, 2013).

Similar certification and standards systems exist in North America. Founded in 2000 by the U.S. Green Building Council (USGBC), Leadership in Energy and Environmental Design (LEED) is one of the earliest and most prominent of these certification systems (USGBC, 2013). In July 2007, Medlar Field at Lubrano Park, home of the State College (PA) Spikes class-A short-season minor league baseball team, became the first professional sport facility to receive LEED certification (State College Spikes, 2013). As of fall 2013, 20 professional arenas, ballparks, and stadiums have attained LEED certification across MLB, Minor League Baseball,

MLS, the NBA, the NFL, and the NHL. Since 2009, over three stadiums across these leagues have received LEED certification annually.

Within the context of sustainable stadiums, the decision to adopt a pro-environmental design is likely grounded in expected enhancement of an organization's so-called triple bottom line (TBL), which consists of the economic, environmental, and social impacts of a decision (Elkington, 1998; Kellison & Kim, 2014). First, and perhaps most obviously significant to organizations, is the possible financial savings generated by the green facility, including reduced cost of utilities and waste management. Second, environmental initiatives are designed to reduce the short- and long-term impact of a facility on the environment. Finally, growing consumerism of pro-environmental products and services has pushed organizations to establish green operating practices (Richardson & Lynes, 2007).

For a sport teams or event seeking to demonstrate its environmental commitment, the stadium is perhaps the most visible symbol. These physical markers can be used to represent an enduring corporate culture (Elsbach, 2006). For example, a team endeavoring to improve its local reputation might highlight its forward-thinking and socially responsible initiatives in the form of obtaining LEED certification. As part of this study, we attempted to examine whether such perception-management considerations are made during the planning phase of a new sport facility (e.g., are owners incentivized to adopt sustainable design to improve their organizations' images?). With this knowledge, those seeking to reduce the environmental impact of sport facilities and events would be better equipped to promote their agenda.

Method

Although it is clear that sport organizations are becoming more responsive to calls to reduce their environmental impact, less is known about the considerations of decision-makers

during the actual processes of innovation adoption and diffusion. Within the diffusion-of-innovations literature, scholars have identified a number of individual, organizational, and environmental determinants theorized to yield innovation adoption (Damanpour & Schneider, 2006; Eisenhardt & Martin, 2000). Given that the incorporation of eco-friendly design in sport facilities is a relatively recent development, in this study, we sought to identify the unique factors that are contributing to the widespread adoption, and subsequent diffusion, of this pro-environmental innovation. Thus, the purpose of this study was to gain insight into the key influencers involved in the decision to incorporate eco-friendly features into the design of a new or renovated sport facility is made. In light of this purpose, we endeavored to identify: (1) the individuals and groups involved in the decision to adopt sustainable facility designs and (2) the incentives for owners and design firms to support pro-environmental initiatives.

In the spirit of discovery, description, and theory development, a qualitative research design was used to examine innovation adoption and diffusion of sustainable sport-facility design (Rudd & Johnson, 2010). Standardized, open-ended interviews were conducted in late 2012 with a convenience sample of lead designers of renowned collegiate, professional, and international sport venues identified as pro-environmental (i.e., either through official certification or through substantial media recognition). In sum, 13 individuals agreed to participate in the study. These individuals were responsible for the design of more than 25 eco-friendly sport facilities across Europe, Australia, Africa, and North America. The facilities discussed were used for a variety of leagues and events, including FIFA World Cup, the Olympic and Paralympic Games, college football and basketball, MLB, and the NFL. Each interviewee held the title (or a derivate of) Principal, Associate Principal, Senior Architect, or Project Designer.

Architects play significant roles not just in creating the physical designs of stadiums, but also in developing the political and social stories associated with the facilities. As noted by Horne (2011), "…The role of architects in contemporary culture is to act as conveyors of meaningful discourses about the buildings and the cultural spaces they produce. The same can be said for the designers and architects of sports facilities and stadia" (p. 220). Each of the participants interviewed in this study possessed firsthand knowledge of their respective facilities' design phases, which included face-to-face and virtual meetings with team ownership and management, university stakeholders, building contractors, and other designers. This level of insight lent to the credibility of the qualitative study (Milne & Oberle, 2005). Participants were provided with a list of prepared questions prior to completing the interview. This script was designed to guide discourse related to the planning and implementation phases of innovation adoption. In order to facilitate a more open-ended discussion and enhance the study's authenticity, participants were invited to speak freely, elaborate, and provide additional comments whenever desired (Milne & Oberle, 2005).

The testimony of the facility designers was collected asynchronously using online survey software. This medium was optimal based on the accessibility of participants, many of whom had limited availability to participate in the study. Furthermore, an online data collection was deemed preferable because of its low cost of administering and minimal environmental impact. Survey design was mindful of Dillman, Smyth, and Christian's (2008) web survey construction principles, which offer remedies for nonresponse and measurement error.

The data were transcribed and stored using NVivo 10 qualitative data analysis software (QSR International, 2012). Themes were extracted from the interviews following the open, axial, and selective coding sequence outlined by Strauss and Corbin (2008). First, each line of

data was categorized into phenomena. Second, when appropriate, connections were formed between the first-stage categories. Third, a group of core categories germane to the research purpose were finalized. To address the interpretive validity of the analysis, participants were invited to review their testimony, and when desired, provide clarification. Additionally, the results are presented below largely through verbatims, thereby allowing readers to "experience the participants' actual language, dialect, and personal meanings" (Johnson & Christensen, 2008, p. 277).

Results and Discussion

In order to identify who was involved in the innovation-adoption process and what role each of these parties played, we focused our investigation on individuals involved in new stadium designs. It should be acknowledged that many pro-environmental stadium enhancements have been made to existing facilities. In North America, over half of those professional facilities recognized by the USGBC were certified "LEED for Existing Buildings." For some of the more recently built venues such as the Toyota Center, which opened in Houston in 2003, receiving LEED certification was mostly an administrative procedure because it had already incorporated green design elements when it was originally constructed. For other facilities like Chicago's Soldier Field, LEED certification came after a major renovation. We will revisit this issue in our discussion of future research.

Three unique findings emerged from our focus on the decision to adopt. First, interviewed project designers recognized the individuals and groups who were critical in the decision-making process. Second, the perceived benefits of pro-environmental stadiums were identified. Third, the rate of innovation diffusion was predicted. In the following sections, we present our findings in further detail.

Key Players in Design Decisions

As expected, the key stakeholders in the design process were the decision-makers (i.e., ownership or university stakeholders) and their consultants (i.e., the facility designers). Together, ownership and the facility designers represent the two communication channel parties: the facility designers have expertise regarding the innovation, while ownership lacks that expertise but possess the decision-making authority. Interviewees also identified a number of other influencing groups, including the media, political leaders, environmental activists, and local citizens. The varying degrees of influence of each of these groups are important to recognize. As illustrated below, while ownership had ultimate decision-making authority, those decisions were often influenced (either wholly or in part) by legislative mandates, potential public relations consequences, and organizational culture.

Owners and quasi-owners. Many of the interviewees matter-of-factly acknowledged that ownership was the chief decision-maker in the design process. One exception was in college athletics, where "ownership" was represented by university stakeholders entrusted with decision-making authority (e.g., athletic director, project managers). These individuals serve as proxies, or quasi-owners, because they have vested interests in budgetary matters and are delegated decision-making authority. Interestingly, the financial complexity of each facility project sometimes makes it difficult to identify exactly *who* is part of the ownership (Kellison & Mondello, 2012). The majority of new stadium projects are financed by a combination of public and private capital; in this case, an ownership group might include a city or county stadium authority, a local corporation, and the owners of the team. Other projects are financed fully by government entities. Regardless of the often-confusing makeup of the facility ownership,

interviewees indicated that stakeholders overseeing the stadium's primary tenant (i.e., the team) were always involved in the stadium-design phase.

Many interviewees spoke to the decision-making power of ownership. As noted by an Associate Principal of a LEED-certified MLB park, much of this power was based on the owners' control of the budget:

> [Ownership is] extremely important because budget always becomes a topic for conversation with green design. The majority of new trends have a price tag associated with them so it is the owners' responsibility to decide if they want them incorporated or not.

This quotation illustrates the simple yet important role construction costs usually play in the decision-making process. While the notion that owners are apprehensive toward premium costs is commonsensical, it will be later shown that the cost of a new stadium is only one consideration in an adoption decision. Furthermore, in certain cases, the added cost of incorporating pro-environmental features into a new stadium is largely irrelevant.

Other designers who participated in this study noted that the pool of decision-makers appeared to shrink when meetings transitioned from abstract pre-planning to actual decisions. Said one architect of a sustainable college football stadium, "It finally sinks in when [owners] have to make key budget decisions." At that point, the dialogue narrows to the owners and the chief architect, with the owners holding the ultimate authority, as discussed by an MLB stadium designer:

> If you do not have [owner] buy-in then or really their focus and determination on building sustainable buildings then it won't be fully implemented. There are easy sustainable decisions designers can make without impact to cost, but there are certainly

functions that are owner-driven and controlled such as mechanical systems, lighting controls, building controls, landscaping, and so on.

Ultimately, a designer's ability to be creative is at the mercy of the owners' authority over cost-related issues. Once pro-environmental technologies begin creating premium costs, the role of the building designer becomes more consultative.

Several stadium designers acknowledged the knowledge barriers that sometimes existed between themselves and the chief decision-makers. In particular, one Senior Associate believed he had a responsibility to educate ownership: "I think that most of the key decision-makers are not as informed about the green building process as they say and it takes the documentation process to start to inform them." This lack of technical expertise on the part of the owners is not unexpected, and many owners were credited with introducing or quickly embracing the idea of a pro-environmental stadium. A Project Manager of several large-scale stadium projects explained simply, "…Without their direction or understanding, the green building process typically isn't pursued." Thus, in order for pro-environmental initiatives to gain traction, they must be understood and supported by ownership. In the following section, we highlight the role that design firms have in garnering that support.

Design firms. Because this study utilized a convenience sample of architects having portfolios of eco-friendly stadiums, all participants shared the standpoint that stadiums should incorporate ecologically sound features. Therefore, when interviewees were asked to discuss the role design firms played in the innovation-adoption process, many acknowledged that owners were often apprehensive of green-building costs. A designer of several green major and minor league ballparks highlighted one of the designer's resulting primary responsibilities to ownership:

> These discussions are not abnormal. As design professionals, we educate owners on what the advantages and potential drawbacks are of sustainable design. We like to ensure that they are fully educated on the process and potential outcome before project budgets, schedules, and stakeholder goals are fully defined.

This statement acknowledges the limits of the design firm's influence, a notion confirmed by other interviewees, including a Senior Principal of an Olympic venue in Australia: "…It is up to the client group as to whether they do not wish to adopt an environmental strategy." Similarly, a project leader of a pro-environmental soccer stadium in an Arab state acknowledged, "We see this frequently and it is still the case for many projects. Ultimately, you are responding to the client and need to incorporate their wishes and desires." When debating over a design element that significantly raises the stadium's price tag, designers must defer to ownership. Initial cost premiums are likely the top concern for owners, and a recent analysis of LEED vs. non-LEED buildings found cost premiums for LEED buildings averaged 4.1% (Nyikos, Thal, Hicks, & Leach, 2012). Still, that same study found energy costs in LEED-certified buildings to be 31% lower and operating costs to be $.70 per square foot less than their non-LEED counterparts, suggesting pro-environmental stadiums could produce long-term savings.

When given the scenario of an owner reluctant to add sustainable elements to a stadium design because of the perceived costs, nearly all interviewees echoed the need to educate the owners about the actual up-front costs and long-term savings of the project. A Senior Architect Technician of two LEED-certified MLB stadiums highlighted this sentiment:

> Regardless of whether sustainable design is incorporated, our firm is open and willing to listen to all projects presented. As architects, we perform our due diligence to make sure that the end result is a high-performance, environmentally friendly building whether or

> not additional capital has been set aside for sustainability purposes. Also, based on our experience from a cost-perspective, we have learned that as the industry has become more familiar with sustainable building strategies and technologies, incorporating sustainability does not always require additional capital investment.

Other interviewees discussed the necessity of educating owners on the improved operation and function of eco-friendly facilities, opportunities to reduce costs through smarter material selection and sourcing, and the importance of lifecycle savings.

Still other designers discussed their influence when facing a reluctant owner unwilling to reconsider the decision not to incorporate eco-friendly features into the stadium design. Noting that this scenario was not uncommon, interviewees addressed what happens when a client's plan does not align with the architecture firm's pro-environmental agenda. Acknowledging an owner's concern over added costs, an NFL stadium project director commented, "Likely, the solution would be to include passive pro-environmental systems that could be designed to incorporate some of these benefits without the added cost of creating a 'green' building." Other designers simply stated they would not be willing to change on certain issues, including the Vice President of a firm which built a LEED-certified college stadium (i.e., "In creating a 50-year facility and meeting many code requirements, some of the strategies will have to be part of the project no matter what."); a Senior Principal of green stadiums in Australia and New Zealand (i.e., "We would identify exactly what their concern was, and whether they were willing to move a little on that stance. We would apply it as far as we felt we could."); and a Senior Architect of an MLB stadium (i.e., "They can elect not to certify a project to save some cost, but that likely won't affect the design decisions we propose.").

In addition to the architects' obvious roles in planning stadiums, the testimony above illustrated their varying influence in decisions involving the adoption of pro-environmental designs. Many facility designers interviewed in this study expressed strong feelings toward the pro-environmental movement and showed conviction in educating owners on the benefits of sustainable design. This principle is evident in the response of a Project Designer of a green college basketball venue: "At the end of the day it is ultimately their choice, but as a designer, I feel it is my duty to educate as many individuals as possible on 'green design." Although owners and design firms are the primary groups involved in innovation-adoption deliberation, others can exert immense pressure on the decision-maker. These additional agents of influence are identified in the next section.

External agents of influence. Four additional groups of influence emerged from an analysis of participant responses. These groups included the media, political leaders, environmental activists, and local citizens. According to the stadium designers, each of these groups had varying degrees of influence ranging from, depending on the case, trivial to mandating. In any case, these groups represent other sources that are considered during decision-to-adopt deliberations.

As the primary information source for local citizens, the local press provides an important service during civic debates. Furthermore, with its editorial authority, decisions made about what content to publish, how an issue is portrayed, and whether to endorse a particular cause may influence public discourse (Jönsson, 2011). While cases of press influence on stadium-finance debates are well documented in the literature (e.g., Buist & Mason, 2010; Trumpbour, 2006), research on the media's effect on environmental policy has been decidedly mixed (cf. Crow, 2010). In this study, the Project Manager of an NFL stadium noted that the media

coverage of a new eco-friendly facility tended to focus on its environmental and community impacts. Interviewees like the Associate Principal of an indoor collegiate practice facility indicated their belief that decision-makers who elected to adopt environmentally sustainable practices enjoyed the public-relations potential that came with such a decision: "I say [the media is most important] because some owners, not all, enjoy the positive [public relations] sustainable facilities bring. As long as it brings [PR], then we will continue to see it supported." The expectation that a pro-environmental stadium will bring positive media exposure would not likely be sufficient to lead an owner to invest heavily in a new technology, but as the architects' testimonies demonstrated, it was a factor worthy of consideration.

According to interviewees, the promise of positive public-relations exposure also came from local political leaders. Political interest in environmental science continues to grow (Bulkeley & Betsill, 2010; O'Riordan, 2004), and a number of interviewees cited "government" or "political leaders" as the group chiefly responsible for pro-environmental stadiums. In some cases, lawmakers require that a stadium receiving public financing meet mandatory environmental benchmarks (Pfahl, 2013). A second reason for political leaders' influence is tied to their visibility in the media. As explained by one Project Manager, political leaders provide a vehicle through which additional spotlight for the team can be generated:

> I would rank civic leaders as the most important given they are delivering a message to their constituents and the large amount of PR and exposure surrounding sports and venues gives them a platform with which to take a position. Most owners and operators incorporate these elements as a response to the community and desires of local citizens in order to avoid any negative backlash.

The above quotation illustrates the relationship between the agents of influence. With the exception of forcing a government mandate, these influencers do not have access to the adoption deliberations. The local press provides an alternative to face-to-face meetings, and political leaders have been able to use the media to express their satisfaction or dissatisfaction with stadium planners.

Environmental activists have also used the press as a medium through which to communicate to owners. In fact, the mere presence of an organized environmentalist organization—and the threat of a public protest by which it is sometimes accompanied—can push decision-makers toward the election of sustainable technology. As one architect noted, green designs will "avoid any negative attacks or disappointment from environmental groups." Previous research has shown that the efforts of activist groups on local, state, and international environmental policy may sometimes go unrewarded (Böhmelt & Betzold, 2013; Nævdal & Brazee, 2000). However, to a professional sport team relying on the support of its local community, the specter of bad press likely impacts ownership decisions (Kellison, 2013).

If the agents of influence were arranged in a sequence, political leaders and environmental groups would communicate through the media to both ownership and local citizens. Ordinary citizens, while unlikely to sway environmental lawmaking (Ringquist, Neshkova, & Aamidor, 2013), may have significantly greater influence on businesses like professional sport organizations (Hobson, 2013). In communities in which environmental issues are central, proposals with eco-friendly designs are expected to receive more citizen support for public financing (Kellison & Mondello, 2012). Several interviewees described the general public as increasingly aware of environmental issues and predicted local communities would drive innovation diffusion. A Senior Principal associated with several Olympic facilities

discussed the influence of a knowledgeable consumer base: "The public is far more aware of the longer-term impacts of the construction industry, and in particular, sports infrastructure on the environment. The public expects a responsible environmental approach to the design, operation, and maintenance of these often-large buildings." According to interviewees, decision-makers who failed to embrace a pro-environmental agenda in the facility-design project will face increasing opposition in future years.

Incentives to Build Green

As noted previously in the discussion of the TBL, benefits of pro-environmental design have traditionally been grouped into three categories: environmental, economic, and social (Elkington, 1998). In this study, we highlight the economic benefits expected by ownership and design firms. In addition to responding to the expectations of facility designers, the media, political leaders, environmental activists, and ordinary citizens, decision-makers must also consider other factors when considering innovation adoption. As discussed above, for owners, incentives to build sustainable features into the stadium's designs are largely economic. Facility-design firms may also reap economic benefits from being an early adopter of a new system.

To ownership. In our interviews with owners, the most frequently cited benefit of an environmentally sustainable stadium was long-term savings. These savings are the result of initial tax credits, reduced utility costs, and a longer facility lifecycle (Nyikos et al., 2012). The *long-term* qualifier is important to understanding this benefit, particularly for owners who would consider selling their team and facility before any real savings were realized. Investment in environmentally friendly facilities has a great guarantee for long-term owners like colleges and universities, whose ownership normally lasts the life of the building. Even so, short-term owners could benefit by selling a stadium at a premium price: if a facility were put on sale, it would

likely have, as one interviewee explained, "a greater payback to the owner" because of the quality of design and long-term savings associated with it.

Other perceived incentives related to the positive publicity generated from the facility. As noted by one interviewee, "Most cost benefits are long-term investments but when mixed with…public relations, [owners] can realize more short-term benefits as well." New sponsorship interests may also arise from companies seeking to partner with other forward-thinking organizations: "We've actually had green sponsors bring incremental revenue to a project because of a green feature." A team's exposure to positive press could produce new opportunities for community partnerships, corporate sponsorships, and industry attention.

More generally, owners are incentivized to adopt sustainable designs in order to stay on the forefront of innovation adoption, according to facility designers. As early adopters, teams currently playing in LEED-certified facilities are still relatively uncommon and can therefore attract media attention and sponsorship interest. To one designer, a decision to exclude pro-environmental elements in a stadium's design would be detrimental to its business prospects:

> [An eco-friendly venue] is a venue that is on par with its competitors in terms of attracting talent and use. …If you try to produce a building that is not green, you are designing a facility that is not going to be on par with competing venues. While the benefits may not be clearly defined related to green building, any venue that does not have this focus would be considered out-of-date.

An organizational culture that embraces innovation is a strategic imperative for organizations seeking to maintain or gain a competitive advantage (Vincent, Bharadwaj, & Challagalla, 2004). As discussed below, this philosophy is equally applicable to facility designers.

To design firms. Like the benefits they anticipated for owners, interviewees identified a number of economic incentives for the designers of pro-environmental facilities. These benefits included marketing and public-relations benefits, tax credits, and additional revenues, though all to a much lesser degree than for facility owners. A designer may receive small premiums for producing a LEED-certified stadium, but the primary benefit is to establish itself as a top architecture firm. As eco-friendly facilities become more a part of the status quo, architecture firms with expertise in pro-environmental facilities will be better able to meet the strategic and technical demands of their clients. This point was articulated by the Principal of an eco-friendly civic arena: "It is becoming increasingly the demand of the sports market to demonstrate how your firm incorporates sustainable practices. Most municipalities now call for their sports and assembly facilities to utilize sustainable practices." In other words, owners who solicit requests for proposals for a new stadium will likely avoid partnering with a firm that lacks a portfolio of innovative designs, including those organizations without experience in sustainable building.

Lastly, architecture firms that design such facilities are able to demonstrate their environmental and social commitments. These benefits may be particularly important in light of the relatively smaller economic benefits derived from designing eco-friendly projects. To illustrate this point, the Senior Architect of a LEED-certified stadium is worth quoting at length:

> As global leaders in sports and event architecture, our mission is to provide high-performance solutions that offer our clients the most efficient building for the money they spend. Therefore in doing our part, our incentive as architects has become the opportunity to inspire humanity to do their part also. Simply put, we see sustainable design as a good business strategy, and will continue to provide facilities that are not only aesthetically beautiful but are environmentally sensitive as well.

While innovation adoption and diffusion are recognized as business strategies throughout this paper, it is important to also acknowledge the nonpecuniary benefits associated with green building. As shown above, stadium architects work to produce leading designs that will open doors to more projects. At the initial innovation adoption stages, however, the decision to adopt is largely voluntary: companies could always defer until more information was known and then adopt later. For design firms on the leading edge of sustainable design, the benefits of green stadiums extend beyond a client's bottom line; to these organizations, reduced environmental impacts and inspired communities are worth additional effort and cost.

Perceptions of Innovation Diffusion

Given the interviewees' knowledge of the stadium-design market, we reasoned that these facility designers could forecast the growth of environmentally sustainable sport facilities with some accuracy. While unable to provide predictions of the speed of diffusion, their insight could aid pro-environmental advocates in better understanding how to foster sustainable design. Interviewees unanimously agreed that the trend of pro-environmental stadium designs would continue indefinitely; however, there was some disagreement over the reason for the continued trend. The majority of interviewees believed owners would continue to support any initiative that saved money and presented a positive image to the community.

A second reason for the expectation of continued innovation diffusion was the leadership of firms involved in designing these facilities. According to several interviewees, the focus on environmental impact by design firms is emblematic not only of each company (e.g., "Our staff…has an inherent desire to ensure the projects they are working on have an environmental aspect to them as well."), but also of the industry more generally. Commenting on the current culture of the architecture industry, the Project Designer of an indoor college turf field

speculated that designers would continue to engineer ways to minimize the environmental impacts of large public assembly facilities:

> I do believe this trend will continue because environmental concerns have become a forefront in thoughts and ideas throughout architecture in general. Although it has taken a little longer to develop these ideas and incorporate them into athletic facilities—due mostly to the scale of these buildings—pro-environmental features will introduce a new way of thinking about large-scale projects.

As indicated above and in earlier designer testimony, continued advances in sustainable technologies will ease apprehension about the initial costs of pro-environmental facilities. Furthermore, some efficient building and operation systems are increasingly standard and no longer require additional investment by building owners.

Finally, pro-environmental features are becoming standard not just because of lower costs, but also because they have come to be expected by the general public: "[Sustainable design] has become a baseline for future stadium development. Essentially, it is no longer an added feature or something that would be nice to do but rather a requirement or expectation from the fans and community." Some facility designers believe that the general public is increasingly active and better informed in the stadium-design process, as noted by a Senior Principal: "The public is far more aware of the long-term impacts of the construction industry and in particular sports infrastructure on the environment." A highly involved citizenry is especially expected in cities providing taxpayer subsidization of at least some portion of a stadium's construction. In these cases, the public has a vested interest in the design not only as citizens, but also as investors.

In its entirety, the testimony collected for this study supports the suspicion that the five analytic classifications of innovation adoption—relative advantage, compatibility, complexity, trialability, and observability—are of varying strength. This may be particularly true among early adopters of an innovation requiring significant investment of time and capital, such is the case when constructing pro-environmental stadiums. For instance, a sustainable stadium design may offer a relative advantage over a conventional design; as several interviewees discussed, owners are cognizant of the potential economic, environmental, and social benefits of a new facility, an idea supported elsewhere in the literature (Kellison & Kim, 2014). Additionally, a forward-thinking stadium design may be viewed by the public as compatible with an organization's existing culture of innovation, thereby complementing the company's already positive public image. On the other hand, the complexity and lack of trialability of green stadium design and construction, along with uncertainty about how visible a team's sustainable initiatives are known by the public, are expected to discourage innovation adoption (Kellison & Kim, 2014).

As noted previously, innovators tend to be enterprising and risk-taking. One possible explanation for the fact this group is willing to take risks despite the complexity, lack of trialability, and unknown observability of green stadium designs is the large anticipated payoff associated with relative advantage and compatibility. That is, because green stadium adoption remains a relatively new phenomenon, early adopters have enjoyed considerable attention from the press across all markets (e.g., local, regional, national, international) and mediums (e.g., newspaper articles, weblog reports, press releases on league websites). In addition, as the adoption rate continues to increase, more data will become available to answer questions

surrounding the complexity, trialability, and observability of eco-friendly stadium design, possibly resulting in greater acceptance by the majority of organizations.

Concluding Remarks

Building an arena, ballpark, or stadium from the ground up involves a lot of moving parts. In the early stadium-design stages, owners work side-by-side with expert architects to conceive state-of-the-art venues of which teams, corporate sponsors, fans, city leaders, and local communities will be proud. Increasingly, based in part on the influence of the various parties described above, owners are investing in environmental sustainability. The facility designers who made up this study's sample have a collective portfolio of over 25 pro-environmental sport facilities spanning four continents, and there was considerable diversity among the group. Nevertheless, there was unanimous agreement that this particular innovation would continue in an upward trend.

As illustrated in this study, teams and firms have begun incorporating sustainable elements into the design of a new facility with some expectation that public awareness of their environmental stewardship will grow. Given the deep meaning ascribed to mega sport facilities by fans, ordinary citizens, urban planners, and sportswriters, it is unsurprising that some sport teams and governing bodies have come to market their sustainable initiatives. More broadly, however, early adopters of pro-environmental stadium design have also sought to use the stadiums as organizational symbols of innovation and cutting-edge management.

One goal of our research was to contribute a qualitative understanding of what decision-makers consider when contemplating an innovation adoption. Accordingly, the sample represented in this study represents the innovator and early adopter categories (Rogers, 2003). Previous research has shown that at least three antecedents of organizational innovativeness

exist: managerial, organizational, and environmental (Damanpour & Schneider, 2006). Using a single case-study approach, Hoeber and Hoeber (2012) effectively illustrated the examples between these three determinants. However, we endeavored to provide a more in-depth analysis of who the primary influencers are in the decision-making process and what each of their primary interests are. Our findings suggest that ownership is the de facto determinant of innovation adoption. That is, regardless of the design firms, political leaders, environmental activists, local citizens, and press, and regardless of the potential for cost savings, positive public relations, and competitive advantage, the owner gave the final verdict.

The results of this study provide a rich illustration of the innovation-adoption process, beginning with the knowledge stage and progression through the persuasion, decision, implementation, and confirmation stages. First, the knowledge stage consists of characteristics of the decision-making units, identified in this study as (1) owners and quasi-owners and (2) design firms. Second, the persuasion stage is based on perceived characteristics of the innovation. As noted above, when hesitant about complexity, trialability, and observability, owners often defer to the expertise of design firms. Third, in the context of the current study, the decision stage encompasses the moment when decision-makers elect to adopt pro-environmental stadium designs. Fourth, while not explicitly examined in this study, the implementation stage reflects the period of time that occurs after the adoption decision is made, which include the construction and operations phases. As noted further below, both the decision and implementation stages are fertile areas for future inquiry, as researchers could examine the barriers experienced by innovation rejecters and problems faced during the implementation stage (Trendafilova, Kellison, & Spearman, 2014). Finally, during the confirmation stage, designers

and managers measure adoption effectiveness using the TBL, including economic benefits, the degree to which environmental impacts are reduced, and the societal response.

An underlying purpose of this study was to apply Rogers' (2003) broad innovation-diffusion framework to the context of sustainable stadium design in order to better understand the primary influencers of innovation adoption in sport. Despite the general connections, the nature of stadium construction complicates the traditional rate-of-adoption progression. For an organization weighing the costs and benefits of a pro-environmental stadium, the decision to omit green design elements does not cancel the construction of the facility. Thus, the teams that have built environmentally suboptimal facilities in the past five years have implied their skepticism toward sustainable design and are unlikely to reconsider adoption for the life of the stadium. Such cases are unique: although a pro-environmental design might not be adopted by owners, it is not as if the alternative of not building a pro-environmental stadium is to not build anything at all. That is, stadium planning continues without a pro-environmental focus, an immense amount of public and private capital is raised, and a new facility ultimately emerges. Therefore, in these cases, the innovation-adoption process should be reimagined as a complex series of decisions rather than as a static adopt-or-not choice.

In addition to its application to innovation-diffusion theory, this study also contributes to the literature related to environmentally sustainable design in sport. The results of the study indicate that owners are cognizant of the economic benefits associated with green stadiums. Although we focused on exploring the economic benefits traditionally tied to sustainable design, facility designers also revealed an appreciation for the environmental and social benefits of green stadiums. The richness of this content can provide sport managers with an analysis of what influences the decision to adopt sustainable initiatives, what benefits are derived from such a

decision, and whether similar adoption trends should be expected in the immediate future. This information could also be utilized by environmental activists to exert pressure on decision-makers to adopt sustainable practices.

Moving forward, new research should investigate the actual process of making the decision to adopting a pro-environmental stadium design. In this study, the key influencers in the decision-making process were identified. Using this knowledge, scholars should consider answering questions related to how decisions are actually made. What types of analyses were conducted (e.g., SWOT, cost-benefit)? How much additional cost were owners willing to accept? From where did the most pressure to support a green stadium originate? What were the primary sources of opposition? Following this line of inquiry will continue to expand the application of innovation-diffusion theory to the stadium-design process.

This study focused on cases of successful implementation of environmental sustainability. Therefore, less is known about the barriers to innovation adoption, a direction for future research also advocated by Hoeber and Hoeber (2012). Previous research has shown that insufficient staffing (in quantity and quality) and funding have limited some sport organizations' ability to implement sustainable initiatives (Trendafilova et al., 2014). In this study, interviewees identified at least one possible barrier. Historically, the lack of technological sophistication made designing a truly environmentally sustainable stadium nearly impossible. The sheer expansiveness of the facility was a contradiction to the principles of sustainable design, but as the number of stadiums represented in this study indicate, these issues are becoming less problematic. A follow-up study should employ the same qualitative research method but instead focus on new stadiums that have not met environmental standards. Learning

more about what factors, if any, were considered before rejecting a pro-environmental design would improve our understanding of the innovation-adoption process.

The stadiums represented by the designers in our sample were all new, and therefore, the incorporation of an environmentally sustainable design was just one aspect of a complex planning process. Scholars would benefit by exploring cases in which stadiums were retrofitted with the primary purpose of addressing environmental impact concerns. When owners elect to renovate their facility in order to meet pro-environmental standards—as opposed to building a new facility and bundling pro-environmental standards with a wide range of design features—their motives may be quite different. For example, in a new stadium, a heating, ventilation, and cooling (HVAC) system is a necessity; regardless of its efficiency rating, it must be included in the stadium design. On the other hand, replacing an existing HVAC system with a more eco-friendly design requires a conscious decision to invest in pro-environmental technology. Therefore, an extension of the current study should identify unique aspects of the decision-making process associated with renovating stadiums.

Through this study, we sought to expand the existing scholarship on sport and the environment by identifying underlying issues that influence decisions to incorporate sustainable design in new or renovated arenas, ballparks, and stadiums. These findings were especially relevant to organizations considering adoption of the eco-friendly-facility innovation, as the results of the study suggest owning an eco-friendly sport facility holds distinct advantages over ownership of facilities constructed in the traditional manner. Additionally, we endeavored to contribute to the innovation-diffusion literature by contributing a qualitative illustration of how innovation adoption and its subsequent diffusion are sparked. Our access to the architects directly involved in the design and construction of pro-environmental facilities provides new

insight to assist in understanding the key voices in the decision-making process. Such an understanding is necessary in order to encourage further diffusion of socially responsible innovation in sport.

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