Bridging the Gap: Leveraging Social Media to Drive Proliferation of Sustainable Buildings

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I. Abstract

As we progress in the global fight against climate change, there has been slow adoption of sustainable building practices, especially within the United States. It is vital for the public to become familiar enough with the concepts to generate a demand for sustainable buildings. This study investigates the use of social media as a key tool for filling the knowledge gap between sustainable building professionals and the public. Specifically, it seeks to address why businesses in the industry should utilize social media and how they can use it most effectively. The study investigates the public's use habits and preferences on six social media platforms with a survey, interviews, platform discourse analysis, and a review of popular press and peer reviewed journals. The study finds that Instagram is ideal for visual content targeting younger populations; Facebook is best for written content targeting older populations; TikTok is the best platform for reaching new audiences using short videos which may direct users to YouTube for in-depth learning; LinkedIn is ideal for interindustry content; and Twitter is best for intra-industry content. Bridging the gap will propel widespread change in the built environment by generating consumer demand for sustainable buildings, enabling all to reap its benefits and contribute to stopping, and reversing, effects of climate change.

II. Introduction

Social media plays a key role in modern society and possesses almost infinite possibility for creating meaningful change. In any industry, the starting point is identifying the "why" behind social media presence. Creating content that is engaging and purposeful is key to success; not necessarily in the number of likes or followers, but success through the lens of the greater good. In the sustainable building industry, this kind of success is of even greater importance as humanity bands together to fight climate change and prevent further damage to the earth. Yet, buildings are largely excluded from the sustainability discussion in the public realm.

Green building professionals know how much of an impact our buildings have on climate change. Unfortunately, there is a large disconnect between professionals and the public when it comes to knowledge of sustainable buildings and the sustainable built environment. This research report seeks to identify how six social media platforms can be optimally utilized by sustainable building-oriented businesses in the United States to bridge this gap and drive industry progress for the benefit of all people and our planet.

The building sector, especially in the U.S., has some of the greatest potential to make significant strides in the fight against climate change. By creating green buildings that are regenerative, efficient, and resilient, the U.S. could "cut carbon emissions by 841 million metric tons through 2040," (Layne, 2019). Buildings account for 40% of total greenhouse gas emissions, making up the largest portion of emissions by category. Buildings also consume about 70% of total produced electricity. These percentages are expected to continue to rise as the global population rises and energy demand in buildings increases due to "improved access to energy in developing countries, greater ownership and use of energy-consuming devices, and rapid growth in global buildings floor area," (IEA, 2021). As one of the primary sectors contributing to climate change, the building industry around the world is transitioning to a sustainable building industry that prioritizes reduced energy and water consumption, healthy indoor environments, and an overall minimal impact on the planet.

The World Green Building Council has deemed the 2020's the 'Decade for Climate Action' (World Green Building Council, 2020). Yet, the United States has largely made it a decade for inaction; more than that, numbers of people and organizations participate in climate denial and are continually putting immediate profits over people (Feygina, 2019). Without rapid implementation of policies and actions that contribute to fighting climate change, there may not be much for any country to be proud of in a few decades (Bradshaw et al., 2021). Climate change threatens every species and habitat in every corner of the world. As the 'Decade of Climate Action' progresses, the United States ranks 55 of 58 countries on the Climate Change Performance Index (CCPI, 2022). Although the U.S. has moved up by a few spots on the index since 2021, there is a long way to go in the global effort in which the US must play a key role. With the technological and financial resources that the United States possesses, the country has an incredible potential for improvement. This contradiction between actual and potential progress gives rise to the rationale for this study which investigates a potential solution at the foundation of the problem.

At the core of any societal change lies the power of people and their knowledge. Behind environmental, economic, or social arguments in favor of sustainable buildings, lie socio-technical phenomena that influence societal transitions. I argue that this challenge of social momentum is the greatest reason the United States is underperforming in the green building industry. Thus, successfully propelling the green building industry in the US must begin with accurate information and education of all stakeholders. In this case, a stakeholder is any person that occupies or has occupied a building: everyone. Queue the arguably most useful tool of the 21st century, social media.

III. Literature Review

Because social media is a continuously and rapidly evolving mode of marketing, the literature review is restricted to 2010 and 2022. Similar to the literature review findings of Palmer and Udawatta (2019), I find that there is little existing research on the current discussion of sustainable buildings on social media and best practices for businesses, in the sustainable building industry specifically, to utilize social media.

Many companies in the sustainable building industry are considered small businesses and do not have the full marketing resources of large businesses. Nevertheless, social media should not be an afterthought. For businesses in the sustainable building industry to continue making strides in the fight against climate change, they must be internally sustainable by implementing sustainable business practices, including strong marketing and social media strategies. Palmer and Udawatta (2019) discuss the foundational motivations for social media use based on Brown's 2014 report that suggests "social media can improve communication, advocacy, learning and sharing in the sector, and they concluded that social media are, 'a key enabler for crowd-sourcing and problem-solving; innovation sharing; co-creation of value; and for crowdfunding for ideas and innovations'," (Palmer & Udawatta, 2019). While marketing certainly encompasses more than social media, it is a necessity for engaging with existing clients, potential clients, potential employees, and the public. Vafaei, Hegyesné Görgényi, and Maria (2016) discuss the importance of using marketing strategies, including social media, specifically for sustainability-oriented organizations. In addition to having sustainable practices internally, "Organizations should consider their sustainable behavior from the perspectives of ethics and general marketing strategy. The implication is that it is not enough to realize sustainability without communicating the efforts and promoting such efforts. Therefore, organizations need to make effort to progress toward a more reliable and effective sustainable status, and perhaps to the transparency quadrant," (Vafaei, et. al., 2016). In other words, as applied to this report, the lack of public knowledge of sustainable buildings and the sustainable built environment can, in part, be attributed to the lack of communication and promotion by companies in the industry.

Pittman, Read, & Chen (2021) investigate the use of social media as a tool to encourage non-green consumers to think about the environment and pursue sales of sustainable products. Their study uses the Elaboration Likelihood Model and the Social Judgment Theory as a basis for research development and hypotheses formation. Three strategic appeals methods were tested: functional, emotional, and combination. It was found that non-green consumers are most likely to engage with social media content and pursue purchasing if the message is low information (functional) and high fear (emotional). Other sectors of sustainability have already taken advantage of using social media to convert non-green consumers. Over the last decade or so, there has been a clear shift in public awareness and adoption of sustainable consumer products, which Palmer and Udawatta (2019) attribute to the leveraging of social media to promote sustainability ideas, issues, and activities. For example, the press release from Hong Kong Green Building Council (2016) reports on the success of collaboration between HKGBC and Construction Industry Council to launch social media campaigns promoting the national annual Green Building Week. One of the campaigns used was a Video Idea Contest which aims to crowdsource innovative ideas to help drive public awareness and implementation of green building concepts.

People spend almost an entire day's worth of time on social media each week, making it a core arena for sparking change across vast populations. This is due to the role social media plays in the development and proliferation of social norms, which are "the most powerful driver of changing behaviors toward sustainability," (Feygina, 2019). Meanwhile, "The diffusion of misinformation through social media is of particular interest given the newness of the speed and reach offered by this medium," (Treen, et. al., 2020). Even within the building industry, there are still hurdles to overcome in convincing all players to build sustainably because "the main challenge with a transformation in construction is that it is social in nature, it is not primarily a technological problem, or even related to new technologies. Many sustainable building techniques exist, the major challenge is to persuade a risk-averse industry actors to try out green concepts," (Nykamp, 2017). These socio-technical phenomena cannot be ignored in the argument in favor of using social media to increase awareness of the importance of sustainable buildings to drive progress. The challenge is thus present on multiple fronts: building industry conversion and public conversion, both of which simultaneously face the issues of information, misinformation, and disinformation. The potential offered by social media to address these challenges at low or no cost is unprecedented; no amount of paper mail, flyers, or emails can match the power of social media.

Palmer and Udawatta (2019) researched Twitter as a core platform within the construction industry, based on results from prior studies, which is one of the many industries within the sustainable building industry. Their methods involved a platform discourse analysis including twenty-six keywords sourced from academic journals and papers from the sustainable construction industry. The analysis was conducted over the course of 52 weeks and utilized a commercial Twitter data service to gather data continuously over the period. It was found that "green building" was used with the highest frequency of the twenty-six keywords. The spikes in usage of the keyword correlate to specific green building events and conferences, as well as announcements of new green building projects announced by important governmental figures such as senators.

Palmer and Udawatta (2019) suggest additional motivations for using social media in the industry, including organizing virtual connection and community engagement, as well as a method for collaboration and development of new ideas. In other words, social media has the potential to fulfill the idea that "two heads are better than one," by creating a vast community that can not only help a business grow and develop over time, but also help the sustainable building industry. Afzalan and Muller (2014) studied the use of social media as a tool for green infrastructure planning in a case study of community park planning in Eugene, Oregon. The research builds on communicative rationality theory, a Habermasian theory. The research used methods of discourse analysis on several forum platforms, including Facebook. It was found that social media is effective, in conjunction with other methods, in facilitating and supporting the collaborative process.

Despite the benefits social media can offer to support industry progress, Palmer and Udawatta (2019) found that businesses in the construction industry use social media less than other industries and, in the cases where it is, it is not used to the full potential. The industry's social media is described as "broadcast communication," a one-way street that does not encourage the

collaboration and community building that social media can bring. This issue of using social media appropriately is explicitly addressed by Butow (2020) in *Ultimate Guide to Social Media Marketing*: “Social media is not a broadcast channel for your business. It is a way for you to connect and engage with your audience, which means you need to share your new content in a way that is sociable and conversational” (Butow, 2020).

IV. Research Questions

Every successful business responds to a demand. At the same time, effective marketing also works to generate and grow demand over time. In the case of the sustainable building industry, there is a large potential to stimulate latent demand. If people do not know the importance of sustainable buildings, they will not demand sustainable buildings. This lack of demand takes the pressure off policy makers to implement stricter code that will aggressively fight climate change, and instead be faced with terribly slow market transition, thus continuing harm to the earth. It is certain that is not the intent of businesses in the sustainable building industry, but that is the reality. The industry is in a position where rapid change is necessary, and social media marketing is one mode to spur their mission. This study aims to address the questions:

i. Why should companies in the sustainable building industry use social media?
ii. How can these companies use social media platforms most effectively to grow public knowledge of sustainable buildings?

V. Methodology

Study Area

This study investigates the use of social media as a tool for change, primarily in the United States. The social media platforms included in this study are Facebook, Instagram, TikTok, LinkedIn, Twitter, and YouTube. The generated survey targets those over the age of eighteen for preemptive caution, while data from other sources may include younger age groups. Figures 1 and 2 visualize the location of survey participants internationally and nationally.

Figure 1: International survey respondents map, created using ArcGIS Pro 2.9.

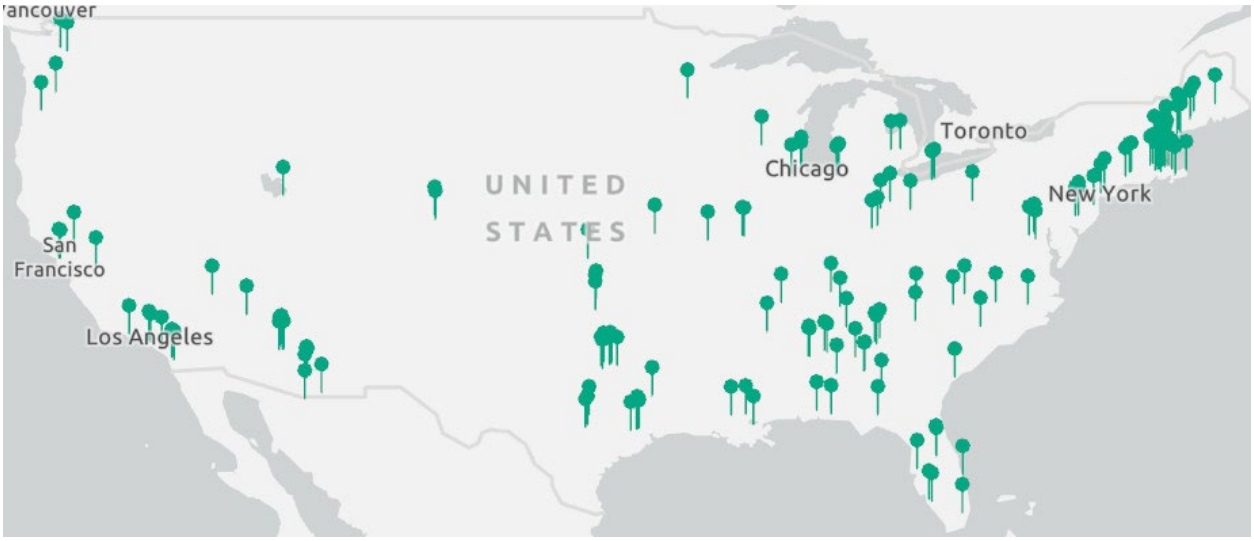


Figure 2: National survey respondents map, created using ArcGIS Pro 2.9.

Research Design

This study is a cross-sectional review of six social media platforms and the existing condition of the sustainable building industry on each. This report serves as a baseline snapshot of these topics for businesses in the sustainable building industry. I will demonstrate persuasive arguments as to why these businesses should utilize social media and highlight key data supporting recommendations on how they can leverage it most effectively.

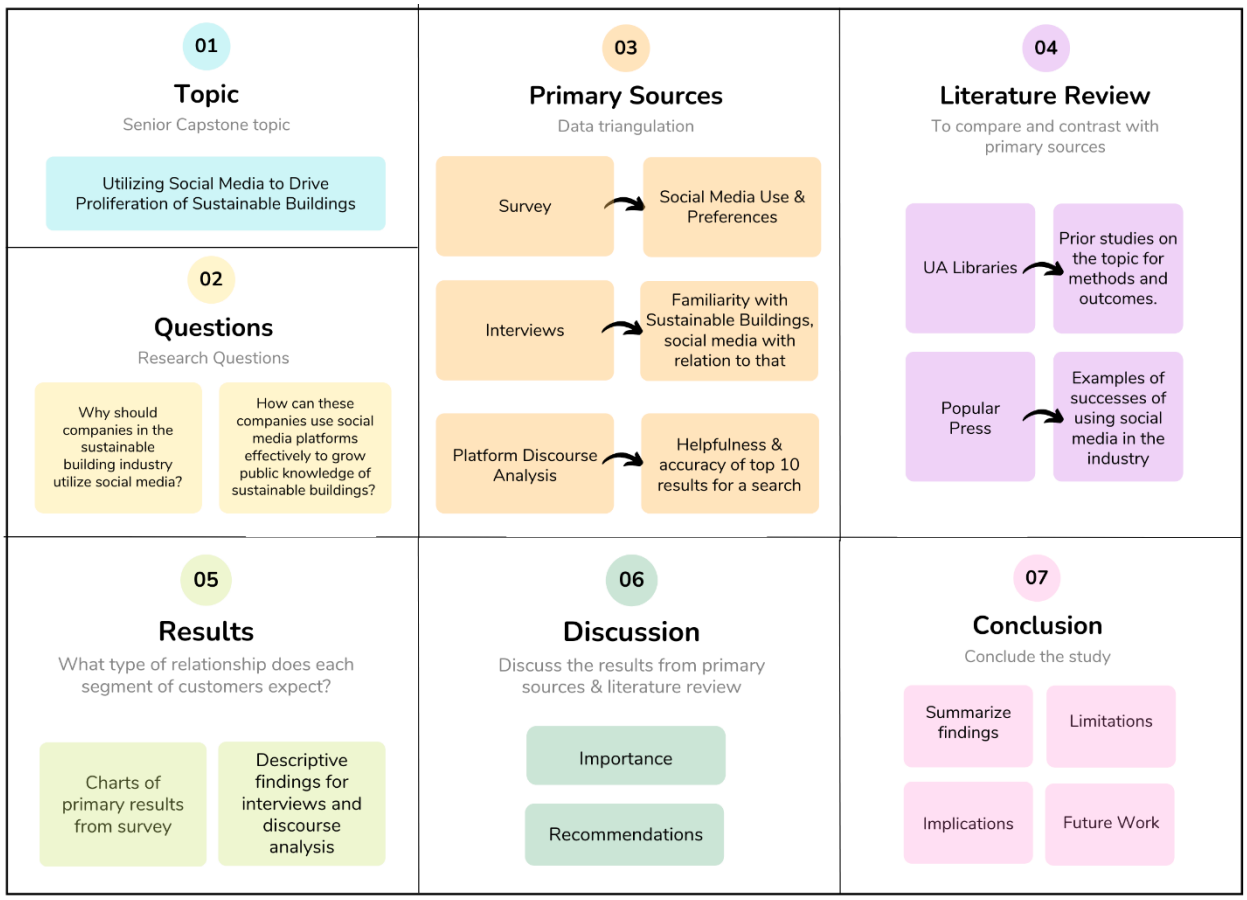


Figure 3: Conceptual framework for study.

Methods

This report uses mixed-methods data triangulation to gather qualitative and quantitative data. Data sources include a survey, interviews, platform discourse analysis, and a review of peer reviewed journals and popular press. The survey, interviews, and platform discourse analysis are primary data sources, supported by the secondary and tertiary sources of peer-reviewed journals and popular press.

The survey, Social Media Use and Perceptions, was generated using Qualtrics. All survey questions and response options are in Appendix B. The survey was published to three of the six

targeted platforms: Facebook, Instagram, and Twitter, with a total potential audience of over 100,000 users. Specific reach breakdown can be found in Appendix B: Table 3.

The study conducted interviews with one willing participant, sourced from survey question responses, of each age range, limited to participant availability. As a result, six (6) survey participants were interviewed in March 2022. Interviewee profiles can be found in Appendix A and guideline interview questions are in Appendix B. Audio from the interviews was recorded for reference while completing this report.

The platform discourse analysis review was conducted as part of this study to assess the existing discussion surrounding sustainable buildings on social media. This search consisted of six (6) hashtag searches on each platform. Hashtag search terms include #greenbuilding, #sustainablebuilding, #greenhome, #sutainablehome, #energyefficient, and #energyefficiency. Each of the six hashtags were searched on the six platforms using the author's personal social media accounts. Before each search, the cache was cleared to reduce the influence of past user activity on the analysis results. However, it is possible that existing followers/following on the accounts could have influenced the results. Thus, future work for this part of the study should involve the use of new, blank accounts on all platforms.

Facebook and Instagram discourse analyses were conducted on February 22, 2022, between 7:30 and 8:30 PM CST. LinkedIn, Twitter, TikTok and YouTube discourse analyses were conducted on February 26, 2022, between 3:00 PM and 5:30 PM CST. For each of the thirty-six searches, the top ten results were scored on accuracy and helpfulness, with the overarching question of "Would this help a viewer to learn more about the sustainable built environment?" Each post received one (1) point for accuracy if considered to be accurate to the respective hashtag in the context of sustainable built environments. If considered accurate, the post was then evaluated for helpfulness, defined as providing useful information to the viewer. Therefore, accuracy was scored out of ten (10) and helpfulness was scored out of the number of accurate posts. The full platform discourse analysis process can be found in Appendix B.

Prior studies, sourced through UA Libraries and Bing search engine, were referenced for the literature review to gather necessary information for understanding, comparison, and discussion. Search terms include 'social media and sustainable buildings,' 'social media and green buildings,' and 'social media green building trends.'

VI. Results

Survey

The survey results can be analyzed in several ways to draw conclusions based on raw data responses. The survey received a total of 294 responses during the time from February 5, 2022, to February 19, 2022. However, the final sixty responses, submitted from February 12th to February 19th, experienced an error and these incomplete responses have been omitted from the results of this report. Of the 234 survey participants, most respondents are between the ages of 23 and 27. This can be attributed to the author's age and connected peers. The chart in figure 4 shows the full breakdown of survey respondent age.

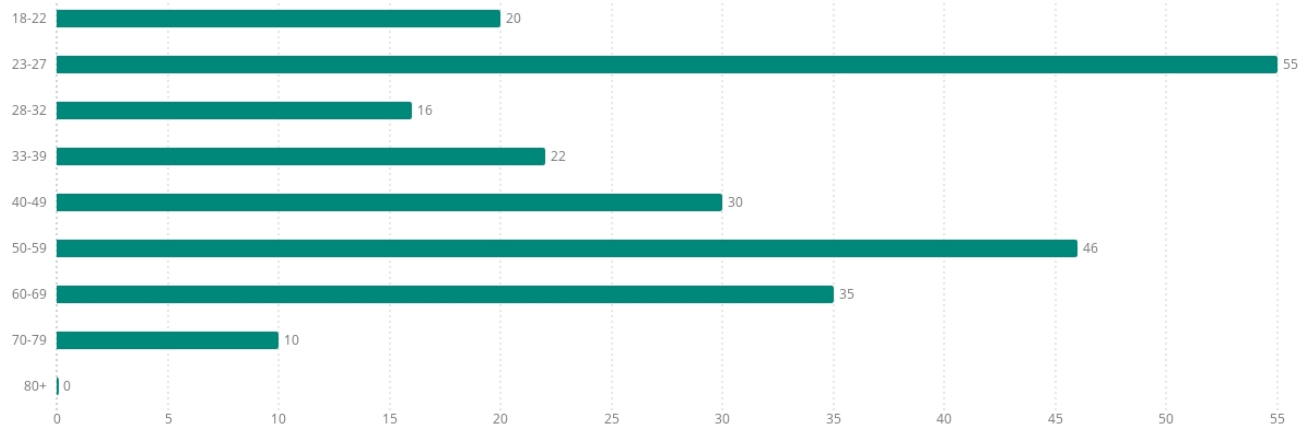


Figure 4: Count of survey participants for each age group.

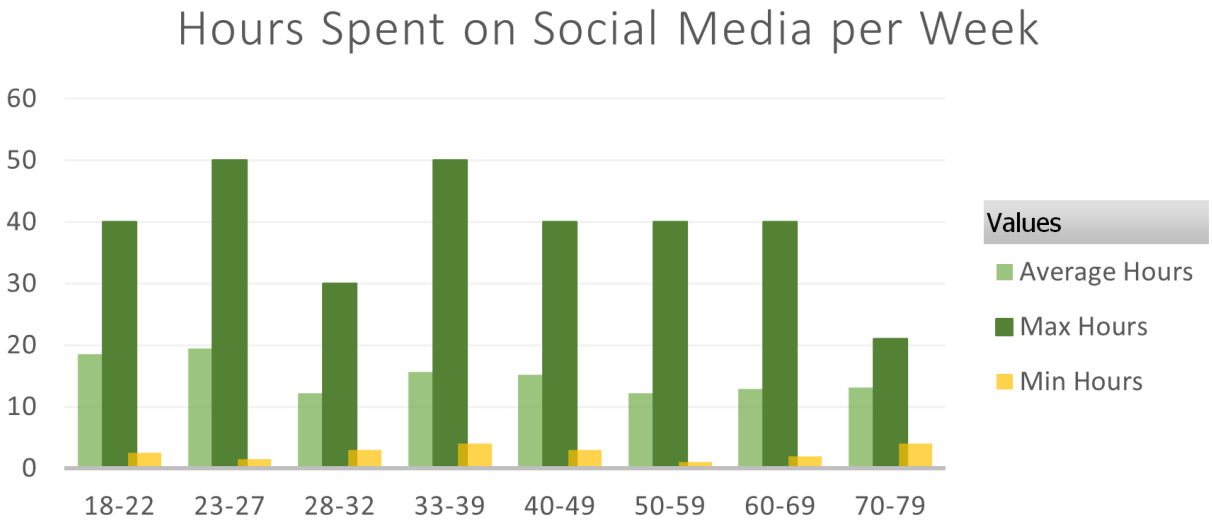


Figure 5: Survey-reported hours spent on social media per week, by age group.

Figure 5 shows the correlation between age group and approximate hours spent on social media per week. It should be noted that this is inherently skewed and cannot serve as true sample data

for the entire population due to the survey distribution method, primarily via social media platforms. However, it does provide some insight into the habits of those who already use social media. The Social Media Use and Perceptions survey found that people spend an average of almost 16 hours per week on social media. The median hours spent across all age groups is 14 hours. Survey findings are lower than 2022 international data reported by Broadband Search and Statista: 144 minutes per day and 145 minutes per day, respectively, which equals slightly more than two and a half hours per day or 17.5 hours per week. Additionally, Influencer Marketing Hub reports almost 4.5 billion people use social media worldwide (Geyser, 2022). With 4.5 billion users potentially on social media for somewhere between 14 and 17.5 hours per week, there is an incredible amount of time available to grow public awareness of the importance of sustainable buildings and generate consumer demand.

In leveraging social media to achieve social and business goals, one consideration for each company is the age range of their target audience(s). From there, recommendations can be made as to which platform(s) to use and how to best use them. Survey participants were asked to rank the six platforms from most utilized to least utilized. Across all ages, the four most utilized platforms, in varying order for different age groups, are Instagram, Facebook, YouTube and TikTok. TikTok is only reported as a platform of frequent use for those between ages 18 and 32, and Facebook is not often used by those under 28. It is recommended to target those under 40 on Instagram, YouTube, and TikTok. Those over the age of 40 are most likely to encounter a business' content on Facebook, Instagram, and YouTube. The breakdown of frequently used platforms by age group is in Figure 6.

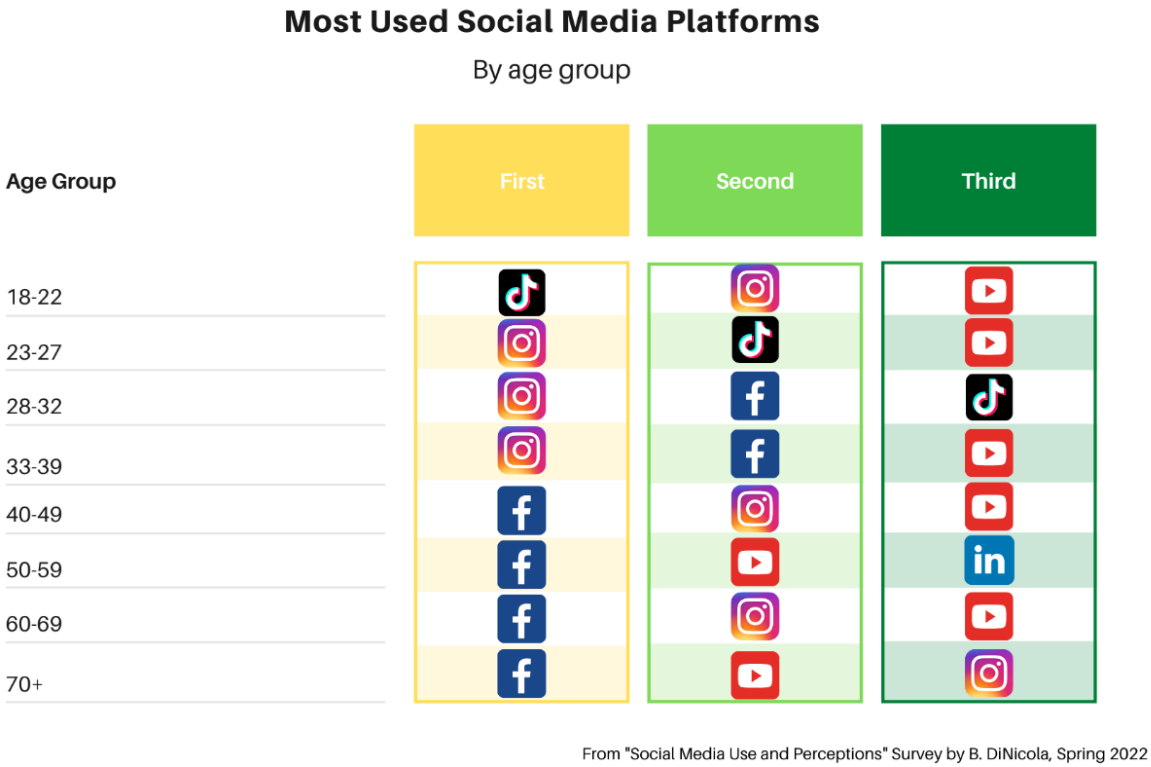


Figure 6: Most used social media platforms by age group.

In addition to how often people use different platforms, it is important to investigate which platforms users frequently engage with new accounts. Frequency of interaction with new accounts is largely controlled by the overall platform design and algorithms. However, to refute or support this preconceived knowledge, survey respondents were asked to give a rough percentage of how frequently they interact with new accounts on each of the six platforms. The Social Media Use and Perceptions survey shows that people across all age ranges interact with new accounts, defined here as ones they are not already following, most often on TikTok, LinkedIn, and YouTube. TikTok is the top ranked for new account interactions for those over 70 and under 40, while YouTube is the top ranked for those between the ages of 40 and 69. However, with the rise of Instagram and Facebook Reels, which is the attempt by Meta to compete with TikTok, there is potential for a shift in optimal platforms for reaching new audiences in coming months and years. The breakdown of responses by age group is shown in Figure 7.

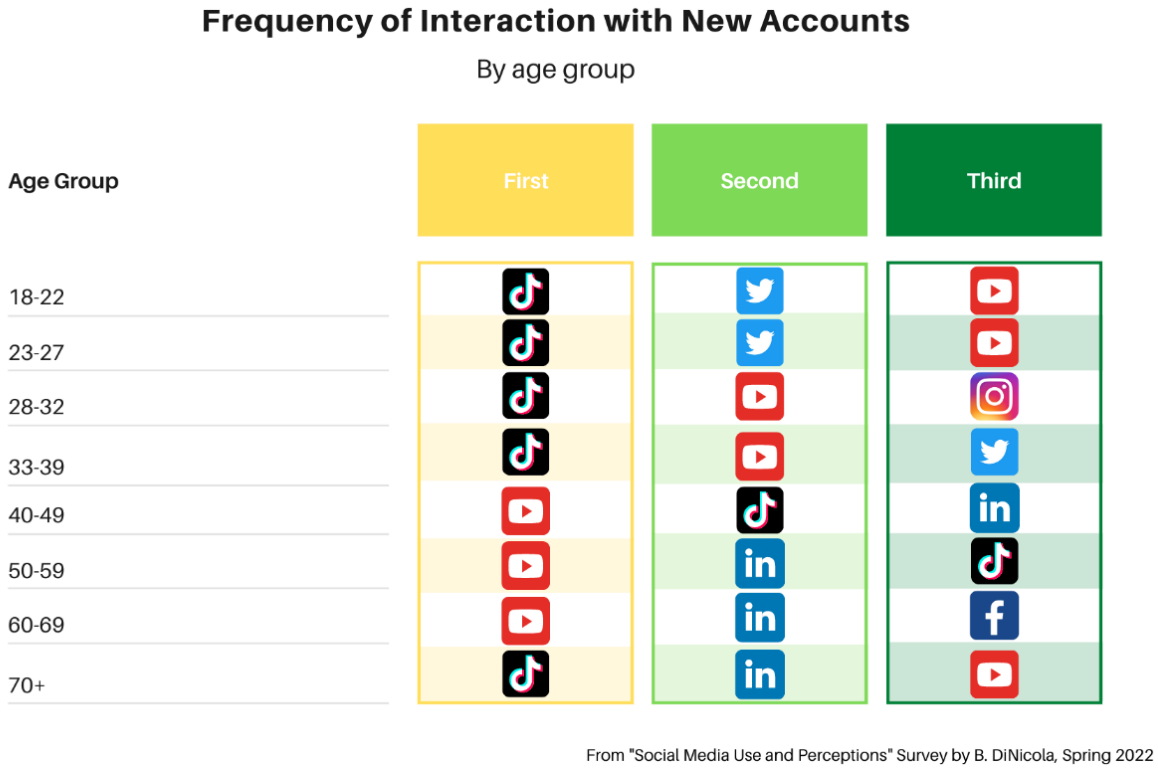


Figure 7: Platforms where users most frequently interact with new accounts.

When interacting with new accounts and accounts the user is already following, the type of content preferred by users comes into play. If users tend to shy away from specific types of content on certain platforms in general, they are unlikely to engage with those types of content from new accounts. To address this, survey respondents were asked to specify the length of video preferred on different platforms. Overall, people prefer no videos on LinkedIn or Twitter, very short[1] or short[2] videos on TikTok and Instagram, very short to medium[3] length on

[1] Very short is defined as up to 30 seconds.
[2] Short video is defined as between 30 seconds and 2 minutes
[3] Medium is defined as 2 to 5 minutes.

Facebook, and any length on YouTube, but tending towards medium to very long.[4,5] The full results are available in Appendix A: Figures 11 through 16. However, video length is not the only type of content that can vary.

In addition to video length preferences on all platforms, survey respondents were asked to report where they typically view content on Instagram and Facebook. The other four platforms have more structured designs and algorithms in which the favorable mode of viewing content is already known. The survey finds that most people use the home feed to view content on both Meta-owned platforms. Story format is used significantly more often on Instagram as opposed to Facebook. The full results from these two survey questions are shown in Figures 8 and 9.

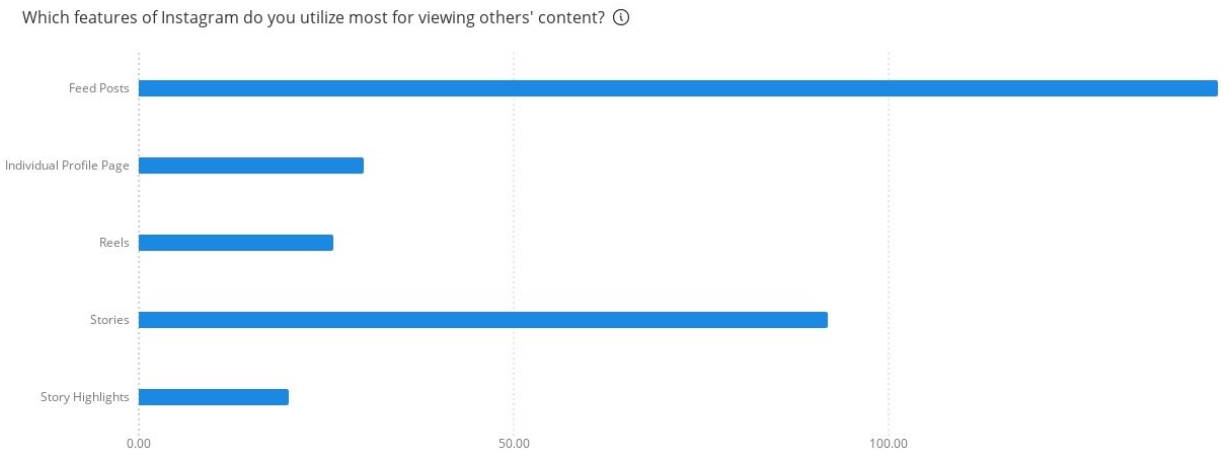


Figure 8: Features of Instagram used most for viewing content.

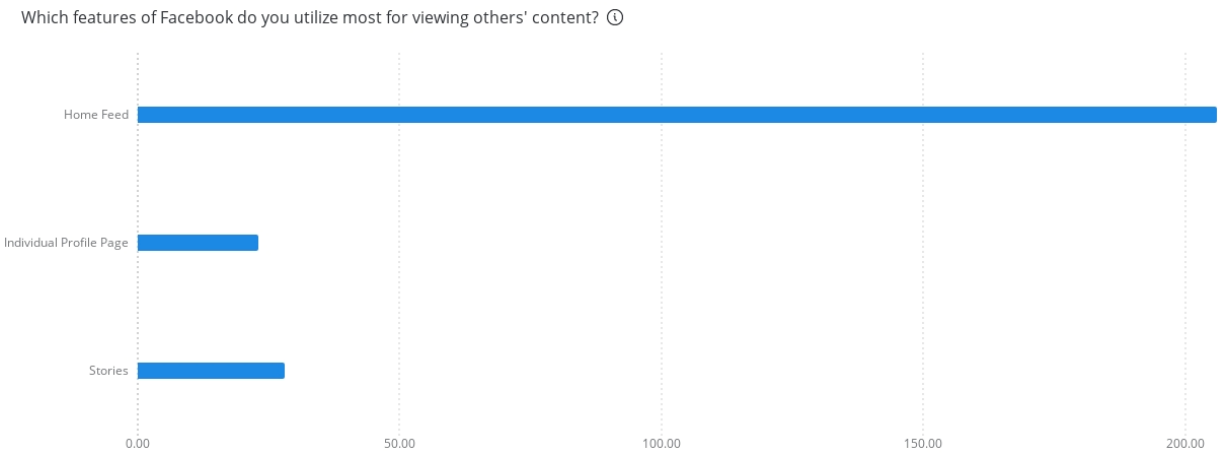


Figure 9: Features of Facebook used most for viewing content.

LinkedIn was chosen by 56% of survey participants as the most visited platform for professional development/educational content. YouTube chosen as the top platform for this purpose by 33% of respondents, which aligns with the information collected during interviews and findings of the platform discourse analysis The full results from this survey question are shown in Figure 10.

[4] Long is defined as 5 to 10 minutes.
[5] Very long is defined as any video longer than 10 minutes.

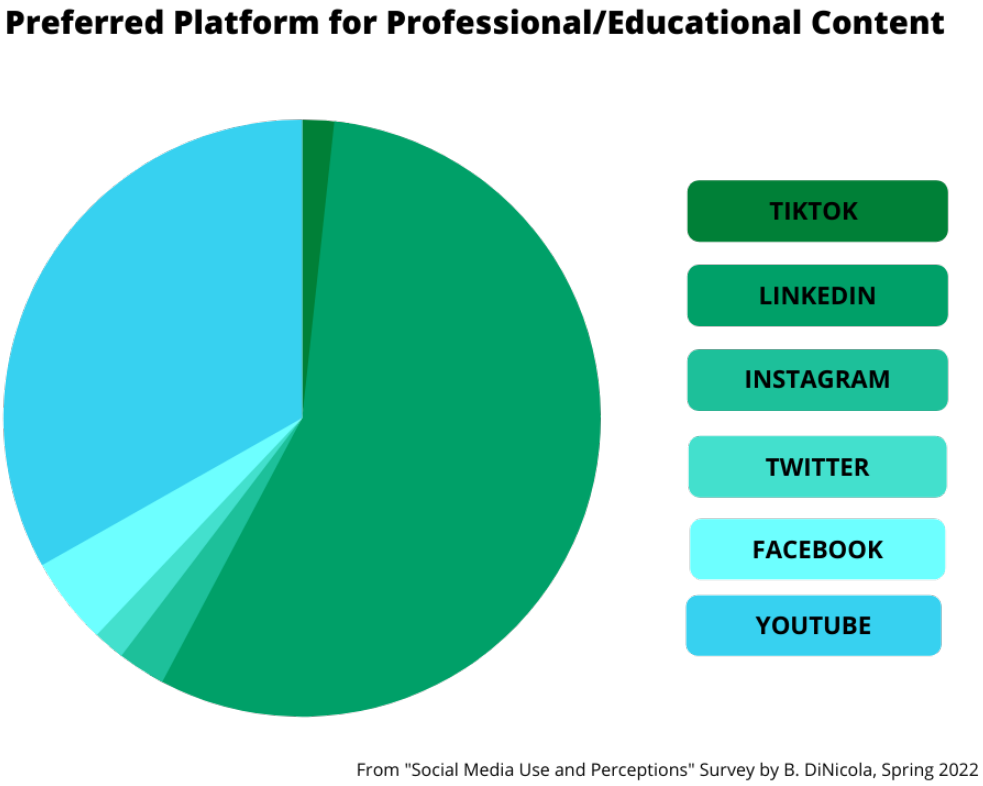


Figure 10: Most likely platform to visit for professional or educational content.

The findings of the Social Media Use and Perceptions survey are valuable data for businesses in the sustainable building industry to pair with their target audience. However, for social media to be successfully leveraged to drive industry progress, audiences cannot solely be broken down to mere numbers and statistics. The platform discourse analysis and interviews with selected survey participants provide the necessary qualitative data to back up survey findings and address the research questions.

Platform Discourse Analysis

To supplement the survey findings, the platform discourse analysis assesses the existing presence of sustainable building content on each platform. The full results are in Table 4 in Appendix A. Key results from the analyses are outlined below.

- LinkedIn shows the highest accuracy and helpfulness of the six platforms.
- #energyefficiency shows the most accurate and helpful results of the six hashtags.
- Of the six platforms, Instagram has the highest number of returns, but the least accuracy and helpfulness.
- The terminology 'green', both in #greenbuilding and #greenhome, is problematic on the primarily visual platforms of Instagram and TikTok. Creators utilize the hashtags to refer to the color as in a green design aesthetic.
- The terminology 'home', both in #greenhome and #sustainablehome, returns broader results that largely pertain to purchased products such as steel straws, reusable plastic bags, and refurbished furniture. While these are vital parts of living sustainably, they do not constitute parts of the built environment.

Interviews

Interviews were conducted with six survey participants across multiple age groups. The interviews built on the survey by tying in focused questions about awareness of sustainable buildings, willingness to learn more about the subject, and social media preferences with regards to learning. Key findings from the interviews are outlined below.

- All interviewees had some knowledge of sustainable buildings, encountered through workplace buildings or buildings in the local community.
- Interviewee knowledge of sustainable buildings was limited, but more than hypothesized.
- Interviewees #1-3, younger interviewees, have a general interest in learning more about sustainable buildings due to climate change concerns, with less practical applicability concerns.
- Interviewees #4-6, older interviewees, have an interest in learning more about sustainable buildings for practical personal reasons applicable to their own current or future homes and workplaces.
- Interviewees #1-3 prefer longer videos for more in-depth learning. These videos are sought out based on introduction to a concept via short social media content on TikTok or Instagram.
- Interviewees #4-6 prefer written articles for more in-depth learning, and generally encounter these articles on Facebook.
- Interviewee #1 discussed a dislike for videos on social media in general due to not being able to listen while in public without headphones.
- Of the four interviewees that like videos, they noted a preference for short-form videos on all platforms except for YouTube.

Interview findings of this study are supporting evidence to the literature review findings of Palmer and Udawatta (2019), that the use of social media marketing for sustainable consumer

products has been successful. When prompted to describe their familiarity with sustainable buildings, interviewees #1 and #2 briefly mentioned interaction with LEED certified buildings in real life. However, when prompted with the question of their interaction with sustainable or green buildings on social media, both conversations redirected to sustainable consumer products. Interviewee #2 explained that they feel relatively powerless over the sustainability of buildings, while they do have control over purchasing decisions. This reinforces the justification of this study, that there must be a cohesive effort of sustainable building professionals to show the public that they are not powerless in the buildings sector of sustainability. Knowledge is power; once people are equipped with the knowledge of the importance of sustainable buildings and basic concepts, they can, and will, demand better.

VII. Discussion

Goal setting, benchmarking, and long-term data tracking are important aspects of sustainability, regardless of the sector. This also applies to marketing strategies and the use of social media. The findings of this report serve as one form of benchmarking and include motivations for setting social media goals. However, these recommendations are not a one-size fits all and must be fine-tuned by each business to address unique business objectives and social goals.

Recommendations For Social Media Marketing

The first step in promoting a two-way street on social media, as encouraged by Palmer & Udawatta (2019) and Butow (2020), is to meet people where they are. This is accomplished through following platform algorithms. It is unlikely that current audiences will visit a specific profile to check for latest updates (Figures 8 & 9, p. 17). Algorithms are set in place by each platform and dictate how the platform works. Instagram and Facebook determine what appears on a user's home feed based on their history of interaction with a specific account, user's history of interaction with types of content (i.e., video versus still graphic), all users' interaction with a single post, and how much a specific account interacts with the user's content (Thomas, 2021). LinkedIn is very organic in its algorithm, meaning it can be difficult to reach new audiences, but it should be relatively easy to reach existing audiences so long as a company is sharing content that engages a small sample of the existing audience (Munir, 2021). Twitter and YouTube use a mix of the aforementioned algorithms, with factors including user interaction with similar content, user interaction with a specific account, all user interaction with a post, and more (Newberry & Sehl, 2021). The TikTok algorithm is especially unique, leading to a remarkably high degree of new account interaction (Newberry, 2022). The key takeaway is that it is important to leverage platforms' unique algorithms as pathways to reaching audiences. All algorithms center around promoting content that people enjoy and interact with.

Reach New Audiences – Current Clients, Potential Clients, and General Public

Reaching new audiences on social media can be tricky, but certain platforms are designed in ways that increase the likelihood of reaching new audiences. Taking into consideration platform algorithms and platform popularity are both important, but it is also important to recognize that preferences of the public are not always the same as industry niche preferences.

Survey and platform discourse analysis results alone could discourage the use Twitter as a platform for reaching the public. The survey results show that Twitter is not a platform of frequent use. Twitter is neither the best nor worst platform for sustainable building discussion according to the platform discourse analysis. However, this may be attributed to flaws in analysis method, rather than a true lack of sustainable building discourse; it is possible that platform users are not utilizing hashtags and therefore did not show up in discourse analysis results. In contrast to survey and platform discourse analysis findings, the research results of Palmer & Udawatta (2019) show that Twitter is a popular platform within the construction industry. A competitor analysis for a private company in the building performance industry was conducted separately from this research report and shows high activity on Twitter in comparison to other platforms.[6]

[6] The full results of the competitor analysis are shown in Table 3 in Appendix A.

The findings from the competitor analysis corroborate the justification of the research report by Palmer & Udawatta (2019). Therefore, Twitter is recommended as a good platform for reaching new audiences within the construction industry, but there are significantly better platforms for reaching the public such as YouTube, TikTok, Instagram, and Facebook.

Instagram and Facebook have similar algorithms and features, which makes sense given that they are both owned by Meta. While Facebook is more suited to links and written content, Instagram is more suited to visual content. This may be the reasoning for survey respondents of younger age groups showing a preference for Instagram while older age groups show a preference for Facebook. This aligns with the interview findings that younger interviewees #1-#3 prefer graphic or video content, while older interviewees #4-#6 prefer written content or posts that link to website articles. While some preferences, like Instagram versus Facebook, vary by age group, others are steady across the board.

YouTube videos are a popular platform for the public, regardless of age. People turn to this platform for both leisure and educational or professional content and frequently interact with new accounts, making it an excellent platform for reaching any target audience (DiNicola, 2022). However, people also prefer longer video content on YouTube, anything over two minutes (DiNicola, 2022), which is not necessarily easy to generate on a frequent basis for a small business with limited resources. This challenge may be worth overcoming due to the vast potential for reaching people of all walks of life. Three interviewees noted that they are often introduced to a sustainability concept on TikTok, and then will turn to YouTube for more detailed information, especially tutorial type content. Thus, reaching the public on YouTube should be coupled with strategies on other platforms to draw initial attention and then reorient people to YouTube for more in-depth learning to make the time and resource investment worthwhile. It is recommended for small businesses to build a community and audience on low-cost, high reward platforms, such as Instagram and TikTok, before investing in YouTube video content.

TikTok and Instagram and Facebook Reels are great opportunities for shorter video content, which is more feasible to produce as a small business with limited resources. TikTok has recently changed to allow videos up to 3 minutes, while Reels are restricted to 1 minute. These short-form, vertical videos are best suited to more casual content and are very people-centric, meaning these are not a good place for use of animated graphics or slideshow-type videos. Well-crafted content on these platforms has incredible opportunity for reaching new audiences for business visibility and sustainable building awareness, especially the more developed TikTok.

TikTok is the ideal platform for reaching new audiences but is less suitable for content that only targets existing audiences, such as introducing a new employee. TikTok is known for its algorithm of subcultures, meaning, for example, a user who has interacted with some sustainability content is highly likely to see more sustainability content on their home feed, known as the For You Page. The TikTok algorithm is also trend-oriented, so following trends is key to successfully reaching new audiences who are not already be engaging with green building content.

Unlike TikTok, it is difficult to reach new audiences on LinkedIn due to its algorithm and design for professional networking and development. However, that does not mean it is impossible! Although LinkedIn is not among the most frequently used platforms, it is the platform most people turn to for professional and educational content (DiNicola, 2022). Additionally, the platform discourse analysis shows that LinkedIn has the highest accuracy and helpfulness scores. Therefore, LinkedIn is ideal for industry or company updates that a wide audience would find useful or enjoyable and offers some type of professional development. In addition to professional networking and development, LinkedIn is also a popular job posting site. This makes the platform ideal for big company updates and for connecting with potential and existing clients, and potential employees.

The work is not over when a company successfully leverages user preferences for platforms and content type to formulate a strategy that works with platform algorithms. Once new audiences are reached, businesses must continue to engage its audience and foster collaboration within the virtual community.

Reach Existing Audiences – Connect and Create Loyalty

After reaching new audiences, the key is to keep your audience engaged by connecting with them and creating a loyal following. This breaks down into two key elements: optimizing content to work with the algorithms and measuring key performance indicators (KPIs) for social media analytics. Tailoring these elements to existing audiences enables businesses to build the trust that is vital to generating business sales and long-term growth via social media. Connection and trust are key to increasing public awareness of sustainable buildings, which in turn increases industry demand.

Utilizing the platform algorithms to work for a company, rather than against it, requires producing social media content that captivates and engages the audience, exemplified by the strategy from Hong Kong Green Building Council and Construction Industry Council (2016). There are many ways to do this, and the best way is ultimately decided by a company's unique audience. However, this report recommends several methods based on survey data, interview data, and general social media marketing principles.

- Ask questions – Encourage deeper thought and discussion among your audience. Participate in the discussion. Utilize comment sections, polls, feedback stickers for Stories, and encourage sharing content with peers.
- Engage with related industry content – Social media is a two-way street! Sustainability is a joint effort and requires collaboration to realize progress. This also helps with platform algorithms and reaching both new and existing audiences.
- Go with what works – If static graphics are most popular with existing audiences, then produce still graphic content. Do not continue to produce content that consistently performs poorly. At the same time, do not be afraid to experiment with new kinds of content! Measuring KPIs allows for analysis of what an audience does or does not respond well to.

- Diversify – Users are unlikely to follow a business on multiple platforms if the content is identical on each. Diversify content to work with each platform's audience and algorithm.
- Videos – It is recommended to include closed captions for all video content with spoken word. Not only is this beneficial for those on-the-go, but it is an important accommodation for people who are hard of hearing. Instagram, Facebook, and TikTok can generate closed captions automatically. Auto-generated captions should be proofread for accuracy before posting. Additionally, closed captioning can boost Search Engine Optimization, commonly referred to as SEO (Andrea, 2021).

It is always important to capture users quickly on all platforms, whether that is with an intriguing video title, a thought-provoking question in caption, or an educational graphic. How can a business ensure they are reaching their audience, capturing their attention, and promoting future growth on any platform? By measuring key performance indicators. KPIs are used to determine what is working and what is not working. If certain types of content are not working, the social media content strategy needs to be revised. This means that an existing audience is not being reached or captivated. In the context of increasing public awareness of the sustainable building industry, KPIs include likes, comments, shares, and followers. For videos, watch time is an important KPI, or else the audience may not be learning the information. Irrespective of effort put forward based on this study's recommendations, it is virtually a waste without tracking the success, failures, and lessons of a business' content on social media platforms.

Recommendations Summary

Given that the findings of this study are plentiful, their discussion is summarized below.

All Platforms

- Regardless of platform or age of target audience, all content should be engaging and enjoyable. Encourage discussion and collaboration, ask questions, and engage with others' content by commenting, liking, and sharing. This allows the platform algorithms to work for you, rather than against you.
- Companies should measure KPIs to assess social media accounts and content, noting successes, failures, and lessons that can be used to tailor strategy and support long term success.
- Social media platforms evolve and change rapidly. Strategy should be reassessed often to continually be leveraged in growing awareness and driving industry progress.
- Include closed captioning for all video content to allow users who are hard of hearing to engage with content. Closed captioning is also useful for people on-the-go and helps to boost SEO. Closed captioning increases overall engagement, which is favorable for platform algorithms.

Individual Platforms

- TikTok is a low risk, high reward platform with incredible potential for the short-form, casual videos to reach new audiences. It is currently most popular with those under forty but is a comparatively new platform, so this may change in coming years.
- Instagram is a primarily visual platform that is popular with younger audiences and some older audiences. Posts, stories, and Reels are all engaging to users. Instagram and Facebook Reels are in competition with TikTok, so the same or similar video content can be used to reach new audiences that primarily use Instagram and/or Facebook.
- Facebook is recommended for older audiences, which generally prefer written content. It is recommended to use Facebook to link to longer, in-depth articles. Users typically engage with content on their home feed and do not frequently interact with new accounts, as Reels are less popular on Facebook than Instagram.
- YouTube is recommended to reach audiences of any age using video content over 2 minutes. Videos should be educational and contribute to professional or personal development. Utilize low cost, high reward platforms for initial engagement and direct to YouTube for more in-depth learning.
- Twitter is popular within the construction and building industry, therefore the platform is recommended for intra-industry engagement using written content or still images. Videos are not recommended on the platform itself, but it is a good platform for links to external written or video content. It is not a popular platform for the public, regardless of age group.
- LinkedIn is recommended for educational and professional content that engages audiences of any age both within and outside of the sustainable building industry. Video is not recommended for this platform but could be used for linking to YouTube, if warranted.

VIII. Conclusions and Limitations

This study explores how social media can be leveraged to bridge the knowledge gap between sustainable building professionals and the public, with the overall goal of driving the proliferation of sustainable buildings through generating demand.

This study finds that YouTube is ideal for long-form educational video content. However, topics should be introduced via popular casual browsing platforms such as TikTok or Instagram and Facebook Reels. It is recognized that long-form content requires more resources to produce versus short-form, and therefore TikTok and Reels are a recommended starting point for video content. Instagram is more widely used across age groups than Facebook. However. now that the two are integrated under Meta, it is relatively easy to manage the two as one platform with additional tailoring to core audience age and preferences measured through KPIs. LinkedIn is recommended as the ideal platform for interindustry content that appeals to a wider audience. Alternatively, Twitter is best left for intra-industry content and discussion.

Regardless of the platform or content type, it is vital to distribute content that sparks the interest of new and existing audiences. Content should promote a two-way street of conversation and foster a sense of community. For this to be effective, a company needs to not only expect its audience to engage, but also actively engage with other users' content. In addition to contributing to the community discussion, this also helps in leveraging platform algorithms.

Future work to expand on this study includes a deeper dive into each individual platform, including long term discourse analyses conducted with new, blank user accounts and significantly broader surveys of each platform's users. Additionally, platform features and algorithms evolve often, so future studies should include similar reassessments of this study's findings.

This study is limited by several factors including survey language, response options, and resources for conducting platform discourse analyses. This survey is restricted to English speakers due to the native language of the survey author. Additionally, the survey responses have the possibility of skewed results due to the lack of ability for respondents to indicate they "do not use platform." However, most questions did not require answers which may have balanced this slightly if survey respondents discovered the ability to not answer. Regardless, the survey should be modified to remove this limitation. Lastly, the platform discourse analysis could be significantly improved by a long-term study that is automated, like the methods of Palmer & Udawatta (2019). This part of the study is limited by resources, including both time and technology.

The findings of this study have broad implications, leading to the recommendation that companies should start small and work within resource capabilities, while also considering which platforms are best suited to help achieve business goals. Regardless of the number of platforms initially pursued by a company, it is important to formulate marketing and social media content strategies that maximize the opportunity to reach both new and existing audiences.

The idea of using social media to raise awareness of an issue on a broad scale is not a new strategy. It is already successfully used by different sectors of the sustainability industry to achieve goals including raising climate change awareness, promoting sustainable consumer products, and encouraging acceptance and adoption of renewable energy technologies. Now, it is time for the sustainable building industry to take advantage of this invaluable tool. This study provides a starting point for companies in the industry to embark on the path of using social media, including why it should be used and recommendations for how content can be optimized to realize success. As we work together with a cohesive vision of a healthy environment and sustainable planet for all, social media is a free tool that must be leveraged to reach our envisioned future.

IX. Appendix A: Tables and Figures

Table 1: Interviewee Profiles

Identifier	Age Range	Interview Date	Initials
Interviewee #1	23-27	3/5/22	JG
Interviewee #2	23-27	3/6/22	AB
Interviewee #3	28-32	3/16/22	JH
Interviewee #4	40-49	3/17/22	HC
Interviewee #5	50-59	3/14/22	BC
Interviewee #6	60-69	3/20/22	PB

Table 2: Survey reach breakdown.

Platform	**Profile**	**Potential Reach**
Facebook	Personal Page	1,863
	Alabama Student Ticket Exchange	76,000
	Alpha Delta Pi Alumnae Group	23,300
	University of Arizona Online Group	1,000
Instagram	Personal Profile: Story	2,719
Twitter	Personal Profile	2,294
Microsoft Teams	BER Employees	18
GroupMe	Houndstooth Sports Bar Staff	19
Sum		**107,213**

Table 3: Competitor analysis results for count of followers/subscribers on platforms.[7]

Facebook	Twitter	LinkedIn	Instagram	YouTube
2,979	5,741	3,321	1,653	339
N/A	245	987	N/A	Unknown
6,911	1,768	935	601	448
436	1,397	751	351	N/A
450	2,011	151	N/A	39
2	144	33	197	N/A
205	N/A	N/A	N/A	N/A

[7] Companies have been omitted for confidentiality of private company that this competitor analysis was originally completed for.

Table 4: Platform discourse analysis rubric and results.

	Hashtag											
Platform	**#greenbuilding**	**Percent**	**#sustainablebuilding**	**Percent**	**#greenhome**	**Percent**	**#sustainablehome**	**Percent**	**#energyefficient**	**Percent**	**#energyefficiency**	**Percent**
Facebook												
# of Returns	19K		5.5K		15K		11K		23K		36K	
Accurate?	10 of 10	100%	10 of 10	100%	6 of 10	60%	5 of 10	50%	8 of 10	80%	9 of 10	90%
Helpful?	7 of 10	70%	9 of 10	90%	4 of 6	67%	5 of 5	100%	6 of 8	75%	9 of 9	100%
Instagram												
# of Returns	346,090		86,979		361,834		244,778		255,216		265,244	
Accurate?	10 of 10	100%	5 of 10	50%	1 of 10	10%	3 of 10	30%	9 of 10	90%	7 of 10	70%
Helpful?	4 of 10	40%	3 of 5	60%	1 of 1	100%	0 of 3	0%	7 of 9	78%	6 of 7	86%
LinkedIn												
# of Returns	N/A		N/A		N/A		N/A		N/A		N/A	
Accurate?	10 of 10	100%	10 of 10	100%	10 of 10	100%	9 of 10	90%	9 of 10	90%	10 of 10	100%
Helpful?	10 of 10	100%	8 of 10	80%	10 of 10	100%	7 of 9	78%	8 of 9	89%	10 of 10	100%
Twitter												
# of Returns	490		N/A		N/A		N/A		N/A		170	
Accurate?	9 of 10	90%	9 of 10	90%	9 of 10	90%	4 of 10	40%	9 of 10	90%	10 of 10	100%
Helpful?	9 of 9	100%	5 of 9	56%	9 of 9	100%	2 of 4	50%	9 of 9	100%	7 of 10 (3 repeats)	70%
YouTube												
# of Returns	1.6K		208		628		197		1K		2.8K	
Accurate?	10 of 10	100%	10 of 10	100%	5 of 10	50%	10 of 10	100%	10 of 10	100%	10 of 10	100%
Helpful?	10 of 10	100%	10 of 10	100%	5 of 5	100%	10 of 10	100%	10 of 10	100%	10 of 10	100%
TikTok												
# of Returns	10.9M		8.4M		9.4M		14.4M		6.7M		2.2M	
Accurate?	10 of 10	100%	10 of 10	100%	3 of 10	30%	3 of 10	30%	8 of 10	80%	8 of 10	80%
Helpful?	9 of 10 (1 repeat)	90%	10 of 10	100%	2 out 3	67%	3 of 3	100%	5 of 8	63%	6 of 8	75%

Figure 11: Video length preferred on Instagram, from survey.

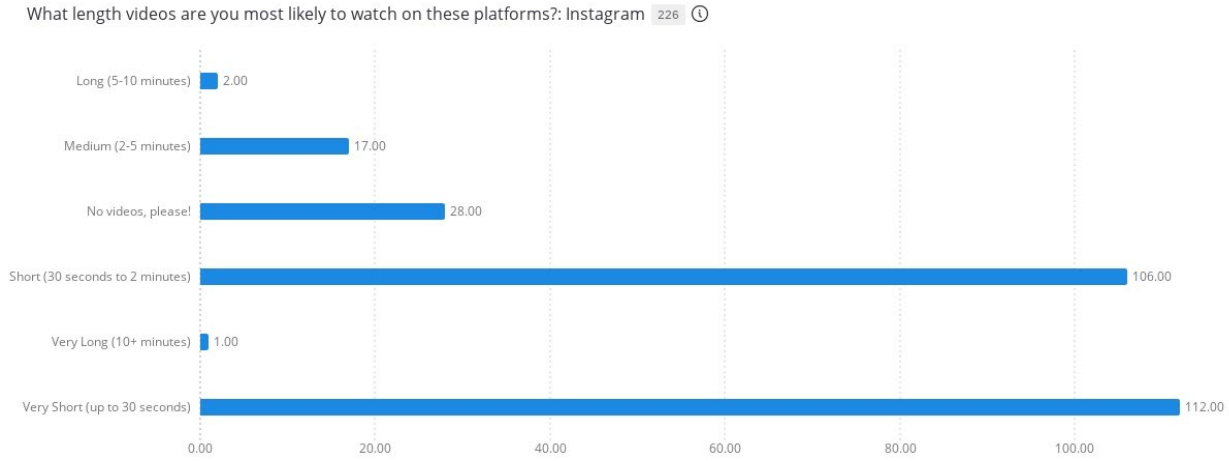


Figure 12: Video length preferred on Twitter, from survey.

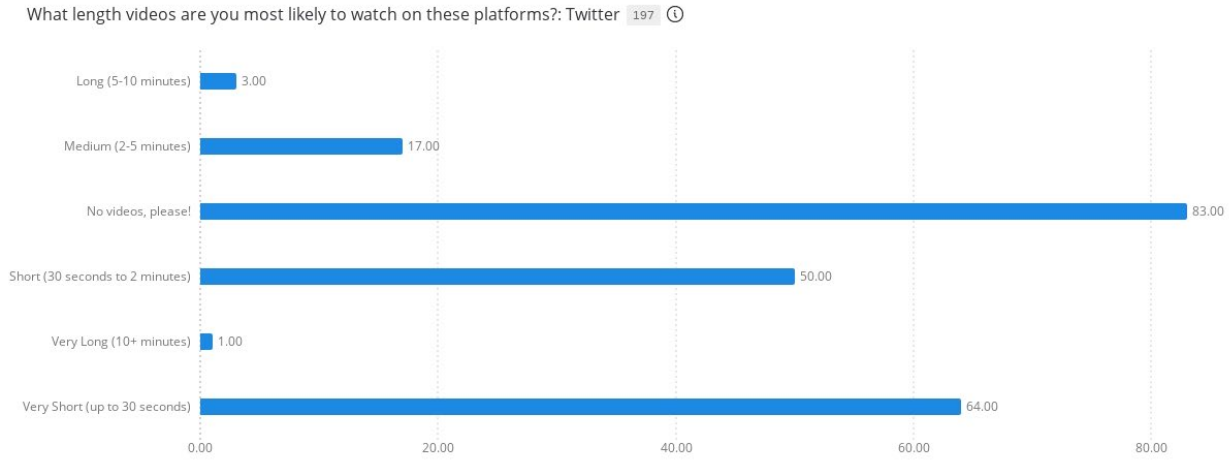


Figure 13: Video length preferred on LinkedIn, from survey.

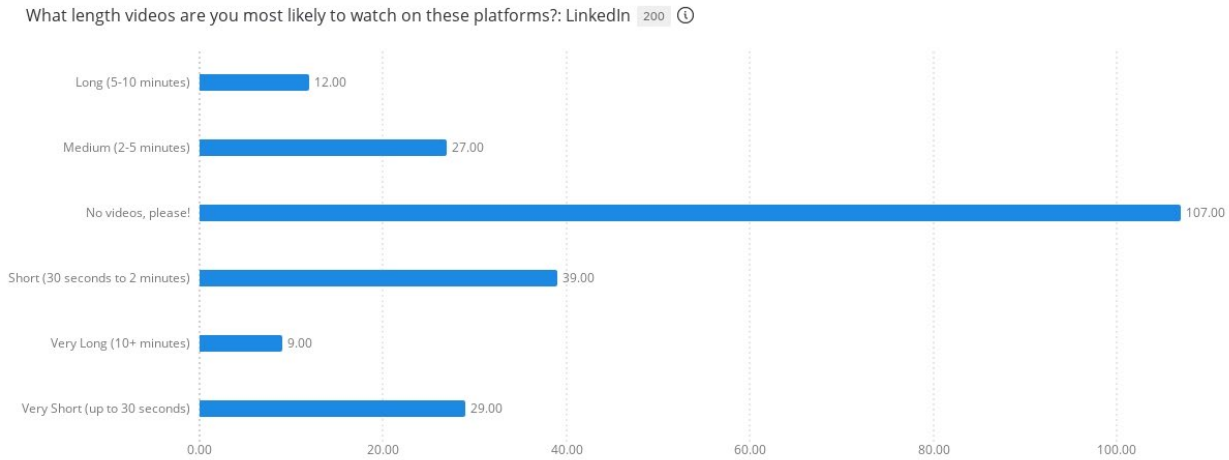


Figure 14: Video length preferred on TikTok, from survey.

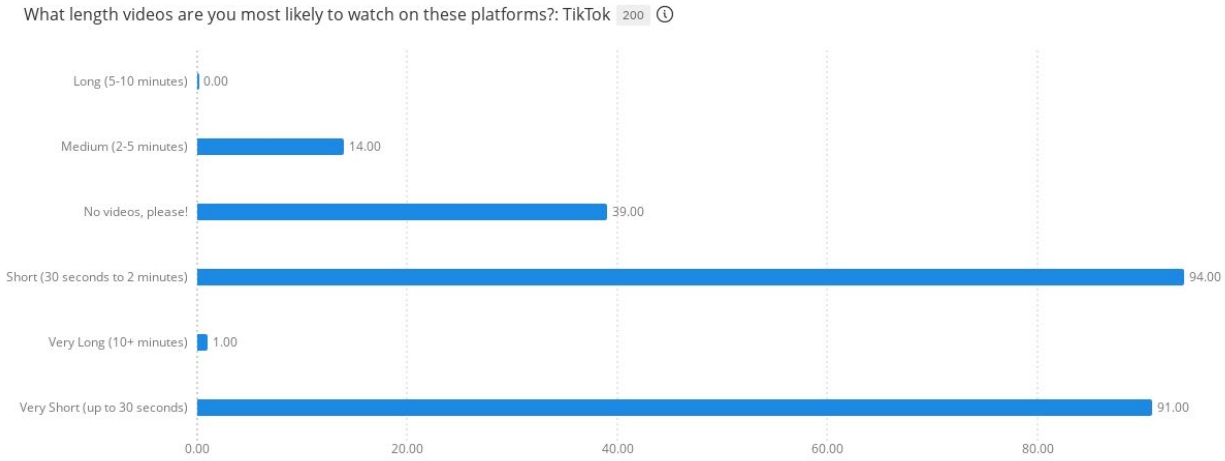


Figure 15: Video length preferred on Facebook, from survey.

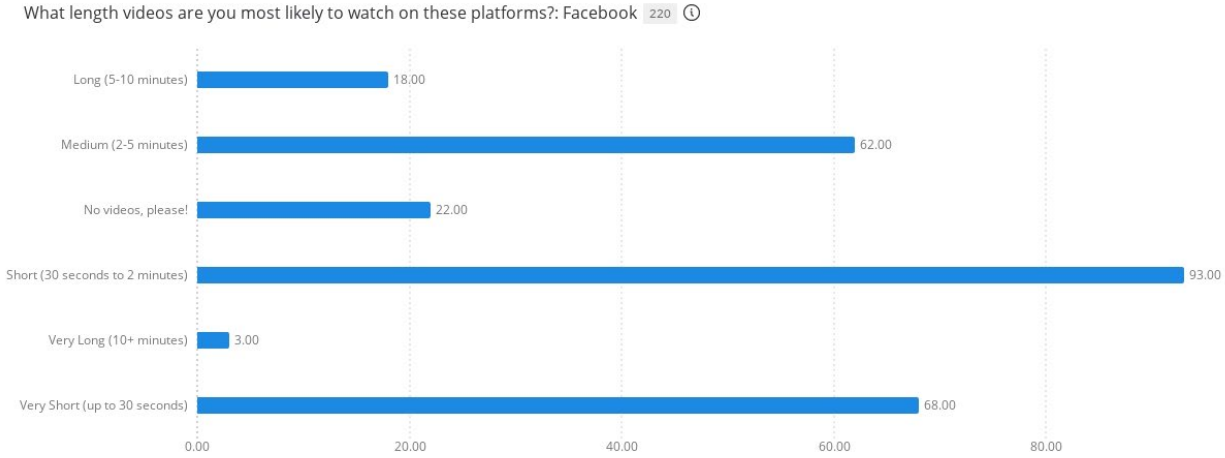
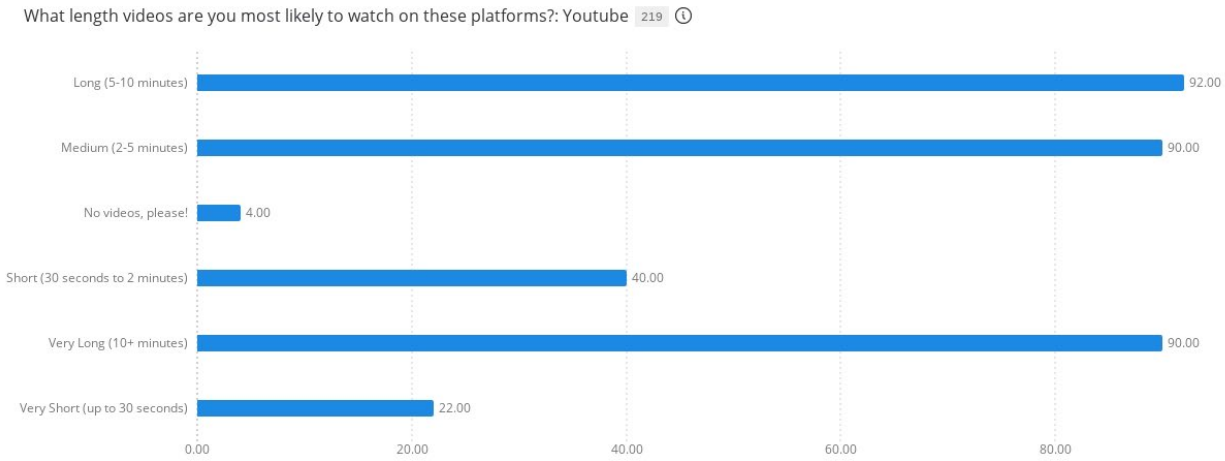


Figure 16: Video length preferred on YouTube, from survey.



X. Appendix B: Research Design and Methods

Survey Questions: Social Media Use and Perceptions
Link: https://uarizona.co1.qualtrics.com/jfe/form/SV_8IeN1WBplMGNKzc

1. Please select your age range.
2. In general, how many hours do you spend on social media platforms in total per week?
3. Please rank these social media platforms from most utilized (1) to least utilized (6).
4. What is your perceived content purpose for each of these platforms?
5. Which platform are you most likely to visit for professional development/educational content?
6. Which features of Instagram do you utilize most for viewing others' content?
7. Which features of Facebook do you utilize most for viewing others' content?
8. What length videos are you most likely to watch on these platforms?
9. How often do you explore or interact with new (not already following) accounts on these platforms?
10. If you would be willing to have a short interview with me to answer more detailed questions on your social media use and preferences, please include your first name and email.

Interview Questions[8]

1. Please describe your familiarity with sustainable or green buildings and their benefits.
    a. Where have you encountered sustainable buildings?
    b. What makes you think about sustainable buildings?
    c. What sustainable aspects capture your attention?
2. Do you encounter these things on social media?
    a. Which platforms?
    b. How often?
3. Do you have an interest in learning more about green buildings on any level?
    a. Why or why not?
4. If yes, would social media be a place you would seek out learning more about green buildings?
    a. Why or why not?
    b. If yes, which platforms?
5. Please describe the kind of content on social media that draws you in and catches your attention.
    a. What are you most likely to stop and interact with?

[8] These questions are a framework for the interview. Additional questions may have been asked depending on interviewee answers.

Platform Discourse Analysis Process

1. Clear browser cache and platform search history.
2. Search the first hashtag, #greenbuilding, on the platform. For this study, Facebook was the first analyzed platform.
3. If provided by platform, record number of returns. Record title for number of returns i.e., Posts, views, videos, etc. This varies by platform.
4. Analyze the first ten returns for this hashtag based on two qualities:
    a. Is it accurate to the searched hashtag? (Is the hashtag used appropriately by creator?)
    b. If it is accurate, is it also helpful? Can anyone, layperson to industry professional, learn something useful from the post?
5. Record this data out of total.
    a. Accuracy receives a score out of ten.
    b. Helpfulness receives a score out of number of accurate posts. This varies.
6. Make any notes that may be useful in end analysis or report recommendations.
7. Repeat for remaining five hashtags, clearing search history prior to each new hashtag search.
8. Clear browser cache.
9. Repeat for each of the other five platforms, clearing platform search history prior to beginning analysis.
10. Convert fractions into percentages. Record both.
11. Color code accuracy and helpfulness scores based on the following.
    a. Green = Both accuracy and helpfulness are between 70% and 100%
    b. Yellow = Either accuracy or helpfulness is between 50% and 70%
    c. Orange = Either accuracy or helpfulness is below 50%

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