Evaluating the Self-Perceived Benefits of Green Professional Credentials in the Building Design and Construction Community

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The popularity of green construction professional credentials has increased dramatically in recent years, due in part to the mainstream development of sustainable construction in the building design and construction community. Though the professional certification marketplace remains dominated by Leadership in Energy and Environmental Design (LEED), similar credentials are gaining recognition. This study aimed to compare the perceived value of select green construction certifications, including Green Globes Professional, LEED Green Associate, and Green Advantage Certified Practitioner. Professional and personal impacts, including but not limited to compensation, promotion, education, industry recognition, and self-confidence were evaluated using an online survey instrument. Invitations were successfully delivered to 10,134 Green Globes Professionals, LEED Green Associates, Green Advantage Certified Practitioners, and Associated General Contractors members. 730 individuals responded to the Qualtrics survey, and one-way ANOVAs were used to detect significant differences between the reported perceptions of different credential holders. The results revealed that Green Globes Professionals and LEED Green Associates agree more strongly than Green Advantage Certified Practitioners that earning their credentials have had positive impacts on both their careers and self-perceptions. No significant differences between Green Globes Professionals and LEED Green Associates were identified; however, results reveal that the benefits of earning the three credentials have been minimal.

Introduction

Due to increasing awareness of environmental issues, green or sustainable construction has grown substantially in the last decade. Sustainable construction has become so popular that developing a building and not seeking a green rating is newsworthy. For instance, in Lewistown, Maine, *Casino Developers not pursuing green certification* is a local headline (Sun Journal 2011). The number of green building rating systems has also grown. Leadership in Energy and Environmental Design (LEED), launched by the US Green Building Council (USGBC) in 1998, is the dominant building assessment tool, but other rating systems, including The Green Building Initiatives' Green Globes are growing in popularity. Between 2004, when it was launched, and 2009, Green Globes had certified 68 buildings and registered 2,300 new construction starts. At the same time, there were 2,138 existing LEED certified buildings, and over 16,000 new starts registered (Reeder 2010). Each of these rating systems has an associated professional certification. The USGBC offers the LEED Green Associate and the higher level LEED Accredited Professional credentials. Since 2009, LEED AP is offered in five specialties. The Green Building Initiative has the Green Globes Professional program. Though each is intended to promote green construction principles, a primary function of the credential is to train the holder to use the rating systems. Green Advantage is yet another organization that offers a professional credential; however, their Green Advantage Certified Practitioner is not associated with a rating system. Its sole purpose is green building education. In addition to these three credentials, the research has identified over thirty professional credentials offered by such organizations as the National Association of Home Builders, the National Association of Realtors, the National Association of the Remodeling Industry, the American Society of Civil Engineers, and the Association of Energy Engineers. The Association of Energy Engineers alone offers 12 professional certifications related to sustainability.

Previous research has identified several reasons for seeking such credentials, including earning recognition, increasing salary, and increasing responsibility (Bruce et. al. 2009). Not only are individuals seeking to set themselves apart, but also most large firms have multiple accredited professionals on staff, and some even are requiring new hires to have one or more green accreditations (Pearce & Ahn 2011). Even when excluding specialized credentials, there are many options, so both employees and employers need to know how to allocate time and financial resources. Every practitioner cannot hold every credential, so each needs to earn a credential that is appropriate for their situation and is respected by the industry, as opposed to one that means nothing more than letters on a business card. There is a substantial catalogue of literature comparing different rating systems, including studies by the University of Minnesota and Pacific Northwest National Laboratory, but no literature can be found that compares professional credentials associated with sustainable construction and design. Not only does this study compare the scope and credentialing process, but also the value of the three credential as perceived by the holder.

Background and Literature Review

An evaluation of the perceived value of professional certifications requires two fundamental components of background research. First, it is essential to establish the definition of certification, and differentiate types of professional recognition, including certification, licensing, and certificates. The researchers then must define the sources of and the metrics by which to measure value.

Additionally, as the study aims to act as a reference for individuals choosing to earn a credential, the researchers include an overview of the three certifications on which this study focuses: Green Advantage Certified Practitioner, LEED Green Associate, and Green Globes Professional.

Professional Credentials

Definition

The American Society of Quality defines certification as, "a formal recognition that an individual has demonstrated proficiency within, and comprehension of, a specific body of knowledge" (ASQ 2005). It also can represent the credential holder's qualification for a profession based on a set of standards, often related to job requirements (DeBaugh 2005; Mulkey & Naughton 2005; Roberts 2005).

The administering body represents an important difference between certification and licensing. Independent, private organizations, such as the Project Management Institute and the American Society of Civil Engineers, award credentials often for the purposes of peer recognition and credibility (Adams, et. al. 2004; Pearce & Ahn 2011). On the other hand, licenses often are issued by government bodies for demonstrating an understanding of the minimum level of knowledge (Byrne et. al. 2004). Without possession of a license, an individual or company cannot perform certain professional activities (Eggert 2001). For example, to manage construction jobs valued over $120,000, a general contractor must obtain a Class A Contractor License. Contractors are required to sit for three exams and have a net worth of at least $45,000 (Contractor Licensing 2011). In contrast, certification "does not confer any additional rights or privileges," (Eggert 2001). In short, certification is voluntary, while licensure is compulsory (Byrne et. al. 2004).

Like licenses, there are distinct differences between certification and certificates. While certifications often require the successful completion of an assessment or examination, certificates frequently require only attendance and completion of an educational offering, such as a workshop or seminar (Meisinger 2004; Mulkey & Naughton 2005; Schoneboom 2005). Many universities offer certificate programs. For example, NYU's School of Continuing and Professional Education will award a Certificate in Sustainable Design, Construction, and Development for completing a series of four courses (www.scps.nyu.edu). Many professional credentials require maintenance in the form of continuing education and renewal, while most certificates are similar to educational degrees and do not expire (American Association of

Legal Nurse Consultants 1996). The professional community tends to respect credentials more than certificates. As such, many employers and industry practitioners do not place as great a value on certificates, because they rarely require an assessment of knowledge afforded by the educational experience (Adams, et.al. 2004).

Review of the literature has established a definition of a professional certification and its distinction from licenses and certificates. Green Globes Professional (GGP), Green Advantage Certified Practitioner (GACP), and LEED Green Associate are all categorized as certifications, because each is based on a specific and predetermined body of knowledge, sustainable construction. Though each requires the successful completion of an examination, the certifications are not required to perform any job functions. Green Globes does offer a credential that can be considered a license. In order to review construction documents, conduct on-site inspections, and assign an official Green Globes rating, the appraiser must earn the Green Globes Assessor credential. As this study aims to evaluate and compare voluntary credentials that are obtained for the purpose of education and industry recognition, Green Globes Assessor is outside of the research scope.

The following sections present descriptions of the three chosen credentials, including the knowledge base, training resources, testing method, potential costs, and registration requirements. Understanding the scope of each credential and the certification process is an essential step in determining whether a credential is appropriate for their industry position, career goals, and available resources.

Green Globes Professional

Green Globes is a building rating and personal certification system managed by The Green Building Initiative (GBI) since 2005. The GBI aims to differentiate Green Globes from the USGBC's LEED rating system by offering building designers and constructors an online tool to evaluate a building's sustainable design and construction standards (Smith et. al. 2006). The online form is completed before and after construction and commissioning, and a third party appraiser, led by a Green Globes Assessor, validates the online questionnaire results. The environmental assessment areas include energy, indoor environment, water, resources, site, emissions, and project/environmental management (The Green Building Initiative 2011a). The role of the Green Globes Professional is to help building owners, designers, and construction contractors complete the building certification process. They are trained to successfully register buildings, complete the online questionnaire, and facilitate communication between project participants, the GBI staff, and the Green Globes Assessors. Additionally, Green Globes Professional training includes principles of the seven environmental assessment areas included in the rating systemsand management best practices; therefore, they can serve as consultants to the project teams and interpret GBI recommendations and ratings (The Green Building Initiative 2011b).

Earning the Green Globes Professional certification requires three steps. First, the candidate must create an account on the Green Building Initiative website and order the Green Globes Professional Package. The candidate is required to apply for the Green Globes Professional training by completing

the posted application and electronically submitting a resume. The application focuses on industry experience, including years of experience and the number of green projects in which the candidate has participated, and other sustainable construction training. Five or more years of industry experience are required for qualification. GBI will accept candidates with three years of industry experience, if the applicant has met sustainable education and training requirements. The certification package costs $1000, which includes the application, training, and examination fees (The Green Building Initiative 2011c). Training material and courses not included in this package are nonexistent, so the total cost of certification should be no more than $1000. The second step in the certification process is the completion of a ten hour online training program, divided into five sections: Introduction to Green Building, Introduction to the Green Building Initiative, Green Globes Assessment Protocol, Green Globes Certification Process, and two case studies. Each block includes videos and sample exam questions. The training program is supplemented by a Green Globes Professional handbook. Finally, upon completion of the training, the candidate must pass a 90 minute online exam that consists of 45 questions. A score of 85% is required to earn the Green Globes Professional certification (The Green Building Initiative 2011). Certification must be renewed every three years by retaking the online training and passing the exam. The cost for renewal is $500 (The Green Building Initiative 2011b; The Green Building Initiative 2011c).

LEED Green Associate

The US Green Building Council (USGBC) was founded in 1993 in an effort to promote sustainable practices in building design, construction, and operation. USGBC's stated mission is, "To transform the way buildings and communities are designed, built and operated, enabling an environmentally and socially responsible, healthy, and prosperous environment that improves the quality of life." (USGBC 2011a). LEED evaluates buildings in five categories based on 11 assessment areas (see USGBC.org). In addition to the building rating system, USGBC also offers a variety of LEED professional credentials, which are managed by the Green Building Certification Institute (GBCI), a third party certification service. Since 2001, over 170,000 construction industry professionals have earned one or more of these credentials (USGBC 2011a). Once offering only the LEED Accredited Professional (LEED AP) credential, in 2009 the USGBC introduced a system that consists of seven credentials. LEED AP is now offered in five specialties, LEED Green Associate was introduced as an introductory level credential, and LEED Fellow is the highest level credential. There are no specialties offered at the Green Associate level, and it "denotes a basic knowledge of green building principles and practices and LEED." (GBCI 2011a). Since its introduction, over 20,000 individuals have earned the Green Associate credential (GBCI 2011b). LEED Green Associates are trained in seven areas that align with the assessment areas, along with the rating system components and certification process (USGBC 2011c).

LEED Green Associate credentialing is a three step process. The applicant first must create a GBCI account and submit an application. An eligible candidate must have worked on a LEED project, been employed in a sustainable field of construction, design, or development, or completed an education program that addresses sustainable construction. Application approval requires written documentation

of one of the above experiences authored by a project manager, employer, or instructor (GBCI 2011c). Once admitted into the program, the candidate must register for and schedule an exam. Exams are administered by the third party testing service, Prometric, and they must be completed at a Prometric testing center. The two hour computer based exam is comprised of 100 questions and is scored between 150 and 200. Candidates must score 170 points to earn the credential. Professional certification costs can vary substantially based on training. The GBCI application fee is $50 and the exam fee is $150 for students and USGBC members, and $200 for non-members. The USGBC recommends that candidates use two study guides, at a combined cost of $135 (USGBC 2011c). Third party training programs, such as those offered by Everblue Training Institute, can cost up to $745 (Everblue Training Institute 2011). The LEED Green Associate certification must be renewed every two years, though the GBCI's Credential Maintenance Program. LEED Green Associates have the option of retaking the exam or completing 12 hours of continuing education over the two year period. Continuing education credits can be earned by, among other means, participating in projects, attending classes or presentations, publishing, volunteer work, and earning additional green professional certifications (GBCI 2011d).

Green Advantage Certified Practitioner

Green Advantage Inc was formed in 1996 through the collaborative efforts of the Nature Conservancy, Science Applications International Corporation, and the University of Florida, to promote green building education and provide a personal certification program (Green Advantage Inc. 2011a). Unlike the Green Building Initiative and USGBC, Green Advantage Inc. offers a certification that is not affiliated with a building rating system. The organization solely provides a personal certification program. "The Green Advantage mission is to be an exemplary certifier of building related practitioners and organizations nationally and internationally," (Green Advantage Inc. 2011a). The organization does maintain an affiliation with the USGBC, and Green Advantage certification can support LEED building certification and personal credential maintenance. LEED projects are awarded one innovation credit if 30% of key project personnel are Green Advantage Certified Practitioners, and LEED credential holders receive one hour of continuing education credit for earning the GACP certification (Green Advantage Inc. 2011b). Green Advantage offers three certification exams: Commercial, Residential, and Commercial/Residential. The assessment has six sections, each focusing on a specific area of sustainable construction. Material is drawn in part from external sources, including the American Lung Association, the Department of Energy, and Energy Star (Pearce & Fiori 2008).

Practitioners wishing to pursue the GACP certification must set up a Green Advantage account and register for an exam location and time. Registration does not include an application, as the only requirement is that the individual be at least 18 years of age. Candidates can take a computerized or paper-based exam in a group setting. The paper-based exam typically is administered at a training center after completion of a course (Green Advantage Inc. 2011b). Electronic tests are provided at private testing centers, such as Sylvan Learning Center, and other locations with electronic testing facilities. The 90 minute, open book test consists of 60 multiple choice and true/false questions. A score of 75% is required to earn the Green Advantage certification. The cost of certification can vary

depending on training. The registration fee is $175 for all exams, regardless of concentration or delivery method. Upon successful registration, candidates are provided a study guide and material that can be used during the exam. Though Green Advantage neither requires nor offers training courses, they recommend additional training for, "individuals new to the construction industry, new to green building, or for those seeking additional input." (Green Advantage Inc. 2011c). Many training providers charge between $200 and $300 for group courses (Resource Dynamics/Green Building Education, 2009; ABC Delaware, 2011; Eco Training USA, 2011). Some courses cost as much as $500 (Becoming Green, Inc. 2011). Additionally, in case of failure, each retesting requires payment of the $175 registration fee. The certification expires in three years. Triennial maintenance requires only that a GACP pass the current exam. The reexamination fee is $175 (Green Advantage Inc. 2011b).

Perceived Value Studies

Impact of Professional Credentials

Review of existing literature reveals impact studies associated with professional certifications both within the construction industry, and also in a broad range of other professions. Notable research directed outside of the construction industry includes evaluations of the perceived value of certifications in nursing, information technology, and safety engineering, along with a variety of business administration certifications. Previous research presents a myriad of benefits associated with certification within the nursing industry. Increased earning potential is a commonly referenced value to certified practitioners (Grief 2007; Rbonson & Mee 2004; Byrne et. al. 2004). Grief (2007) found that on average, the hourly wage differential between Certified Flight Registered Nurses(CFRN) and uncertified nurses is between $0.50 and $1.00. Additionally, CFRNs are awarded annual bonuses up to an additional $3000. Beyond income advantages, credentialing in the nursing field can indicate success, achievement, and employee growth, leading to professional recognition and empowerment (Piazza et. al. 2006; Gaberson et. al. 2003). The certified nurses have more control over their work, and certification often is used as a self-marketing tool (Gaberson et. al. 2003). Byrne, Valentine, and Carter (2004) refer to these professional and career development impacts as extrinsic motivators or rewards. These extrinsic motivators are "external to the individuals or were defined by others." Certification not only has a professional impact, but also personal or psychological value (Eggert 2001). Byrne, Valentine, and Carter (2004) refer to the personal value as intrinsic motivators or rewards. For example, credentialed nurses report a feeling of increased self-esteem due to a feeling of accomplishment and professional satisfaction (Grief 2007). This example indicates that intrinsic rewards are "motivators internal to the individual and linked to values of personal development and self-concept," (Byrne et. al. 2004). Other intrinsic motivators include but are not limited to knowledge development, competence, and confidence in abilities.

Though there is evidence to suggest that certification in the IT industry can impact earnings potential, much of the available literature focuses on the educational and recruitment value of certifications

(Bartlett et al 2005; Barber 1998; Segalla et. al. 2001). In some cases, it is suggested that IT certifications might be more attractive to employers than a two or four-year degree, as many see more value in specific, applied skills training (Carnevale & Desrochers 2001). University degrees tend to offer a broad and well-rounded education with little instruction specific to a particular industry segment or product (Bartlett et. al. 2005). Eggert (2004), though, holds that certification is not an adequate substitute for a formal four-year education, but certification does serve to bridge the gap between education and industry. Furthermore, Eggert (2004) believes that recertification and credential maintenance has significant educational value. The typical IT credential knowledge base is frequently updated to reflect new technology and methods, and a willingness to recertify establishes a professional's commitment to continually preserve professional competence (Wright 1997).

Adams et. al. (2004) allude to benefits of certification in the Safety, Health, and Environmental (SH&E) industry. Among additional bonuses, the authors confirm the positive impact on personal satisfaction, industry recognition, empowerment, competence, and income. For example, in 2003, a Certified Safety Professional's pay was on average $17,363 greater than that of an individual not holding a certification (ASSE 2004). Though they do not directly reference different certifications, the previously mentioned authors remark that there is a direct relationship between certification difficulty and the industry's perception of a certification's value and integrity. This research team found no other literature that supports this judgment of value. Finally, in their report on certification in the SH&E industry, Adams et al (2004) make a statement that supports the significance of this study of construction professional certifications, stating that, "Practitioners need to spend their limited resources to acquire respected certifications that will be assets to their careers, not simply letters on a resume."

The literature also addresses the benefits of a variety of business certifications. Davis and Rubin (1976) solicited responses from Certified Public Accountants (CPA), Chartered Financial Analysts (CFA), and Chartered Life Underwriters (CLU). The authors asked respondents to rank order six potential impacts of holding their certification. The responses from each sample were evaluated as a group, and the six sources of value were ranked as follows:

1. Made me more competent in my area
2. Afforded me valuable prestige with others in my area of business
3. Made me feel more professional
4. Given me confidence, which has meant a great deal to me personally
5. Afforded me prestige with the public
6. Been of no particular value

A survey of hospitality financial professionals revealed the potential impacts of two certifications: Certified Hospitality Accountant Executive (CHAE) and Certified Hospitality Technology Professionals (CHTP) (Damitio & Schmidgall 2001). 40% of respondents felt that their certifications had no monetary value with regards to salary, but 61% believed their certifications were helpful in recruitment. The certified hospitality professionals placed a greater value on non-financial benefits. The majority of participants believed that earning their certification recognized their commitment to professionalism,

identified professional expertise, and indicated a basic level of competence (Damitio & Schmidgall 2001).

Literature evaluating the impact of certifications in the construction industry is limited, and much of the reported value is in the form of claims made by the certifying organizations. The Building Performance Institute (BPI) advertises that its residential construction certifications have both financial and non-financial benefits. The title of their *Benefits of Certification* page is "Get Qualified, Earn More," and the certification body asserts that BPI certified professionals are in greater demand (Building Performance Institute 2010). Non-financial benefits mentioned by the organization include a further developed knowledge base and the feeling of pride associated with being a part of the green construction movement. Additionally, the organization states that even the best non-certified contractors have more difficulty solving problems associated with energy consumption and greenhouse gas emissions. In fact, "they can do more harm than good" (Building Performance Institute 2010). The Association of Energy Engineers (AEE) offers a variety of certifications and lists a number of benefits in support of earning a professional certification, regardless of the certification source (AEE 2011). Certification establishes a knowledge base for practitioners, and recertification supports continuing education that encourages professionals to maintain competence and an awareness of changing means and methods. Additionally, earning a certification can foster recognition of achievement from colleagues and employers. A 2011 survey conducted by the Association of Energy supports these assertions. Among other positive results, 52% of AEE certified professionals agree that they are receiving higher industry visibility since earning their certification (AEE 2011). In 2003, Green Roofs for Healthy Cities established a structured education program that eventually resulted in the development of the Accredited Green Roof Professional (GRP) program. The organization states that a prime benefit of the GRP program is that it establishes a body of knowledge referred to as an occupational standard. Additional impacts include, but are not limited to, increased professionalism and public confidence (GHRC 2010). The organization does not mention financial benefits of earning the GRP accreditation.

Literature discussing the impact of the sustainable construction professional certifications selected for this study is virtually nonexistent. In 2009 and 2010, Bruce, Strong, and Gebkin, published papers addressing the impact of LEED AP on different design and construction professionals. The former study, which quantified the impact on general contractor employees, yielded mixed results regarding the effectiveness of the certification to enhance their career (Bruce et. al. 2009). Though 70% of general contractors disagreed that the certification had a positive impact on their salary or opportunities for promotion, 58% felt as though the certification helped them to earn recognition for their ability to perform their job, and 72% felt that becoming a LEED AP served to increase their prestige among superiors, along with others inside their organization. Only 45%, though, felt more confident in their professional abilities (Bruce et. al. 2009). Like the previously mentioned certifications, much of the available documentation is produced by the certification body. Green Advantage Inc. does not promote financial benefits of earning the GACP certification. The organization stresses that the certification represents the holder's commitment to sustainable construction and environmental well-being. The certification is also a source of greater recognition from colleagues, employers, and clients. Lastly, it is a means to "enhance your presence in the marketplace," by differentiating yourself from other

construction professionals (Green Advantage Inc. 2011b). Much of the Green Advantage documentation focuses on the impact the certification has on construction means and methods, along with building performance. On its website, the organization showcases a University of Florida project which studies the impact of Green Advantage Certified Practitioners on projects seeking LEED certification (Gray 2009).

The Green Building Initiative references impacts of GGP that are similar to the advertised benefits of GACP. The advantages of earning the Green Globes Professional certification include build the practitioner's knowledge of sustainable construction means and methods, along with a more in depth understanding of the Green Globes rating systems. The certification also can be used as a personal marketing tool, as a Green Globes Professional offers more services to a perspective employer (The Green Building Initiative 2011b). The researchers have not identified any statements made by the USGBC or GBCI that outline or even reference the benefits of earning the LEED Green Associate certification.

Summary

This section extracts the shared perceived value elements of each study and other supporting literature. From these mutual impacts and benefits, the researchers can assemble an inventory of variables to present to survey participants. Literature, both in and outside of the construction industry, consistently references measurements of value that can be classified as either professional or personal. Outside of the construction industry, the studies focusing on credentialed nurses and quality professionals place an emphasis on salary, professional recognition, and empowerment. Credential research in the IT industry frequently references perceived competence and the associated advantages during the recruitment process, though they also place a heavy emphasis on education. Studies of safety and business credentials address common personal impacts, such as prestige, feelings of improved professionalism and confidence, along with an overall feeling of personal satisfaction. Within the construction industry, including the GGP and GACP credentials, emphasis is placed primarily on marketability, industry recognition, education, competence, credibility, personal satisfaction, and a commitment to their profession. Little weight is placed on direct financial benefits.

Research Methods

There currently is no experimental evidence comparing the value or impact of sustainable construction professional credentials, particularly Green Advantage Certified Practitioner, LEED Green Associate, Green Globes Professional. To provide to industry professions this valuable comparison, this study aims to answer the following question: *Do statistically significant differences occur among the self-perceived value of LEED Green Associate, Green Globes Professional, and Green Advantage Certified Practitioner, based on survey responses regarding professional and personal certification impacts?*

Credentials for Investigation

The research identified twenty-nine sustainable construction professional credentials offered by eighteen organizations, many of which include multiple concentrations (Table 1). For example, Building Performance Institute offers the BPI Certified Professional credential in eight fields, and LEED AP now includes five specialties.

Table 1: Notable Credentials (*Trade Specific)

Certification	**Source**
Green Building Engineer Certification	Association of Energy Engineers
Certified Sustainable Development Professional*	Association of Energy Engineers
Certified Energy Manager	Association of Energy Engineers
Certified Indoor Air Quality Professional	Association of Energy Engineers
Certified Lighting Efficiency Professional	Association of Energy Engineers
Certified Carbon and GHG Reduction Manager	Association of Energy Engineers
Certified Energy Auditor	Association of Energy Engineers
Certified Power Quality Professional	Association of Energy Engineers
Certified Residential Energy	Association of Energy Engineers
Building Performance Institute Certified Professional (eight specialties)	Building Performance Institute
Certified EcoBroker*	Association of Energy and Environmental Real Estate Professionals
EEBA Master Builder	Energy & Environmental Building Alliance
Certified HERS Rater*	Residential Energy Services Network
Building Energy Modeling Professional*	ASHRAE
Building Biology Practitioner*	Institute for Bau-Biologie & Ecology
Building Biology Environmental Consultant*	Institute for Bau-Biologie & Ecology
Certification	**Source**

Sustainable Engineering Certification*	American Society of Civil Engineers
Certified Commissioning Professional*	Building Commissioning Association
NAR Green Designation*	National Association of Realtors
Certified Green Professional*	NAHB
Green Advantage Certified Practitioner	Green Advantage, Inc
Green Globes Assessor and Professional	The Green Building Initiative
Qualified BREEAM Assessor	Building Research Establishment (BRE) Global
BREEAM Accredited Professional	BRE Global
LEED Green Associate	Green Building Certification Institute (GBCI)
LEED Accredited Professional	GBCI
LEED Fellow	GBCI
Qualified and Certified Energy Professional	College of Energy, Environment, and Sustainability
Certified Solar Roofing Professional*	Roof Integrated Solar Energy

This investigation focused only on comparable credentials that would be attractive to a broad demographic. Many of the above listed credentials are trade specific and are not applicable to multiple professions. For example, in general, only realtors are inclined to pursue the Certified EcoBroker credential offered by the Association of Energy and Environmental Real Estate Professionals, whereas to eliminate such selection bias, the researchers established four criteria by which to select credentials for study:

1. The credential must reflect knowledge of sustainable means and methods in the Building Design and Construction industry.

2. The credential must be broad-spectrum, requiring a whole-building/development evaluation, which addresses multiple sustainable practices, including energy and water conservation, indoor environmental quality, and reuse of materials.

3. The credential must not target a specific trade or industry.

4. The credential cannot be limited to a particular region or location outside of the United States. For example BREEAM is an English system. Though used internationally, BRE Environmental Assessment Method (BREEAM) is most widely recognized in Brittan.

Only three certifications meet all four conditions. Green Globes Professional, LEED Green Associate, and Green Advantage Certified Practitioner are sustainability-related credentials that potentially appeal to all architecture/engineering/construction industry practitioners. Additionally, some professionals

outside of the construction industry have obtained one or more of these certifications, showing the broader appeal of these certifications.

Data Collection

To gather data regarding the perceived value or impact of the three selected certifications, the researchers developed a survey closely modeled after that of previous studies, including those previously created by a contributor to this study (Bruce *et al*., 2009; Bruce *et al*., 2010). The overall survey consisted of 67 questions, but not all participants were required to answer all questions. Questiones were presented based on how many credentials each respondent held.

Samples

The researchers assembled four samples for survey distribution: Green Globes Professionals, Green Advantage Certified Practitioners, LEED Green Associates, and Associated General Contractors (AGC) members. Individual invitations were written for each sample.

Green Globes Professionals

At the time of this study, there were 168 Green Globes Professionals listed in the online GGP directory on the Green Building Initiative website. Due to the limited size of this population, the researchers contacted the entire population of Green Globes Professionals. The initial invitation to participate in the survey was sent as a single email to the GGP sample. Approximately two weeks later, a follow-up email containing much of the same material was delivered to each GGP individually. The researchers decided that a message addressed to the recipient, i.e. “Dear Mr. Johnson,” would more effectively encourage participation.

Green Advantage Certified Practitioner

At the time of the study, 3975 Green Advantage Certified Practitioners were listed in the GACP directory on the Green Advantage Inc. website. Due to a service available to the researchers, the entire population was invited to participate in the survey. After contacting and sharing the survey with representatives of the Green Advantage Inc., the Communications Department offered to and did include an invitation to voluntarily respond to the survey the Summer 2011 issue of the GreenLight Newsletter, which is sent to all Green Advantage Certified Practitioners quarterly. For the purposes of sending a reminder, the researchers mined the GACP directory, and two weeks after the release of the newsletter, a follow-up message was sent to the entire population in a group email.

LEED Green Associate

At the time of the study, the Green Building Certification Institute (GBCI) listed in the online directory 18041 LEED Green Associates in the United States. Email addresses were not made public, and the researchers were required to send invitations to a sample of LEED Green Associates using the GBCI directory's user interface. Due to limited time and resources, the researchers took a systematic sample from the directory. The directory is presented in pages of 50 credential holders. The researchers selected the top seven entries on each of the 361 pages to create a sample of 2527 LEED Green Associates. This sample represents 14% of the population. The sample not only was manageable for the researchers, but also more comparable in size to the other samples. No follow-up was sent to this sample, so the LEED Green Associates received only a single invitation.

Associated General Contractors of America

The researchers designed the survey to also acquire data from professionals not holding credentials. Though this study focuses only on the self-perceived value of the selected credentials, for the purposes of a potential follow-up study, information regarding the value as seen by certified professionals' peers was gathered. In an effort to access professionals not holding a credential, the researchers assembled a sample of AGC contractors. At the time of the study, there were 28,193 member organizations listed on the AGC of America online directory. 4405 (15.6%) listings included email contact information. The researchers mined the directory and sent an invitation to all members with a published email address. No follow-up was sent to these organizations.

Survey

The survey was created and distributed by the researchers using the Qualtrics online survey instrument. For distribution, Qualtrics generates a web address that can be sent to the participants, by which they can access the anonymous survey. Upon opening the survey, participants were asked to confirm that they are at least 18 years of age and consent to the survey conditions. A response of "yes," implied consent and activated the survey, and participants were asked if they hold a professional certification. Based on his or her response (LEED, Green Globes, Green Advantage, other, none), the respondent was directed to the next level of questions. Those holding one or more of the three target credentials were individually presented the same questions for each credential.

Before addressing the perceived value of his or her credential, the respondent was asked a series of questions that can be used to determine factors considered when choosing to pursue certification. The participant was asked when he or she chose to pursue a credential. In this case, timing refers to the stage in the respondent's career. Was he or she a student, seeking employment, or already employed? The participant was then asked to rate the reasons for choosing the credential. He or she was asked a question root, followed by 12 stems,

Please rate the importance of the following factors you might have considered when choosing to earn a green certification:

1. Marketability
2. Greater potential for increase in salary
3. Greater potential for promotion
4. Employer Preference
5. Required time commitment
6. Monetary cost of certification
7. Exam difficulty
8. Greater job responsibility
9. Recognition from employers, peers, and clients
10. Degree to which it builds your knowledge base
11. Personal satisfaction and feeling of accomplishment
12. Degree to which it builds networking contacts.

The researchers provided an interval scale, on which respondents rated the significance of each variable on a scale from 0 through 7 (0- did not consider, 1- not influential, 7- very influential).

The survey followed with a series of questions regarding the certification process. The questions addressed monetary cost, difficulty, and preparation time and resources. This section served to validate the information collected during background research. Additionally, the responses will prove relevant when participants are later asked if the benefits of holding the credential are worth certification cost. The respondent then moved on to answer questions regarding the impact of his or her credential, based on the impacts collected from prior art.

How has earning the professional certification impacted your career in terms of the following:

1. Increased your compensation?
2. Increased your promotion opportunities?
3. Led to increased job responsibilities?
4. Increased your opportunities for professional contributions (speaking, writing, contributing to a related professional organization?
5. Empowered your existing position, more often included in decision making?
6. Increased your marketability for recruitment?
7. Improved credibility?
8. Improved perception of competence from employers, peers, and clients?
9. Improved perceived level of commitment to your profession?
10. Helped build networking contacts?

How has earning the professional certification impacted your self-perception in terms of the following:

1. Feeling of high standing in your profession?
2. Developed your knowledge of sustainable construction principles?
3. Developed your knowledge of sustainable construction rating systems?
4. Added confidence in your abilities?
5. Feeling of personal satisfaction?
6. Improved self-esteem?
7. Feeling of personal accomplishment?

Participants not holding a sustainable construction professional credential were directed to an alternative set of questions. This demographic was asked to evaluate colleagues holding such credentials using the same variables presented to the credentialed respondents.

Following the questions regarding impact, all participants were asked to provide demographic and general information about themselves. Critical information included employer classification and annual revenue. Also, it is necessary to know the participant's level of involvement in human resources and general company management. If he or she is involved with human resource decisions, the researchers could present questions regarding hiring preferences and compensation policies involving those with and without professional certifications. If the respondents have knowledge of or participate in general management, they were asked questions regarding a credentialed employee's impact on company performance. Does employing practitioners with professional credentials improve the company's ability to attract clients? Does it affect company revenues and profits (company can request additional compensation; more often completes a job under budget)? Does it improve the credibility or reputation of the organization? Though this information is outside the scope of the current study, which is based on employee responses, it is recorded here may be useful in future studies that focus on the employer.

Data Analysis

Before starting the data analysis, the researchers downloaded the survey results in the form of an Excel workbook, with which they then could organize and manipulate the data. The analysis was carried out in three stages. The researchers first chose to evaluate the difficulty and time commitment associated with earning each chosen certification. These analyses serve both to validate information found on training and certifying organizations' websites, and to provide professionals with objective and subjective information concerning the certification processes. Next, the researchers evaluated the descriptive statistics derived from responses to the two impact questions, including response proportions and mean ratings. These means are represented visually in Excel generated column charts. Finally, analysis of variance tests were used to determine statistically significant differences between the calculated means in each of the 17 categories. The credential served as the independent variable, while the numerical response by each participant acted as the dependent variable. The one-way ANOVA tests only for variations among the group of samples. In order to identify the source of the significant differences, researchers performed a Tukey-Kramer Honestly Significant Difference (HSD) test, which

will reveal differences between any two credentials. Excel is not programmed to perform Tukey tests, and pooled T-tests can yield false similarities, so the data was exported to JMP statistical software for the multiple comparisons procedure.

Results

Survey Responses

In August 2011, the Qualtrics survey was send to the 11075 qualified participants. 941 of the e-mails were returned as undeliverable, so the link was successfully distributed to 10134 individuals and businesses. Many of the contact emails on the AGC website were not personal. For example *info@company.com* was a frequent listing, so it is unknown how many of these invitations reached qualified participants within an ACG member organization. The survey was deactivated on September 1, 2011. In that time period, 831 individuals, or 8.2% of the survey population accessed the survey. Of those, 635 completed the survey, and 730 participants responded to the two impact questions, which produce the bulk of the data necessary to answer the main research question. The response rates from the credential-specific samples are more encouraging. 423 LEED Green Associates, or 17% of the sample, responded to the survey. Additionally, 66 GGPs (39%) took part, and 249 GACPs (6%) participated. 94 contributors indicated that they hold certifications other than LEED Green Associate, GGP, or GACP. The majority reporting that they hold legacy and/or specialty LEED AP credentials.

Demographics and Organization Characteristics

Demographic information shows that the sample population was representative of construction professionals in many different sectors of the industry (Table 2). Respondents were asked to identify the category in which they would place their organization or employer.

Table 2: Construction industry sectors covered by survey

Industry Sector	Response	%
General Contractor	187	16%
Design Build Contractor	174	15%
Architect/Engineer	152	13%
Facilities Operations and Management	90	8%
Other	64	6%
Developer	49	4%
Materials Supplier and/or Manufacturer	47	4%
Education	45	4%

Industry Sector	Response	%
Other Specialty Contractor	42	4%
Building Performance Consultant	38	3%
HVAC Contractor	28	2%
Finish Carpentry	28	2%
Framing Contractor	27	2%
Real Estate Agency	26	2%
Homebuilder	23	2%
Electrical Contractor	21	2%
Excavation Contractor	21	2%
Certification Consultant	18	2%
Plumbing Contractor	17	1%
Landscape Architect	13	1%
Non-profit	13	1%
Solar Contractor	12	1%
Government	12	1%
Landscape Contractor	6	1%
Roofing Contractor	6	1%
Lender	4	<1%
Total	1163	100%

Prime and Design-Build contractors make up 31% of the population, and Architecture and Engineering Firms are an additional 13%. The remaining 56% is spread throughout the construction and related industries, including trade contractors, facilities management, real estate, and suppliers. Furthermore, government, non-profit, financial, and academic institutions are represented. 26% of the population is female, and 74% have at least a bachelor's degree, 24% of which hold master's degrees. Salaries were well distributed. 49% of participants earn less than $75,000 per year, while 29% have annual salaries greater than $100,000. A slight majority are employed by large construction firms, with 56% working for organizations with annual revenue greater than $10 million. Small construction companies are not well represented. Only 19% of participants are part of an organization that produces less than $1 million in annual revenue. This should not be considered a limitation of the study, and the researchers conclude that the population is well diversified.

Data Analysis

Earning the Credentials

The researchers calculated means, medians, and standard deviations associated with certification cost (Table 3) and time commitment (Table 4). Cost data were collected to compare reported values to those found on the certification and training organizations websites.

Table 3: Hours required to earn the certification (rounded to the nearest hour)

	LEED	GGP	GACP	Other
Mean	63	32	22	73
st dev	77	26	31	83
3 stdev	231	78	94	250
Median	40	25	12	60

Table 4: Monetary cost of certification (rounded to the nearest dollar)

	LEED	GGP	GACP	Other
mean	$606	$705	$517	$895
st dev	$496	$388	$534	$738
3 st dev	$1,487	$1,163	$1,603	$2,214
Median	$500	$700	$400	$600

The average LEED Green Associate spent $606 on registration, study materials, and exam fees. This value includes the cost of any courses purchased, if the candidate chose to attend. The same participants allocated almost 63 hours to earning the LEED Green Associate credential. The average Green Advantage Certified Practitioner spends $516 and 22 hours on all stages of certification. Despite the absence of third party training courses, Green Globes Professionals contributed on average $705 and 32 hours toward earning the credential. Variation is substantial, and in several instances the standard deviation is greater than the mean, even after extreme outliers (> 3σ) are removed from the data. For example, the researchers discarded one participant's assertion that he or she spent $5000 through the process of becoming a GACP.

Despite the substantial cost and time requirements, the majority of professionals are satisfied with their decision to earn the credential (Table 5). 66% percent of Green Globes Professionals, along with 68% of LEED Green Associates and 57% of Green Advantage Certified Practitioners are either satisfied or very satisfied with their credential.

Table 5: Level of satisfaction associated with professionals' decisions to earn their credential

Level of Satisfaction	LEED	GGP	GACP
1- Very Dissatisfied	4%	3%	10%
2- Dissatisfied	8%	6%	12%
3- Neutral	20%	24%	22%
4- Satisfied	28%	29%	29%
5- Very Satisfied	40%	37%	28%
Mean	**3.91**	**3.9**	**3.53**
Standard Deviation	1.13	1.08	1.28
Total Responses	392	62	224

The survey also produced information regarding the difficulties concerning the registration process (Table 6) and examination. The survey results reveal that Green Building Certification Institute may perhaps have the most rigorous and difficult registration process. Only 51% of the sample felt that the GBCI process is easy or very easy, while 71% and 80% felt the same for those of the Green Building Initiative and Green Advantage respectively. Similarly, LEED Green Associate stands apart from the other credentials with regard to exam difficulty (Table 7). Participants rated the exam on a scale from 1 to 5, one being very easy, and 5 representing very difficult. The average difficulty of the GACP and GGP exams were 1.76 and 2.15 respectively, while that of the LEED Green Associate was 2.48. The result associated with the Green Advantage Certified Practitioner is surprising, considering the written and verbal comments provided by three GACPs of the many who directly contacted a researcher. These individuals felt the exam was excessively difficult, and at times deceptive. Their opinions, though, do not appear representative of those of the population of Green Advantage Certified Practitioners.

Table 6: Reported registration difficulty

Level of Difficulty	LEED	GGP	GACP
1- Very Easy	21%	34%	52%
2- Easy	30%	37%	28%
3- Somewhat Difficult	33%	15%	13%
4- Difficult	13%	10%	7%
5- Very Difficult	3%	5%	0%
Mean	**2.48**	**2.15**	**1.76**
Standard Deviation	1.06	1.14	0.95
Total Responses	391	62	224

Table 7: Reported exam difficulty

Level of Difficulty	LEED	GGP	GACP
1- Very Easy	6%	11%	21%
2- Easy	15%	26%	24%
3- Somewhat Difficult	39%	50%	41%
4- Difficult	34%	13%	13%
5- Very Difficult	6%	0%	2%
Mean	**3.20**	**2.65**	**2.50**
Standard Deviation	0.96	0.85	1.02
Total Responses	390	62	224

After establishing the characteristics of each credential, the researchers moved on to evaluate and compare the perceived value of the credentials. This lower level analysis provides an idea of the impact of each credential, but does not establish statistical significance. This set of results is separated into two sections, each representing the questions that address the main research question. The professional or career impacts are revealed, followed by a summary of the data gathered concerning the personal value or impact on self-perception.

Professional Value / Impact on Career

Between 368 and 372 LEED Green Associates, 59 Green Globes Professionals, and 217 Green Advantage Certified Practitioners responded to the questions addressing perceived value or impact. 80 participants holding certifications other than GGP, GACP, and LEED Green Associate (from here on referred to as those holding "other" credentials) answered the question also answered the core research questions.

Compensation

Figure 9 shows that 29% of individuals holding other certifications agree or strongly agree that their credential has had a positive influence on their salary. LEED Green Associate is perceived to have the greatest impact among the three certifications on which the study is focused. Table 8 shows that 38 individuals (10% of LEED Green Associates) perceive an impact on compensation, which still is considerably lower than that of "other" credentials. In comparison, only 8% of Green Globes Professionals and 4% of Green Advantage Certified Practitioners agree or strongly agree that their credential has had a positive impact on their compensation. Despite the lower rate of agreement than LEED Green Associates, Figure 1 shows that Green Globes Professional, at 2.53, has the greatest average impact on compensation of the three broad-spectrum credentials.

Promotion

Similar to the value linked with increased compensation, Table 9 shows that a significant minority agrees or strongly agrees that their certification has had an impact on professional advancement. Only 25% of Green Globes Professionals agree or strongly agree with the statement, while 24% of LEED Green Associates and 11% of Green Advantage Certified believe their credentials have been of value with regard to promotion. The average impact of each credential (Figure 1) is below 3, supporting the low rates of agreement. GGP leads with an average rating of 2.92. Similarly, though a higher percentage agrees, still Figure 9 shows that less than 50% of professionals holding other certifications observe benefits from holding their credential in this career impact category.

Job Responsibilities

Moving on, Table 9 shows that a minority of participants feel that earning one or more of the credentials has resulted in increased job duties. Of the 59 Green Globes Professionals that responded to this statement, only 41% agree or strongly agree that the credential is valuable with respect to job duties. For example, a superintendent may now have the opportunity to work more closely with the Green Globes Assessor, or his or her duties may extend to pre-construction planning and online Green Globes survey assessment. This percentage still represents a minority, and LEED Green Associate and GACP respectively have only 31% and 26% agreement rates. Following the current the trend, other sustainable construction professional credentials have a higher rate of agreement (59%), and for the first time, a small majority of a group believes their certification has an influence on job responsibilities.

Opportunities for Professional Contribution

Like the above variables, less than 50% of professionals holding one or more of the three credentials feel that earning the credential has set in motion opportunities to offer professional contributions to the industry, such as speaking, writing, participating in research studies, and contributing to a related professional organization, including National Association of Home Builders, Associated General Contractors, Associated Builders and Contractors, and American Society of Civil Engineers. Table 9 shows that 36% of GGPs believe more opportunities have presented themselves. Only 24% of GACPs, and 29% of LEED Green Associates agree or strongly agree that their credential holds value in this regard. Figure 1 shows that only Green Globes Professionals on average believe they are experiencing growing opportunities to make professional contributions. The GGP mean rating is 3.22, while those of GACPs and LEED Green Associates are 2.80 and 2.89 respectively.

Empowerment

32% of LEED Green Associates agree that certification has facilitated empowerment, meaning they now have more control over their position, and they are permitted a higher level of self-management (Table 9). Empowered employees often are autonomous and have more liberty to apply skills and experience to make decisions regarding performance of job duties (Gibson et. al. 2009). 27% of Green Advantage Certified Practitioners detect similar value, and 44% of Green Globes Professionals agree or strongly agree that earning the credential impacted their employers' decisions to empower their position. Figure 1 shows that GGPs, GACPs, and LEED Green Associates on average report a level of agreement of 3.34, 2.75, and 2.89 respectively.

Marketability

Table 9 shows data that suggest these credentials are a valuable source of personal marketing for recruitment. This response is the first instance of a strong positive response to a variable. The majority of survey participants, including LEED Green Associates (59%), Green Globes Professionals (51%), and those holding other certifications (69%) feel their credential has had a positive impact on marketability. The majority of Green Advantage Certified Practitioners, though, disagree with the statement. 37% of GACPs agree or strongly agree. Figure 1 shows that these credentials generally have a positive impact on recruitment. GGPs, GACPs, and LEED Green Associates on average report a level of agreement of 3.46, 2.99, and 3.55 respectively. This is the only variable for which LEED Green Associate has a greater perceived value than Green Globes Professional.

Credibility

Similarly, data show that sustainable construction professional credentials can enhance one's credibility in the industry. Figure 5 shows that 61% of Green Globes Professionals, 60% of LEED Green Associates, and 47% of Green Advantage Certified Practitioners agree or strongly agree that the credential has a positive impact on their credibility. Average levels of agreement for GGPs, LEED Green Associates, and GACPs are 3.68, 3.60, and 3.25 in turn. This shared feeling was validated by a lawyer who contacted the research team. This LEED Green Associate feels he is more accepted and approachable at industry conferences, including the Greenbuild expo, which he attends annually. The heightened credibility can in cases be the result of an improved perception of competence.

Competence

In line with credibility, the majority of participants feel that certification has a positive impact on competence, as perceived by employers, peers, and clients. Tables 8 and 9 show that 236, or 64% of LEED Green Associates, and 39 or, 66% of responding Green Globes Professionals agree or strongly

agree with the statement. 111, or 51% of Green Advantage Certified Practitioners agree or strongly agree.

Commitment

As in many previous certification studies, the majority of participants report an improved perceived level of commitment to their professions since earning a sustainable construction professional credential. Figure 9 shows that 56% of Green Advantage Certified Practitioners, 63% of LEED Green Associates, and 68% of Green Globes Professionals agree or strongly agree that these credentials have had this professional impact. 76% of those holding more specialized accreditations agree that the certification has been a valuable source of perceived commitment to their profession. Additionally, Figure 1 reveals that mean ratings all are greater than three, supporting the above percentages.

Networking

Finally, table 9 shows that a smaller percentage of individuals believe that holding a credential has facilitated networking. Less than half of LEED Green Associates, Green Advantage Certified Practitioners, and Green Globes Professionals at some level agree that earning the credential has helped them build professional contacts. 58% of professionals holding other credentials do agree or strongly agree with the statement. Average ratings fell accordingly. GACPs report an average rating of 2.93. Though higher, those of GGPs and LEED Green Associates remain low, at 3.20 and 3.04 respectively. As expected, those holding other certifications provide an average response of 3.58.

Table 8: Number of participants who agree or strongly agree with each professional value metric

How has earning your credential impacted your career in terms of the following:	**LEED**	**GGP**	**GACP**	**Other**
Increased your compensation?	38	5	8	23
Increased your promotion opportunities?	88	15	23	34
Led to increased job responsibilities?	116	24	55	47
Increased your opportunities for professional contributions?	108	21	52	46
Empowered your existing position?	117	26	59	51
Increased marketability for recruitment?	219	30	81	55
Improved credibility?	225	36	103	65
Improved perception of competence from employers, peers, and clients?	236	39	111	66
Improved perceived level of commitment to your profession?	232	40	121	61
Helped build networking contacts?	126	24	59	46

Table 9: Proportion of participants who agree or strongly agree with the professional value metrics

How has earning your credential impacted your career in terms of the following:	LEED	GPP	GACP	Other
Increased your compensation?	10%	8%	4%	29%
Increased your promotion opportunities?	24%	25%	11%	43%
Led to increased job responsibilities?	31%	41%	26%	59%
Increased your opportunities for professional contributions?	29%	36%	24%	58%
Empowered your existing position?	32%	44%	27%	65%
Increased marketability for recruitment?	59%	51%	37%	69%
Improved credibility?	60%	61%	47%	81%
Improved perception of competence from employers, peers, and clients	64%	66%	51%	83%
Improved perceived level of commitment to profession?	63%	68%	56%	76%
Helped build networking contacts	34%	41%	27%	58%

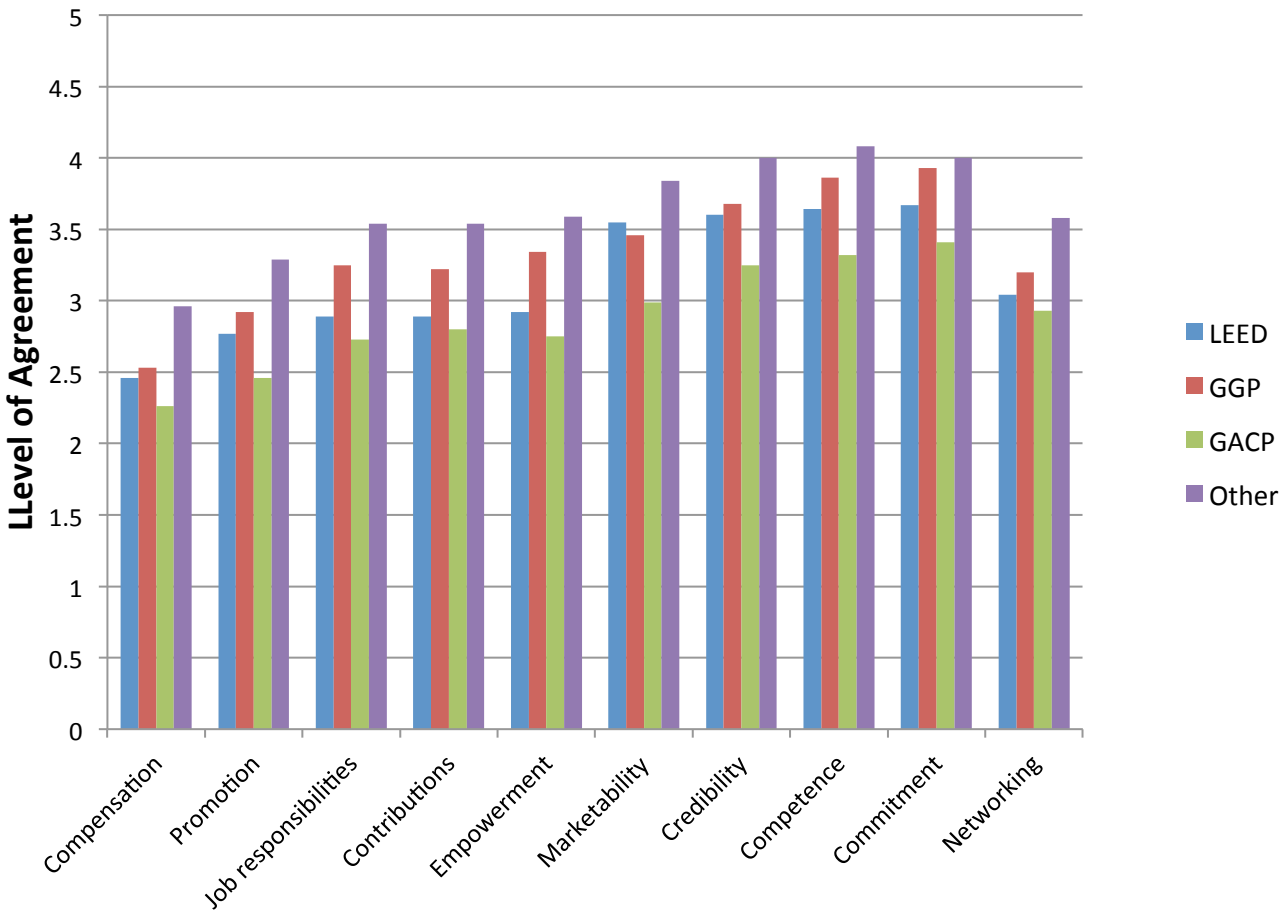

Figure 1: The average professional impact of the three credential and other sustainable construction professional credentials

Personal Value

While professional value focuses on impacts bred by external sources, such as colleagues and clients, personal value, or the impact on self-perception is the internal significance to the credential holder. Tables 10 and 11 reveal that industry practitioners feel their credentials do hold personal value or impact self-perception based on the listed conditions. Figure 2 supports the table values, as the average ratings by certified professionals, save one entry, are greater than three.

Between 370 and 371 LEED Green Associates responded to the question regarding impact on self-perception, as did 59 Green Globes Professionals and about 217 Green Advantage Certified Practitioners. 80 and 81 participants holding other certifications answered the question, which serves to answer part of the core research question.

Professional Standing

Improved professional standing is the only element of self-perception for which the credentials do not consistently have a positive impact. Tables 10 and 11 show that 29, or 49% of participating Green Globes Professionals agree or strongly agree with the statement, compared to 154, or 42% of LEED Green Associates, and 68, or 31% of Green Advantage Certified Practitioners. Only these minorities indicate that earning a professional credential builds prestige, reputation, and position within the industry. On the other hand, 60 of the 81 professionals holding other sustainable construction professional credentials feel their credential has impacted their professional standing within the industry, and their average rating is 3.8. The response means of the three specified credentials also are the lowest of the personal values. GGPs, LEED Green Associates, and GACPs report average ratings of 3.44, 3.23, and 3.03 respectively.

Education

The following two ratings addressed knowledge and education, an impact referenced in nearly all prior studies. Regarding basic sustainable construction knowledge, the majority of certification holders from all systems felt that earning their credential helped them improve their knowledge of general sustainable construction principles. 76% of LEED Green Associates, 68% of Green Globes Professionals, and 69% of Green Advantage Certified Practitioners either agree or strongly agree certification has educational value. 81% of those holding other credentials also agree (Table 11). Average ratings parallel these proportions (Figure 2), as each sample reports a mean value greater than three. Many professionals place a greater value on the credential's effect on knowledge of green construction rating systems. Table 11 shows that 80% of LEED Green Associates and 85% of GGPs agree or strongly agree that certification served to improve their understanding of the associated rating system. Only 61% of GACPs feel the credential has been of value in this regard, but this response was expected, because the certification material does not place emphasis on rating system training. Figure 2 shows that the four average scores all are greater than three, even approaching four.

Confidence

The data show that the certification training, and perhaps even holding the certification, has boosted the professional confidence of respondents. Table 11 shows that the majority of LEED Green Associates, Green Globes Professionals, and other certified industry professionals agree or strongly agree that certification has enhanced their confidence in their ability to successfully accomplish the goals laid out by themselves and employers. 48% of GACPs agree. According to figure 2, LEED Green Associates, GGPs, and GACPs report average ratings of 3.53, 3.90, and 3.28 respectively. Professional s holding other certifications assign an average rating of 3.8.

Personal Satisfaction / Self-Esteem / Personal Accomplishment

The question regarding impact on self-perception ends with three statements that truly reflect psychological impact of earning these credentials. Some participants questioned the inclusion of these potential impacts, one even stating, "the self-esteem stuff is irrelevant." Regardless, the data show that these factors are valuable to many professionals. 73% of LEED Green Associates agree or strongly agree that earning the credential gave them both a feel of satisfaction and personal accomplishment (Table 11). 69% and 71% of Green Globes Professionals feel the same. Green Advantage Certified Practitioners share in this excitement. 54% and 53% agree or strongly agree. Additionally, 25% of GACPs report that certification has improved their self-esteem, but Table 11 shows that less than half of LEED Green Associates, Green Globes Professionals, and other credentials holders believe their credential has this emotional value.

Table 10: Number of participants who either agree or strongly agree with the personal value statements.

How has earning your credential impacted your self-perception in terms of:	LEED	GGP	GACP	Other
Feeling of high standing within your profession?	154	29	68	60
Developed your knowledge of sustainable construction principles?	281	40	148	65
Developed your knowledge of sustainable rating systems?	299	50	133	61
Added confidence in your abilities?	214	42	104	57
Feeling of personal satisfaction?	272	41	117	60
Improved self-esteem?	174	28	55	39
Feeling of personal accomplishment?	271	42	114	62

Table 11: Proportion of participants who either agree or strongly agree with the personal value statements

How has earning your credential impacted your self-perception in terms of:	LEED	GGP	GACP	Other
Feeling of high standing within your profession?	42%	49%	31%	74%
Developed your knowledge of sustainable construction principles?	76%	68%	69%	81%
Developed your knowledge of sustainable rating systems?	80%	85%	61%	75%
Added confidence in your abilities?	58%	71%	48%	70%
Feeling of personal satisfaction?	73%	70%	54%	74%
Improved self-esteem?	47%	48%	26%	49%
Feeling of personal accomplishment?	73%	71%	53%	78%

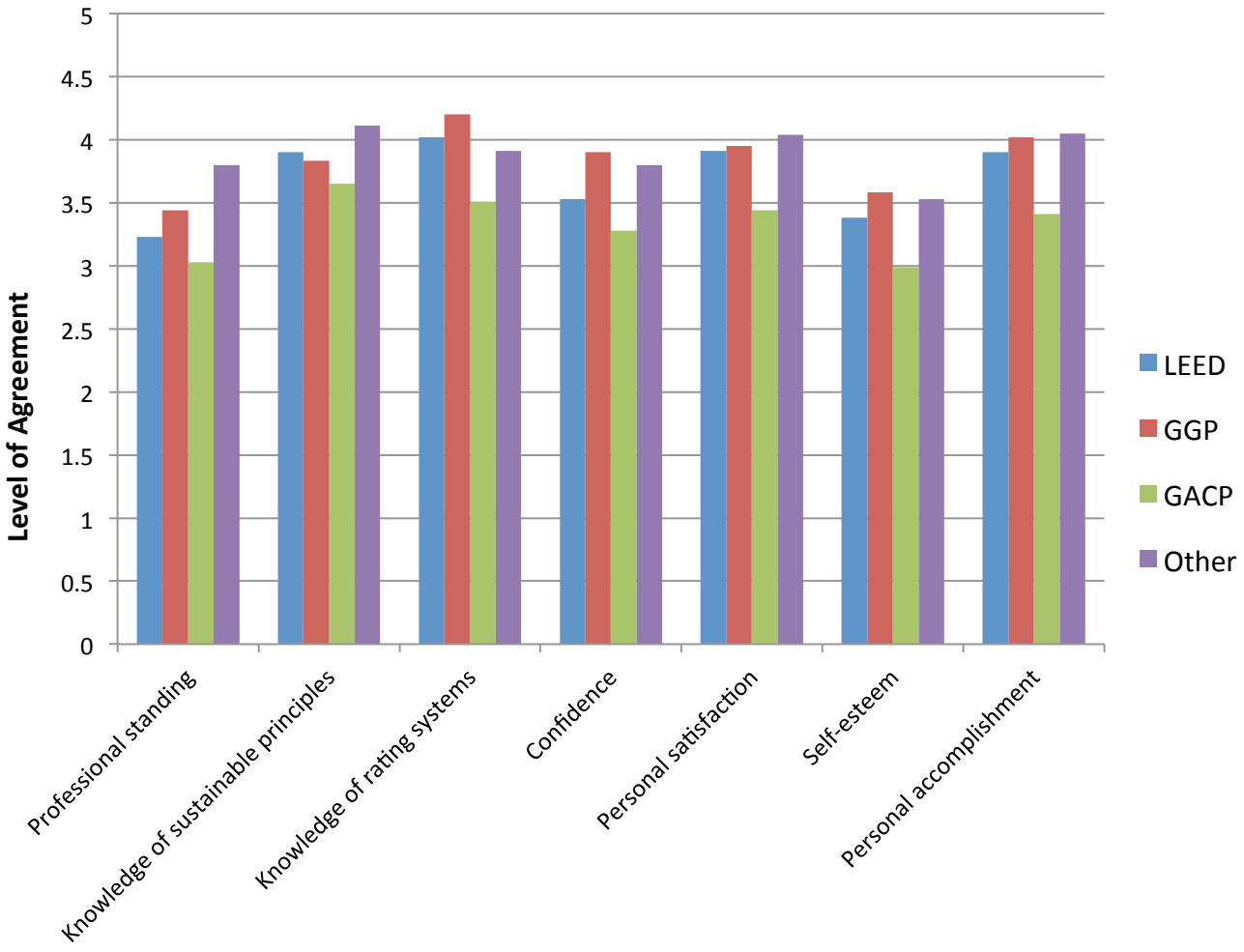

Figure 2: The average personal impact of the three credential and other sustainable construction professional credentials

Statistical Analysis

Simple data analysis reveals differences between the credentials, based on the proportions of individuals who agree or strongly agree and the mean ratings of each professional or career impact variable. Tables 12 and 13 present the results of the ANOVA and Tukey-Kramer tests used to identify potentially random differences between responses to professional and personal impact questions. The tables includes the mean levels of agreement, which are displayed graphically in Figures 1 and 2, along with p-values and the corresponding significant differences at the 0.05 confidence level.

The table shows significant differences in perceived value within every career impact category. Many of the differences are the result of the strength of the other certifications. Of the 30 identified significant differences in means, 18 involve the sample of professionals holding other certifications. Dissimilarities also result from the consistent low level of agreement reported by Green Advantage Certified Practitioners. Table 12 shows that 22 of the 30 identified differences include GACPs, and in every case, Green Advantage Certified Practitioner has the lesser average perceived value. There are no verified differences between LEED Green Associate and Green Globes Professional.

Table 13 presents results that are similar to that of professional value. Again, every personal impact category shows significant differences, but the level of value reported by professionals holding other credentials is not as influential. Only eight of the 20 significant differences result from the responses of the *other* sample. In the case of personal value, mean responses from Green Advantage Certified Practitioner are statistically different in every area from those of the other three samples. 19 of the 20 identified differences involve GACP. Again, the Tukey tests reveal no significant differences between responses by the LEED Green Associates and Green Globes Professionals.

Table 12: Mean impact ratings reported by the four samples, and significant differences between the means for professional impact metrics, alpha=0.05

Professional Impact	LEED	GGP	GACP	Other	Differences α=.05	P-Value
Increased your compensation?	2.46	2.53	2.26	2.96	Other-LEED	0.0011
					Other-GACP	<.0001
Increased your promotion opportunities?	2.77	2.92	2.46	3.29	Other-LEED	0.0009
					Other-GACP	<.0001
					LEED-GACP	0.0052
					GGP-GACP	0.0249
Led to increased job responsibilities?	2.89	3.25	2.73	3.54	Other-LEED	<.0001
					Other-GACP	<.0001
					GGP-GACP	0.0054
Increased your professional opportunities for contributions?	2.89	3.22	2.80	3.54	Other-LEED	<.0001
					Other-GACP	<.0001
Empowered your existing position?	2.92	3.34	2.75	3.59	Other-LEED	<.0001
					Other-GACP	<.0001
					GGP-GACP	0.0035
Increased your marketability for recruitment?	3.55	3.46	2.99	3.84	Other-GACP	<.0001
					LEED-GACP	<.0001
					GGP-GACP	0.0299
Improved credibility?	3.6	3.68	3.25	4	Other-GACP	<.0001
					Other-LEED	0.0115
					GGP-GACP	0.0255
					LEED-GACP	0.0004
Improved perception of competence from employers, peers, and clients?	3.64	3.86	3.32	4.08	Other-LEED	0.0044
					Other-GACP	<.0001
					GGP-GACP	0.0021
					LEED-GACP	0.0017
Improved perceived level of commitment to your profession?	3.67	3.93	3.41	4	Other-GACP	0.0001
					GGP-GACP	0.0041
					LEED-GACP	0.0175
Helped build networking contacts?	3.04	3.2	2.93	3.58	Other-GACP	<.0001
					Other-LEED	0.0007

Table 13: Mean personal impact ratings reported by the four samples, and significant differences between the means for personal impact metrics, alpha=0.05

Personal (self-perception) Impact	LEED	GGP	GACP	Other	Differences α=.05	P-value
Feeling of high standing within your profession?	3.23	3.44	3.03	3.8	Other-GACP	<.0001
					Other-LEED	<.0001
					GGP-GACP	0.0310
Developed your knowledge of sustainable construction principles?	3.9	3.83	3.65	4.11	Other-GACP	0.0016
					LEED-GACP	0.0119
Developed your knowledge of sustainable rating systems?	4.02	4.2	3.51	3.91	GGP-GACP	<.0001
					LEED-GACP	<.0001
					Other-GACP	0.0084
Added confidence in your abilities?	3.53	3.9	3.28	3.8	GGP-GACP	0.0003
					Other-GACP	0.0006
					LEED-GACP	0.0195
Feeling of personal satisfaction?	3.91	3.95	3.44	4.04	Other-GACP	<.0001
					GGP-GACP	0.0044
					LEED-GACP	<.0001
Improved self-esteem?	3.38	3.58	2.99	3.53	Other-GACP	0.0011
					GGP-GACP	0.0016
					LEED-GACP	0.0002
Feeling of personal accomplishment?	3.9	4.02	3.41	4.05	Other-GACP	<.0001
					GGP-GACP	0.0003
					LEED-GACP	<.0001

Conclusions

Discussion and Limitations

The main research question focuses on the perceived value of the broad-spectrum certifications: Green Globes Professional, LEED Green Associate, and Green Advantage Certified Practitioner. Though GGP initially seems to have the greatest reported impact in terms of both career and self-perception components, further statistical analysis shows that these findings potentially are unreliable, due to the small GGP population relative to those of GACP and LEED Green Associate. However, the data and subsequent tests of significance do set GACP and other credentials apart from GGP and LEED Green Associate.

There were observable differences between Green Advantage Certified Practitioners and the other two credentials. Within a realistic level of confidence (.05 α), GACP was statistically lower than GPP in 13 of the 17 categories of personal and professional value. Similarities exist in opportunities for contributions, compensation, networking, and knowledge of sustainable construction principles. Similar significant differences exist between GACP and LEED Green Associate in 11 impact factors, 10 of which are within the same variables for which GGP differs, the other being the green building means and methods educational experience. The researchers identified several reasons why GACP might fall behind the other credentials, all of which stem from the absence of a Green Advantage rating system to support the Green Advantage certification. Though the organization does have a relationship with the Green Building Certification Institute, earning the credential does not require rigorous LEED training. The educational value and potentially the personal marketing value are diminished by this absense, and the survey revealed that marketability and knowledge development have the greatest impact on a professional's decision to earn a credential (Table 14). If these two influences ultimately are not fulfilled, the professional may not value his or her certification. Additionally, evidence would suggest that the presence of a rating system would generate awareness of the accompanying professional credential, and a number of GACPs commented that their certification is relatively unknown in the construction industry, weakening its market value, at least when compared to prominent credentials such as LEED AP and LEED Green Associate. One participant commented, "I was already a LEED-AP and had worked on LEED projects, so GA certification was insignificant in comparison, but something my company wanted me to do." That said, survey results and the Green Advantage directory show that some companies have embraced this credential.

Because the researchers propose that the presence of a supporting rating system has a positive influence on perceived value, it is surprising that there are no significant differences between LEED Green Associate and Green Globes Professional. If this hypothesis is true, the LEED rating system's strong position in the sustainable construction industry should afford LEED Green Associate an advantage over Green Globes Professional. Additionally, though the differences are considered statistically insignificant, GGPs regularly report higher impact ratings. These conflicting results reveal a

potential limitation of the study: the Green Globes Professional sample size was insufficient. Though they had the highest response rate, only 59 GGPs participated, compared to 217 GACPs and 372 LEED Green Associates. This difference prohibits the researchers from establishing differences that account for an acceptable level of uncertainty.

Table 14: Rank of factors considered while deciding to earn a certification

Marketability	6.3
Education / Knowledge Base	6.28
Personal Satisfaction	5.99
Industry Recognition	5.75
Employer Preference	5.55
Networking	5.19
Salary / Promotion	4.67
Job Responsibilities	4.34
Time Commitment	3.95
Cost	3.59
Exam Difficulty	3.42

The other limitation initially affected the researchers' confidence in the GGPs responses. The Green Globes Professional sample is not representative of the industry as a whole. Email address domains revealed that 71 (42%) of GGPs are employed by Jones Lang LaSalle, a 40,000 employee real estate financial and professional services firm (Jones Lang LaSalle 2011). In July 2008, as part of its sustainability initiative, Jones Lang LaSalle purchased EDC Energy and Environment Canada; the organization that initially launched the Green Globes rating system, which now is administered by GBI (Marpman, 2008). The GGP credential likely holds high value at Jones Lang LaSalle, potentially skewing the results, as the career impacts at this single organization may not be consistent throughout the industry. In an attempt to reveal any such impact, the researchers filtered the survey responses, as shown in Table 15, to account only for participants who worked for an organization with annual revenue greater than $10 million. Additionally, Jones Lang LaSalle offers facility operations and management services, so the data was filtered again to include only responses from participants working for facilities managers and yet again for professionals working for facilities management firms with annual revenue greater than $10 million.

Table 15: Responses to professional impact questions by subgroups of Green Globes Professionals

Professional Impact Variables	All responses	>10 mil	Facilities MGT	Facilities MGT & >10 mil
Increased your compensation?	2.53	2.55	2.53	2.77
Increased your promotion opportunities?	2.92	2.91	2.92	3.31
Led to increased job responsibilities?	3.25	3.24	3.25	3.23
Increased your professional opportunities for contributions?	3.22	3.21	3.22	3.15
Empowered your existing position?	3.34	3.27	3.34	3.31
Increased your marketability for recruitment?	3.46	3.73	3.46	3.92
Improved credibility?	3.68	3.7	3.68	3.85
Improved perception of competence from employers, peers, and clients?	3.86	3.94	3.86	4.15
Improved perceived level of commitment to your profession?	3.93	4.00	3.93	4.08
Helped build networking contacts?	3.20	3.18	3.20	3.00

One or more of the columns in Table 15 should more closely represent the responses of Green Globes Professionals who work for Jones Lang LaSalle. The personal impacts of GGP were not reevaluated, because theoretically the employer should have little to no impact on intrinsic motivators. The far right column, which includes only responses from GGPs working for organizations offering facilities operations and management services that gross more than $10million annually, reveals higher impact ratings, but the resulting sample size is 13. The small sample, even within a group of only 59 participants, would not have a tremendous impact on the overall mean displayed on the far left of the table. These results suggest that the relationship between Green Globes and Jones Lang LaSalle does not have a statistically significant impact on the response means. It should be noted, though, that participants were not required to answer demographic questions, so it cannot be assumed that all Lang LaSalle employees were segregated from the other participants for the purposes of evaluating their impact.

Impact ratings between credentials vary throughout the 17 variables associated with professional and personal value, but the study unexpectedly reveals that these credentials have on average had a trivial impact on the participant's career or self-perception. Though average responses are significantly different at times, the means consistently remain close to three. Rarely do the average responses reach or exceed four, suggesting that any impact is not remarkable. Still, tables 8 and 9 show that many professionals agree or strongly agree that certification has had personal and professional impacts. This belief is reflected in statements provided by participants. Some value the training required to earn the credential. One individual with multiple credentials claimed that earning her certifications were "eye opening." One LEED Green Associate feels strongly that the credential is a valuable source of personal marketing for recruitment, stating, "I was unemployed for 8 months when I enrolled and completed the course. Within 2 months of obtaining the credential, I had 2 job offers." Others are proud to know that

they are participating in the green building movement. It should be noted that the greatest value is placed on personal satisfaction and a feeling of accomplishment.

Implications for Practice

The survey results produced valuable information for those considering pursuing a sustainable construction professional credential. No existing literature offers a side-by-side comparison of these broad-spectrum credentials that addresses both the certification process and the self-perceived value associated with a variety of variables. The data show that LEED Green Associate is not the only credential worth the time and money required to earn accreditation. Results do not differentiate it from Green Globes Professional, and in response to some variables, GGPs as a group place more value on their credential, though the analysis of variance suggests that these differences may be unreliable. Some professionals may decide to consider credentials that were not the motivation for this study, as according to the survey, the greatest value is place on *other* credentials, most of which were LEED AP, along with BPI Building Analyst and other residential certifications (Table 16). Even legacy LEED AP is considered by many a higher level credential than LEED Green Associates, though the requirements for certification were similar. Perhaps the development of the LEED AP for Homes credential will change the value of the BPI and NAHB certifications.

Table 16: Write-in responses for those holding credentials other than LEED Green Associate, GGP, and GACP

LEED AP (27)	CAPS
LEED AP BD+C (23)	Green Advantage Environmental Certification Commercial
LEED AP O+M (5)	CxA
LEED AP ID+C (2)	cSBA
Green and Save Home Efficiency Consultant	Certified Green Professional, HERS Rater
Corporate Sustainability Manager certificate	Nace
Developing Green Parking Council Credential	Green Advantage Commercial
Green Point Rater	BPI, RESNET
BPI Building Analyst, BPI Envelope Specialist	Green Globe Auditor
Stormwater Pollution Prevention Certification	NAHB Green Verifier, EPA Lead Free Frim
EIT License	FMP
BPI Building Analyst	N.C.C.E.R. Your Role In The Green Environment
CEM, CEA, CDSM	took a green class through the union hall
BPI Building Analyst	took a green class through the Union hall
NCCER	BPI Building Analyst and Envelope
BOMA	Whole house rater
HERS Rater	Green Advantage Inc Environmental Certification
Green Advantage-Commercial	
GRP	
NAHB Certified Green Professional	
BPI	
Certified Green Professional	

The study also has implications for the organizations developing the credentials. The portion of the survey that addresses the reasons for certification (Table 14) reveals that required time commitment, exam difficulty, and certification cost are not of great importance, while the educational value of earning the credential is heavily weighted. The research offers organizations a catalogue of characteristics by which professionals value certifications, and subsequently how they value there credentials based on these variables. These impact and value responses show that within each credential, there is room for improvement. In addition to knowledge development, professionals' objectives include personal market value and employer recognition. Average impact responses just above three suggest that the certification bodies need to better promote the value of their credential, potentially by initiating direct communication with executives at top companies throughout the industry. Industry correspondence and subsequent promotion could yield professional benefits, encouraging industry practitioners to earn the credential. Regarding the educational experience, Green Advantage might benefit from a greater focus on rating system training, including both LEED and Green Globes. Incorporating training associated with multiple rating systems potentially would incentivize employers to support Green Advantage Certified Practitioner, especially as Green Globes gains popularity in the building design and construction community.

Recommendations for Future Research

This study has uncovered several opportunities for future research. A study, which further investigates the reasons behind the varying self-perceived values of these certifications, might be more beneficial to the certifying organizations, as they work to improve their credentials. Additionally, the opportunity to build on a practitioner's current knowledge base has been identified as a considerable benefit of earning a professional credential. Valuable literature could result from an analysis of improvements in means and methods after certification, thus measuring the successful application of the sustainable construction educational experience. This study could serve either to validate or contest one respondent's claim that certification "only is a marketing tool. It results in few changes in building practices." Additionally, the results revealed statistically significant differences between LEED Green Associate and "other" credentials, including LEED AP (both legacy and w/ specialty). A formal study comparing the value of LEED Green Associate to that of the legacy LEED AP credential could put into perspective the current value of the new entry level LEED credential. The credentials are designed to serve the same purpose. Each is a broad-spectrum credential that does not incorporate specialties and tests only basic concepts of sustainable construction and the LEED rating system. Regardless of legacy LEED AP's obsolescence, does the term *Accredited Professional* itself have greater personal and professional value? Similarly, future studies could address the value of LEED AP with specialty. Is the perceived value of LEED AP even greater than before, now that there are specialties, the credentialing process is more rigorous, and a lower level LEED credential is offered? Finally, in an effort to further investigate the relationship between value and awareness, the researchers recommended an impact study of industry awareness on the perceived value of professional credentials.

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