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Green cost premium as the dynamics of project management practice: A critical review

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A B S T R A C T

Across the globe, the corollary of Green Cost Premium (GCP) obstructs the implementation of Sustainable Buildings (SB). Extensive studies into GCP proliferate, but the research norms rarely traversed theoretical contexts of GCP. The purpose of this paper was to explore the drivers of GCP from the contexts of the prevailing practice of SB using the theoretical lens of practice theory. Secondary literature comprising mainly peer-reviewed publications spanning 20years was critically reviewed. The results show some uncertainty regarding the effect of prevailing practice on the size of GCP due to the dearth of empirical studies. Secondary literature, however, showed that GCP is liable to variations in practice related to the level of knowledge and the implementation processes. The knowledge domain argued that the scope of GCP depends on regional issues including misperceptions, cost management deficiencies and sustainability accounting gaps. During implementation, GCP could also modify in response to changes in cost drivers, factors limiting innovative processes and challenges and barriers in the project environment. Engagements with practice have, however failed to embed this understanding into SB project implementation decisions and dynamics, as limited documented efforts aimed at mitigating the GCP exist. The paper offers a non-conventional perspective for assessing the dynamics of converging regional practices in SB that can contribute to GCP as well as lower the GCP when the practices are improved. GCP is susceptible to practice variations and answers to projects practices across regions. This portrays that the GCP can lessen through innovation of practice elements such as competencies and inputs (materials and procedures). The elements of scientific inquiry for GCP must be disconnected from currently established knowledge about SB systems to regional practices related to knowledge and procedures.

1. Introduction

Sustainable Construction (SC) and Sustainable Buildings (SB) are embedded interpretations of multi-sector sustainable development goals in the construction industry (Berardi, 2013; Schweber, 2013). SC depicts the establishment and accountable administration of a healthy constructed environment using practices that promote resource efficiency with minimal environmental impacts (Kibert, 2013). The off-shoot, SB, refers to the project development 'practices' that create high-performing structures through resource-efficient and ecological principles (Berardi., 2013). The emphasis on 'practice' is to unbundle the fundamental misreading in relative terms used in the literature (Berardi, 2013). Products of SC are branded

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differently, including green building, 'passive buildings' and 'energy-efficient buildings' (Pan & Gramston, 2012), with net-zero energy buildings (nZEB) also gaining prominence (Nduka *et al*., 2019; Sustainable Building Market Study [SBMS], 2019) across the world. The use of these terms portrays two important but interrelated viewpoints that are explicitly comprehensive and constricted. The constricted view pursues environmental sustainability, measured from the performance of the product (e.g., green building and nZEB). The comprehensive view (SB), seeks to optimise the holistic triple bottom-lines of economic, environmental and social sustainability. SB, therefore, broadens the goals of green building, nZEB and passive buildings to include the sustainability of the building development practices or processes (Zhang *et al.,* 2017).

The response towards SB, in its early stage, received twisted misreading as a call to marginalised development than the need to limit unsuitable development practices (Halliday, 2008). Current and projected growth in SB uptake across the globe may have changed the narrative (SBMS, 2019), but the uptake of SB is still voluntary and slow (Park *et al.,* 2017; Nduka *et al*., 2019). The causes of slow uptake have extensively discoursed locally and internationally (Nduka *et al.,* 2019; Abidin & Azzizi, 2016; SBMS, 2019). However, the Green Cost Premium (GCP) (Darko *et al.,* 2017; Darko *et al*., 2020; Adabre *et al*., 2020) and lack of pertinent policies to achieve cost economy during construction overarch (Wang *et al.,* 2018). Amidst these focal admittances, limited studies isolate the GCP for inclusive analysis to unravel why it exists, to at best, position pertinent knowledge about their attributes. Cost management studies in this area have focally investigated and reported the cost performance of projects in terms of their GCPs (Rehm *et al.,* 2013; Hoffman, 2016; Hwang *et al.,* 2017). The dearth of structured understanding of the factors driving the GCP structure remains an impediment to the development of cost reduction strategies (Darko *et al.,* 2017). Even though the operative understanding of SB has improved over time, simplicity of cost certainty and investment viability are faced by the dearth of 'hard evidence' (SBMS, 2019). The relationship between cost uncertainty and the perceived GCP has also remained fixed actively (World Green Building Trend [WGBT], 2018).

The term GCP is a premium invested to achieve social, economic and environmental benefits over the project's lifecycle (Ekung *et al.,* 2021a). The estimate of GCP and the understanding of sustainability practice vary along with regional settings (Boyd & Schweber, 2012). GCP inhibits uptake (Shi *et al*., 2016) and extends the investment payback period (Bevan and Lu, 2013). This study explored the dimensions of GCP in order to provide a structured understanding of its attributes and drivers towards assisting the industry to develop cost reduction strategies. The aim of the study was to appraise practices contextualised to the global project environment that can influence the GCP and to render a theoretical explanation of these elements using the theory of practice. The Practice Theory (PT) has various perspectives, this paper drew on two contexts, integration and practice by doing to posit that GCP is not contiguous with the SB system, but separate and dependent on knowledge and their production practices (King *et al.,* 2014). The objective of the study was to review whether improving cost misconceptions (knowledge) and cost factors (practices) would reduce GCP. Bridging this literature gap is imperative to promote the adoption of SB (SBMS, 2019) and sustainable development goals in the building sector (Adabre *et al.,* 2020). Hu and Skibniewski (2021) asserted that the cost of SB deserved further studies in view of the attendant higher cost, risks, uncertainties and cost overrun.

2. Literature Review

2.1 Sustainable building

Until late 2007, when arguments that separate green buildings from SB became a front-end issue, the term SB was not very popular (Essa *et al.,* 2007). The earlier conception about related practices focused on environmental sustainability (green buildings). Until today, the term SB remains difficult to define in absolute terms among industry experts and academia. The overarching understanding of SB is implicit in the integration of sustainability (economic, environmental and social) objectives (Berardi, 2013; SBMS, 2019). SB therefore, constitute part of the comprehensive natural environment, which are dependent on the socio-technical and the economic components of the society (Choi, 2009). This viewpoint proposes that practices targeted at improving the building must likewise take into account the consequences of their actions in the environment. Documentations about the impacts of building on the locals and the environment thrive (Pitt *et al.*, 2009), and the effects of building in the society spread to persons that live outside a named building (Choi, 2009). Building processes use natural resources, create wastes and their contributions to climate change are seminal (Berardi, 2013; Schweber, 2013). SB, therefore, seeks to optimize resource efficiency and ecological friendliness in the creation and administration of a healthy constructed environment (Kibert, 2013). The benefits of SB include 'higher occupancy rate, higher market value, lower risks and cost-savings from improved energy and water efficiency (Isa *et al*., 2013). Other benefits are reduced 'health and safety costs and workers' productivity' (Olanikpekun *et al.,* 2016). However, the concern for the environment underpins the growing response in the uptake of SB across the global construction industry domains (Olaleye *et al.,* 2015).

2.2 Practice theory

Developed with foundations in philosophy and sociology, practice theory has gained relevance in sustainable construction research (O'Keffe *et al.,* 2014, King *et al.,* 2014; Kokkonen & Alin, 2015; Hampton & Adams, 2018). Fundamentally, the theory analyses practice against overarching dependence on individuals. The emphasis is on the interaction between social activities as the assemblage of expansive networks between different elements in a defined setting (Reckwitz, 2002). Two premises broadly defined in sustainable consumption literature are (1) practice results from repeated interaction between 'saying and doing' and (2) practice is demonstrating doing (Nicolini, 2013). Both perspectives are contingent on ontology (Cox, 2012). The ontology of practice revealed that the understanding of a concept is co-created using a broad range of continuously modified relationships in organised settings. However, the degree of recreating and disseminating the recreated knowledge relating to a concept is dependent on the degree of interaction amongst the system's elements and the extent of innovation implemented (O'Keffe *et al.,* 2014). The term practice refers to the sum of structures that aid the performance of a task as well as those enabling the task performance on a routine basis (Gram-Hassen, 2014). However, a practice portrays the meaning assigned by the practitioners in each context only (Gram-Hassen e*t al.*, 2016).

The elements of practice differ in sustainability literature (Shove *et al*., 2012; Gram-Hassen, 2014). Shove *et al*. (2012) demonstrated that practice has three basic elements, namely: materials, competencies and as perceived. The third rendering, despite portraying the dearth of concrete construct, is, however, the most relevant context for defining cost-related discussions in SB. It is important to note that despite providing the platform upon which practice is implemented, practice constitutes the sets of rules and structures enabling the implementation rules. Acting from the dearth of practical naming of practice elements, Gram-Hassen (2014) reviewed four elements supporting practice, namely: in-built habits, established knowledge, engagement and technologies. In scaling the trajectory of practice to explain varying GCP in SB, the study builds on the established structures to characterise the dynamics of practice.

3. Research Methodology

The research adopted a refined systematic but critical review approach. The approach embraced gathering, synthesis and integration of secondary data related to the domain of interests using logical processes (Danwitz, 2017). The objective was to unveil the main themes and key findings in the area of study. The study progressed using deductive-convergent methods implemented in four stages: data scoping, gathering, screening and synthesis (Danwitz, 2017). During scoping, the study identified pertinent information on the cost of SB. This data collection stage involved gathering the bibliographic information from prominent databases maintained by ScienceDirect, Emerald Insight, Inderscience, MPDI and Google using pre-established search words. The search words include SB, costs of SB, costs factors in SB and others aligning to the topic and keywords. Initial screening was conducted to streamline the list of several hundreds of bibliographic information into specific SB-cost materials. Further preliminary screening was to range the materials to the period 2000 – 2020. During bibliographic screening, downloads were reviewed for relevance to subject matter and thoroughly checked for cost contents in their assumptions and reviews. Eighty-three secondary literature was reviewed in the study. The attributes of the data used in the study showed that high-impact publications emerged significantly between 2010 - 2020 and very few from 2000-2010. Theoretical structuration of the research assumptions is likewise sketchy until late 2010. Theoretical traversing within the literature on costs of SB is likewise sketchy. The engagement with Practice Theory (PT) developed mainly from energy efficiency studies (King *et al.,* 2014; O'Keffe *et al.,* 2014; Kokkonen & Alin, 2015; Gram-Hassen, 2014; Gram-Hassen *et al.,* 2016). The grouping of the publications, which meet the relevant criteria for the study, include journals, institutional reports, textbooks and conference papers in the proportions shown in Fig. 1. However, the proportions of high impact journal papers and other peer-reviewed conference publications in the study (being 86.75%) are adequate to rationalise the quality of the publications underpinning the findings in this research.

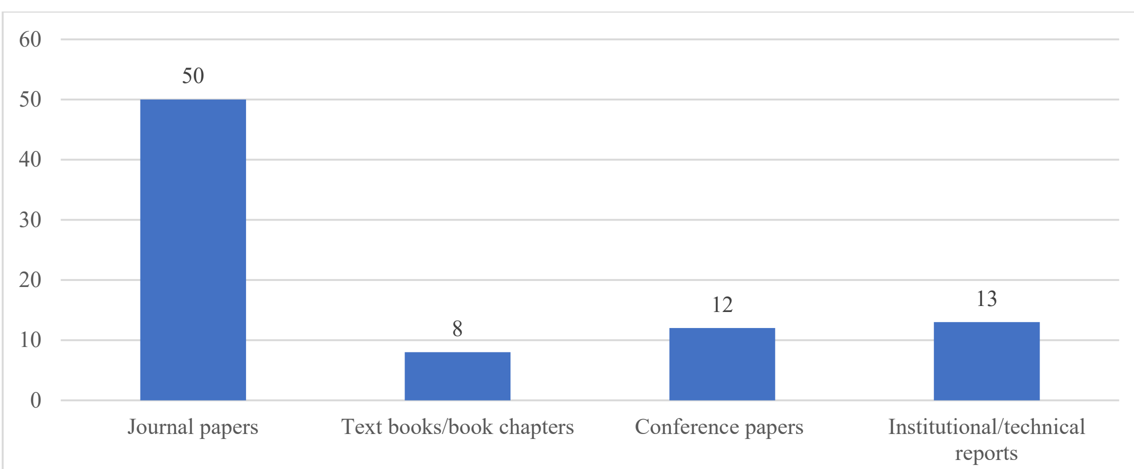

Fig. 1. Classification of literature reviewed

In the journal category, 90% (i.e., 45) out of 50 journal papers are indexed in the Scopus database. By publishers, the number of journal research papers extracted is heterogeneous among key publishers such as Elsevier, Emerald and Taylor and Francis. The number of papers extracted from these databases constituted 62% of the total number of papers in the study. Eight percent of each of the papers was published by Sage and Inderscience, while Springer had only 2% of the papers.

Overall, the distribution of the paper used in the study shows a strong penchant towards high impact journals, as noted by the database, over 90% of the papers are rated journal publications.

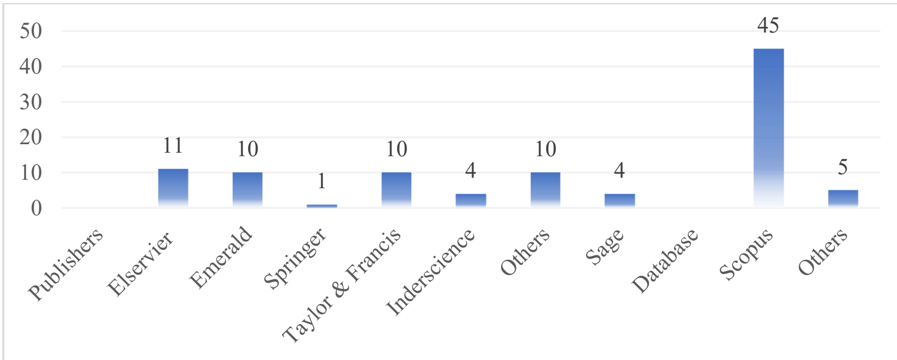

Fig. 2. Distribution of journal papers by publishers and database

Despite using a frame of reference of pertinent keywords in the literature search as previously stated, the spectrum of literature with framings that conforms to practice and costs used in the study is presented in Fig. 3. The data in Fig. 3 shows varying spectrum practice-related subjects including barriers, factors, learning, knowledge among others.

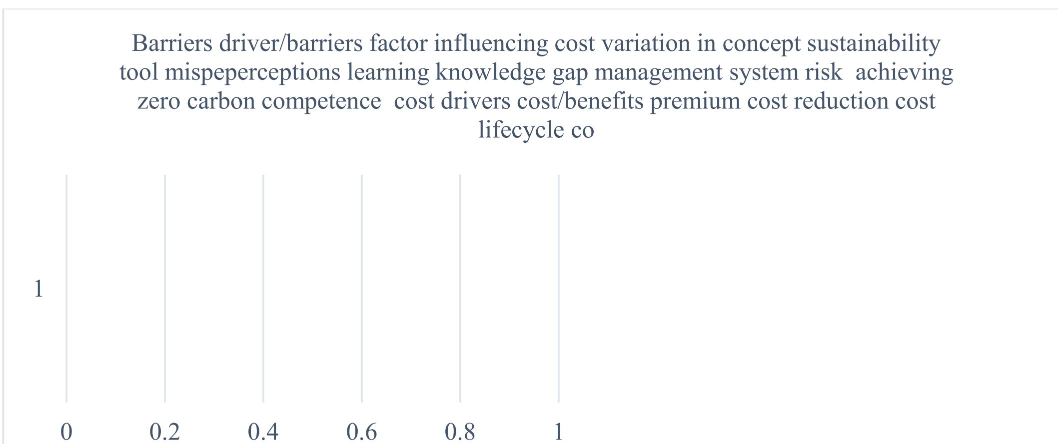

Fig. 3. Mapping of keywords that defines the literature scope in the study

3.1 Conceptual framework

Developing from the premise of PT, the study presents a relationship map (framework) for SB practices' trajectory to GCP (Fig. 4). The theoretical grounding of the relationship in Figure 4 develops from the standpoint, which states that the costs of SB are dependent on inherent practice involved in their production. In the literature, the GCP is disproportionate across regions, overstated, remains a complex phenomenon with both perceptual problems and econometric dimensions (Callaghan, 2014; Tierney and Tennant, 2015; Ekung *et al.,* 2021b). The philosophy of the framework reinforces that the fundamental strategy to improve cost information in SB lies in embedding a proper understanding of the role of inefficient practices contributing to GCP. Past studies have failed to provide adequate exposition on why GCP exists beyond the controversial penchant for luxury sustainable features. A recent study asserts that luxury sustainable features alone cannot account for GCP as a number of projects achieved greenness without these features (Ekung *et al.,* 2021a). Even projects without luxury also achieved greenness with varying GCPs. Fig. 4 indicates that GCP is susceptible to inefficiencies in practice within the project environment. By the hypothesised relationship, the true GCP is the extra-cost emerging from the project achieved without the negative influences of the practice elements. Until the baselines of the practice elements are empirically improved, the factual GCP remains inclusively a misperception bias. Therefore, cost studies must define the baselines to factual GCP by unravelling their cost mechanics. This study, therefore, adopts the following propositions for further investigations:

(1) the practice of SB in different regions varies,
(2) different practice produces varying GCP,
(3) the GCP also vary within a practice,

(4) variability shows certain regions have improved processes than others, and
(5) practices can be innovated to achieve better cost performance (reduced GCP).

In the following sections, these dimensions are explored to explain how each may contribute to the hypothetic relationship between practice and GCP using the PT.

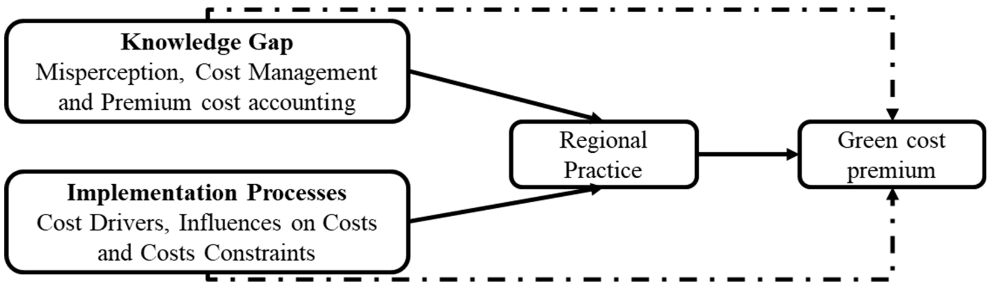

Fig. 4. Conceptual framework of the relationship between GCP and SB practice-elements

4. Findings

4.1 Green cost premium (GCP)

GCP is the extra expenditure expended to procure social, economic and environmental sustainability over the projects' lifecycle (Ekung *et al.,* 2021a). The United States General Services Administration (GSA) pioneered inquiry into the economic implications of GB in 2002 (GSA, 2004; Mapp *et al*., 2011). The earlier studies showed that GCP had a direct relationship with the level of certification targeted (Kats *et al*., 2003). Kats *et al*. (2003) reported a GCP of 2% per square foot. New college buildings in the US attracted £50/m^2 extra funding (Dobson *et al*., 2013). Less than 5% extra funding can achieve a 1-4-Star energy efficiency rating in Nigeria (Ekung *et al.,* 2021a). The premium is 5% in Singaporean experience (Hwang *et al*., 2017), but could grow to 9.37% in India (Vgas and Jha, 2018), 10-20% in other places in Nigeria (WGBT, 2018; Ekung *et al*., 2021a). On the contrary, the SB project is possible without extra funding (Hydes & Creech, 2000; Ding, 2008; Häkkinen and Belloni, 2011; Ekung *et al.,* 2021a). One-Star energy efficiency rating produced cost-savings amounting to $0.86/Square metre in Nigeria (Ekung *et al.,* 2021a), while most SB features are available at no extra costs (Halliday, 2008). The information about the costs of SB summarises one seminal viewpoint that tends to dominate research and practice, that is, SBs have varying premiums. Although this perspective is valid, the view, however, reinforces the need for increased research in order to develop the sources of variability empirically (Gluch *et al*., 2013).

4.2 Dynamics of Practice as allies of GCP

4.2.1 Knowledge gaps

The paper in the previous sections postulated that regional dynamics notably, the level of knowledge and processes that deliver SB are contingent factors that determine the scope of GCP. Three dimensions could explain the knowledge contexts: misperception, cost management and sustainability accounting gaps.

4.2.1.1 Misperception gap

This proposition argues that the GCP of SB is vastly misconceived (Dobson e*t al.,* 2013; Ekung *et al.,* 2021c), but factually, a mere 'psychological and social apparitions' (Hoffman and Henn, 2008). The true GCP in SB is precisely capital expenditure (Hwang *et al*., 2017; Darko *et al.,* 2020), but this is misread as the first-costs (Ekung *et al.,* 2021c). The GCP in most regions is either exaggerated or faces uncertainty and information asymmetry (Bevan and Lu, 2013). In developing countries, the dearth of practical SB projects is seminal and knowledge of GCP is based on literature guidance (Ekung, 2019). In other parts of the globe, the survey of experienced and non-experienced SB designers showed that both groups estimated the GCP within the same margin [18-25%] (WGBC, 2016); this shows an imminent knowledge gap in the two groups. Knowledge requirements in SB are a prerequisite to developing the expertise that promotes a healthy environment (Ekung *et al.,* 2019). The knowledge in this context pertains to the fundamental understanding of key concepts and practices that delivers SB. The knowledge gap is therefore an erroneous conception of the true practice and information about SB.

In abeyance to these paraded misperceptions, the factual position shows the true GCP in an effectively managed project scenario is below the exaggerated benchmarks or averagely of 1-5% (Matthiessen and Morris, 2005; Mapp *et al*., 2011; Ekung *et al.,* 2021a). Table 1 shows that the overall cost of SB is lower than comparable conventional buildings in three Scottish case studies (Halliday, 2008). Overall, there is no statistical inference to support the claim that highly rated SB is actually more expensive (Morris and Matthiessen, 2005; Matipa, 2008). GCP greater than 5% are correlated with elements such as photovoltaic or geothermal heat pumps (Halliday, 2008; Gilmour *et al*., 2013). Luxury features are not mandatory for sustainability certifications across the globe; therefore, SB are achievable without these features. In unravelling the causes of cost misperceptions, Ekung *et al*. (2021c) mainstreamed numerous factors including reliance on exemplary project cost data, the uncertainty of cost data, lack of knowledge and low awareness. Based on the prevalence of these factors and their effects in shaping stakeholders' perceptions, disentangling these variables would produce a clear understanding of the true GCP. Moreover, certain that the GCP exists, prioritising the benefits of SB against their costs shows that value for money is not limited to cost economy; this is a concern for perception management.

Table 1
Comparing per m^2 costs of sustainable/conventional buildings

Projects	SB	CB
McLaren Community Leisure Facility, Callander, Glasgow	£875/m2	£1350/m2
Toll House Garden, Perth, Scotland, completed in 2004	£780/m2	£780/m2
Glencoe Visitor Management Centre	£980/m2	£1450/m2

Source: Halliday (2008)

4.2.1.2 Cost management gap

The dimensions of cost management issues in the GCP debate are multi-perspectives. First, estimating the GCP requires enormous data from intra and inter-project perspectives, which are inadequate in the current practice (Matipa, 2008). Second, developing the true knowledge of the GCP also demands expertise in cost management, which knowledge is a growing concern in different settings (Pearce, 2008). Third, skills related to the holistic cost management of SB are missing among many cost managers and requisite data are likewise difficult to obtain (Ahn *et al*., 2013). Fourth, method-wise, cost estimating practice in SB is based on traditional approaches inclined to labour and material costs (Hu and Skibniewski, 2021), which factual practice demands a significant departure from the traditional norms. Fifth, the data needed in GCP estimating are termed 'hard data' but are not available (SBMS, 2019).

The supply of hard data across the globe is inadequate to answer the proof imperative for beneficial investment decisions in SB (WGBT, 2018). Hard data have intra and inter-project contexts, but prevalent data across projects are intra-project (Matipa, 2008), one-dimensional and unsuitable to transfer learning. Comprehensive cost management of SB, therefore, requires hard data for GCP forecasting and control of the total cost of ownership (lifecycle costs). The dearth of requisite data, therefore, suggests the scope of GCP would increase due to poor discounting of benefits (Bilec *et al.,* 2007). The true costs of SB emerged from the trade-off between costs and benefits. However, the methodological gap in quantifying the benefits of SB is a seminal problem that requires robust data modelling to overcome (Ries e*t al*., 2007; Hu and Skibniewski, 2021). Again, since some basic assumptions are vital tools for tunnelling estimates, wrong assumptions such as inputting low-cost materials/equipment will lead to eventual high lifecycle costs. On the other hand, high-end materials/equipment, on the contrary, yields low lifecycle costs (Pearce, 2008).

In addition, existing cost information emerged from showcase projects (exemplar) that enlist high-end materials and equipment with superflux budgets (Syphers *et al*., 2003; Kats *et al.,* 2003). Adopting GCP benchmarks from exemplary projects to estimate future projects without screening would produce unreliable estimates. The late inclusion of sustainability goals also attracts higher GCP due to planning and project management problems (scope changes) during project execution (Choi, 2009), as well as high risks and uncertainties (Hu and Skibniewski, 2021). High risks influence cost management decisions negatively by introducing inappropriate risk governance (Guan *et al.,* 2020), which traditional cost estimating approaches cannot address (Hu and Skibniewski, 2021).

In response, cost managers often allow baseless contingencies for unknown risks and this practice incidentally contributes to high GCP. These features and the use of traditional cost management models collectively inhibit the opportunities to extrapolate the exact costs of SB and instruct the overstatement of their GCPs. New approaches are developing using parametric costing and intelligent modelling to bridge methodological issues in cost management of SB projects (Hu and Skibniewski, 2021), but stakeholders must grow practical SB implementation to meet the enormous learning and hard data needs in the emerging frontier. Nevertheless, exponents of cost management are critical practices with strong regional variability, which attributes can influence the GCP.

4.2.1.3 Sustainability cost accounting gap

Sustainability practices pursue multiple objectives and the benefits of SB are social, economic and environmental. Therefore, achieving the three dimensions simultaneously within a project adds to GCP. The traditional sustainability cost accounting approach consists of developing separate estimates for SB and comparative CB to determine their costs differential. Even though this practice is prevalent (Kat e*t al*., 2003; Mapp *et al*., 2011; Dobson *et al*., 2013), it does not account for the varying design practices between SB and CB (Hu and Skibniewski, 2021). The practice equally accounts for the cost only, but is silent on financial benefits and risks associated with SB. The cost-benefits quantification imbalance has created enormous problems to the marketability of SB (Choi, 2009). Choi (2009) therefore predicted that until sustainability budgeting and accounting issues are resolved, the reduction in GCP would remain a sketchpad. Little is also known about economic sustainability accounting in research, pertinent studies tend to narrow sustainability costing to environmental accounting (Sesana & Salvalai, 2013). This gap calls for a re-constructed approach to account for sustainability objectives in financial terms in order to reduce the GCP. The statement of costs should therefore include discrete financial costs of aggregated social, economic and environmental gains. This is the most appropriate context to characterise the GCP and not the isolated inclination to construction costs only. This paper notes that an extensive refinement and application of the life cycle assessment tool is a right-thinking in this direction (Dwaikat & Ali, 2016). However, the appropriate understanding of the GCP must address its value-laden context between human and natural law proclivities (Wang *et al*., 2015). The inability to understand these contexts escalate the penchant for traditional costing models (Dobson *et al.,* 2013). The prevalence of the traditional costing models does not, therefore, infer they are adequate to account for sustainability costs (Matipa, 2008); rather, they propel misconceptions (Dobson *et al*., 2013). Costing models that incorporate comprehensive sustainability dimensions and their benefits in cost analysis would also ensure the affordability of sustainable housing (Adabre *et al.,* 2020).

The fundamental sustainability accounting gap contributing to GCP deals with know-how on how to put costs to the benefits of social, economic and environmental benefits in financial terms. Even though economic and environmental perspectives overarch, metrics for measuring these dimensions as well as their cost implications vary along with regional contexts. The cost implications of each objective adapted to design and their extensive impacts on life cycle costs are not fairly identified (Pearce, 2008). Regions with experienced professionals tend to achieve a cost economy than other regions with less developed skills (Syphers *et al.,* 2003). Limited opportunities also exist to trade-off the first cost drivers such as charrettes used in integrated design practices (Pearce, 2008). Moreover, SB has developed into systems that are largely implemented using system approach and their costs must also develop as system costs. A system has integrated components that are difficult to isolate into units as can be done in traditional projects. Failure to recognise the GCP as a system cost (whole life costs) suggests bias. The application of traditional costing models lacks decision-making tools to compare products with related benefits and sustainability values. For instance, a high-value sustainable product with higher benefits and long life would appear more expensive during construction (Pearce, 2008), but traditional costing only considers short-term benefits (cost of construction). Other assessment tools focus on product performance and cannot account for the costs of the input processes and their benefits (Bilec *et al*., 2007; Kats, 2008). Putting costs to sustainability objectives portrays the accounting systems would vary correspondence to regional practice.

4.2.2 Implementation processes

One of the most important questions about the GCP that remains unanswered is the probe to unravel whether or not it is contingent on sustainability features incorporated in designs. Even though sketchy discourse is available (Ekung *et al.,* 2021c), the debate remains vastly inconclusive in focal cost management literature. Facts however exist in support of both positions, while varying reasons underpin each side of the arguments. The PT has however unsettled the misunderstanding and provided factual direction to the drivers of extra costs in SB. According to PT, GCP is contingent on the interaction between practices associated with building processes, its stakeholder and the environment. Factors grouping relating to practice contexts, therefore, varies but three dimensions are isolated for engagement in this paper as seen in Fig. 5.

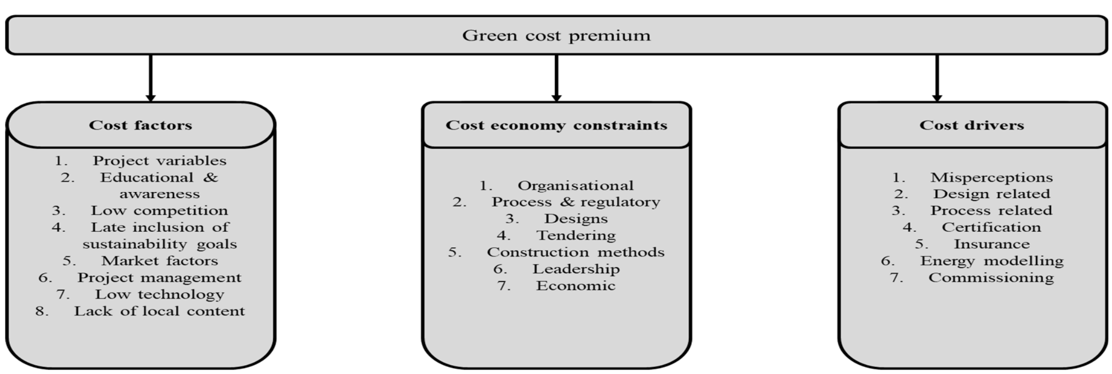

Fig. 5. Summary of practice contexts to high costs of sustainable buildings

4.2.2.1 Cost drivers

Braun (2009) defined the cost driver as any factor that roots a change in the cost of an activity. The classification of cost drivers in SB varies along with regional practices. The Malaysia case studies revealed three categories: soft costs, hard costs and land cost (Abidin & Azizi, 2016). The perceptions of cost management scholars differ on the composition of each dimension, but the pertinent concern is the difference between hard and soft costs. The burden of GCP is principally a product of soft costs (Yudelson, 2009). The elements of soft costs include design fees, management fees, legal fees, taxes, insurance, owner's administration costs and varieties of finance charges (Abidin & Azizi, 2016). Soft costs are the cost of professional services in planning design and management of the projects (Transportation Research Board of Malaysia, 2010). Cartlidge (2018) attributed the GCP to design fees and the estimates vary between 8–12% (Means, 2011). Certification involves the determination of the level of greenness (Matthissen and Morris, 2004), and the cost estimates vary by the tool used. The cost ranging between $1,250 and $22,500 (Langdon, 2007) and $10,000 to $60,000 (Syphers *et al*., 2003) are reported for the US LEED. These estimates include expenditure on appeal, resubmission and management fees (Abidin & Azizi, 2016). The estimate of 'commissioning costs is 0.75% - 2% of total costs for the entire building, 1% - 1.5% of the total electrical system's cost for electrical installation only and 1.5% - 2.5% of the total mechanical system to commission just HVAC and control system' (Means, 2011). The inference shows that varying practices generate different costs implications. Since these are charges on fees, regional advantages and cost reductions are pertinent with improved skills and knowledge development.

4.2.2.2 Costs Constraints

SB is innovative in some ways and products of innovation in the construction context face diverse implementation challenges (Griffith, 2002). The challenges facing SB implementation are termed constraints to cost economy in this study. The constraints could be evasive when aligned to the arrays of stakeholders, client needs and expectations (Choi, 2009). Implementation constraints contributing to GCP include lack of demand by clients (Dobson *et al*., 2013), the type of buildings (Matthiessen and Morris, 2005), dearth of locally produced sustainable materials (Sichali & Banda, 2017; Hwang *et al*., 2017; Matel *et al.,* 2019) and low knowledge of sustainable construction (Tierney & Tennant, 2015; Matel *et al*., 2019). Some regional contexts (the US), show that high GCP is a correlation of expensive sustainable materials and products (Ahn *et al.,* 2013). In the UK, poor quality delivery triggers performance discrepancies between actual cost and design requirements (Tierney & Tennant, 2015). Developing mechanisms to control quality lapses are operative to reduce the costs of non-conformance. Cost constraints sustain the debate that GCP is unrelated to sustainable features only but also contingent project implementation dynamics.

4.2.2.3 Costs Factors

Syphers *et al.* (2003**)** discussed cost factors along with project life cycle contexts. Cost factors in the general literature include new technologies, new products and level of competition between contractors and sub-contractors/suppliers **(**Dobson *et al*., 2013). Views, which dissociates GCP from sustainable features increasingly buttressed the lack of clear design goal, late incorporation of green objective in the project, decentralised projects management processes, insufficient time and low knowledge and inexperience (Syphers *et al*., 2003). The dearth of clear sustainable objectives and late sustainability goals produce disequilibrium through redesign, variation and additional costs. Clear early project objectives allay that careful planning and project management are operative to achieve lower GCP. Fragmented design practices against integrated design confuse building processes and increase inconsistencies in design and documentation (Choi, 2009). Lack of experience in design requirements, materials components, energy modelling and commissioning, likewise increases project budget (Morris & Matthiessen, 2005). These factors show that GCPs are not necessarily sustainable features but contingent on project management practices.

5. Discussion

From the preliminary contexts of practice theory set out in this paper, practice consists of materials, competencies (knowledge) and other contexts perceived as a practice (Shove *et al*., 2012). The conceptual framework of the study aggregated these elements as well as other expositions into two elements, knowledge and process-related practices. Knowledge (Shove *et al.,* 2012) refers to competence (Gram-Hassen, 2014), while the implementation processes cover materials and other frames that proffer a practice in a given setting. Using Gram-Hassen's model, habit and knowledge are competence variables, while engagement and technologies are implementation processes (Gram-Hassen, 2014). To abate the allocation of practice suiting each element, the exponent of habit refers to behavioural issues that shape actors' conception and perceptions about the SB system and their GCPs (Syphers *et al.,* 2003). Knowledge is an umbrella term covering skills, training, education and experience (Ekung and Odesola, 2018). Engagement suggests interfacing (putting to use) skills, materials and technology, while technologies refer to sustainable materials, components and the likes (Gram-Hassen, 2014). The findings from the literature reveal that competence is central to optimising GCP. Competence percept through other practice-related issues examined in the study. It is strategic to define factual GCP and key to improving the limitations posed by other process-related challenges.

The exported context of PT to the dynamics of practice as the predictor of GCP asserts that by engaging in SB, practices are embedded by doing. By the practice elements mined from the literature, it is clear that GCP is not contiguous with SB but the dynamics of practice in each environment. Like energy system, practice is every task undertaken to achieve SB and those elements facilitating the performance of these tasks [e.g., knowledge, experience, skills, education, materials, technologies among others] (Gram-Hassen, 2014; King *et al.,* 2014; Kokkonen & Alin, 2015). By implementing SB projects repeatedly, the craft, skills, materials, technologies and knowledge are directly or indirectly improved due to continuous modification of the processes. Repetition of tasks, therefore, produces modified processes that are at best more efficient than in previous cases. Therefore**, r**egions with reduced GCP are likely, those with better innovative strategies and higher frequency in SB project implementation. In the literature, the premium reported for the US and the UK is lower (<10%) for the highest certification level. Based on these expositions, it is argued that the scope of GCP radically differs from the constrained uniform purviews offered in the literature due to the prevailing factors (practice) in each region. GCP is practice dependent with global implications because:

i. the conceptions of knowledge and practice in SB are comparable, but are influenced by variables in a given region e.g., costs misperception (Ekung *et al.,* 2021b),
ii. GCP and SB are co-jointed, but structurally different based on each system's dynamics (see Ekung *et al.*, 2021c), and
iii. (3) practice creates efficiency in knowledge and processes (Gram-Hassen, 2014; Ekung *et al*., 2021d).

Contributing to the co-evolving structures of practice, Chiu *et al.* (2014) demonstrated that the correlation between a system and practitioners is communally co-created. Accordingly, GCP is conceptually contingent on factors associated with stakeholders' fundamental knowledge of the factual GCP. At this level, there is an overarching issue of cost misperceptions, which the construction industry across the globe can eliminate by improving cost information along the regional level (Ekung *et al.,* 2021b; c; d). Oladokun *et al.,* (2017) showed that improving knowledge is objective to enhance SB implementation. Knowledge also emerged as a significant factor in the effective delivery of SB projects in Malaysia (Jaafar & Salleh, 2018). In support of improving knowledge along the regional level as the pivot of embedding factual cost information, experience and practical engagement in SB projects are some critical allies of the most effective ways to improve cost information (Ekung and Odesola, 2018; Ekung *et al*., 2021c). Engagement with SB also differs as witnessed in the number of certified green building projects based on countries. Sichali and Banda (2017) also asserted that project managers who gained experience in SB projects were more efficient than others without related experience. Therefore, level of knowledge, awareness, education, skills, policies and experience are critical regional issues, which variations can influence the growth of SB or reduce GCP. The understanding of stakeholders in different settings differs and improving these frontiers was trajected to achieve a radical reduction in GCP (Ekung *et al.,* 2021c). Embedding pertinent knowledge would also demystify the apprehensions developed by stakeholders about the effect of GCP (Ekung *et al.,* 2021c). Shove *et al.* (2012) demonstrated that a problem could be improved by illustrating achievable advancement within a practice. The implication is that heterogenous performance through routine implementations can remove impediments within the SB's system.

The second exponents of regional dynamics predicted to explain GCP are processes-related elements. The term practice answers the meaning shaped by the understanding of practitioners in a region. Gram-Hassen *et al.* (2016) stated that the force of PT is the overarching emphasis on anything logical to the practitioners. The scope of the process-related practice is broad-ranging but converges to competence as the fulcrum driving their severity. To account for the spectrum of this process dynamics, the study argues that the GCP is a concept defined by its contributory factors and stakeholders. GCP as a cost factor explained that project variables (e.g., size, types, location and more), level of competition, the stage in the project that sustainability is introduced, availability of resources amongst others contribute to the size of GCP (Syphers *et al.,* 2003; Choi, 2009; Abidin & Azizi, 2016). Secondly, achieving cost economy in each setting is constrained by organisational issues (leadership, experience, knowledge and training), prevailing policy, regulatory requirements and procurement procedures adopted (Tierney and Tennant, 2015). Even though the existing literature have charitably acknowledged the presence of GCP or lack of affordability as a barrier to SB adoption (Darko *et al*., 2020; Adabre *et al*., 2020), the knowledge of the cost factors has over the years received only explorative attention as costs drivers, factors and constraints (Syphers *et al*., 2003; Yudelson, 2009; Dobson *et al.,* 2013; Abidin & Azizi, 2016). In a growing number of critical literature, costs have been superficially recognised as a barrier to SB adoption without detailing the logical frames of their underpinning factors.

5.1 Future Research Directions

The theory of practice has promoted the understanding of factors that could predict GCP. Using their charitable engagements in the literature, this study hypothesised that improving regional practice dynamics would modify stakeholders' knowledge to achieve a reduced GCP. This proposition situates GCP in the knowledge domain, which factual position is contingent on obtainable SB practices. The implication means that GCP is susceptible to practice variations, and the GCP answers to project practices in each region (Syphers *et al.,* 2003). The elements of inquiry for GCP must be disconnected from current or established knowledge about GCP, but SB implementation practices (Kokkonen & Alin, 2015). The existing knowledge about these issues faces pertinent misperceptions in which very little research exists to dispel or approve towards embedding factual understanding (Ekung *et al*., 2021b; c). The understanding is also a disjointed idea in the literature as no research has modelled the relationship between these constructs. Therefore, the ways in which regional practices assist to construct or moderate the scope of GCP in SB projects are uncontested domains in need of empirical research.

This study conceives that intelligent modelling approaches would provide an objective characterisation of the exogenous relationship between regional practice and GCP based on the multiple networks structure between knowledge and other practice elements. The positions also show that knowledge development is strategic to achieving a cost-effective SB with reduced GCP. Because the dynamics of practice differ, the meaning of practice must flow from the understanding of practitioners and local contexts. If a practice is anything logical in its environment (Gram-Hassen *et al.,* 2016), research supporting the trajected literature gap would necessarily fit a pluralist approach and varying settings.

Future research must develop and validate practitioners' view of the concept of SB practices in each region in addition to extracted variables in the literature in designing viable research instruments. This is a non-conventional perspective for assessing the dynamics of converging practices as interactive adaptation processes. Chiu *et al.* (2014) reconceptualised the nexus between people and building systems to show that both concepts are not only mutually connected but jointly co-created using collaborative revision among units of analysis in a system. Therefore, the spectrum of regional practice would vary with the level of modification in an organised setting. As noted by O'Keffe *et al.* (2014), the depth of co-creating a practice (concept) varies with the level of interaction between the elements of the system and the degree of innovation implemented. A better understanding of practice predisposing GCP is projected to grow or diminish with a region's engagement in SB project implementation**.** The more stakeholders succeed in implementing SB projects, the GCP gets opaque and would become more invisible.

6. Conclusion

Green Cost Premium (GCP) has emerged as one of the most prominent misperceptions widely disseminated about SB across the globe. This paper provides insights into the structure of GCP from the perspective of practice dynamics to guide stakeholders' understanding of the true extra costs in SB projects. The factual exposition to the question of why does it cost more to develop SB has emerged from the practice theory analysed in this study. The paper showed that GCP is unconnected to the SB system but largely a knowledge gap and process-oriented factors contextual to varying regional practices. The varying GCP are ancillaries to differing regional practices, which implication portrays those regions with improved practices in terms of skills, informed perceptions and technological advancement are likely to achieve lower GCP. The GCP in regions with advanced practices are therefore expectedly lower, while their counterparts in developing countries, with lower practice efficiency experience higher GCP. Multi-faceted factors arising from SB implementation practices, stakeholders and project environments also fuel the GCP including cost factors, drivers and constraints. It seems GCP reduction is achievable through improved project practices, disseminating appropriate knowledge, proper cost management and sustainability accounting. However, these positions emerge from explorative postulations that lack pertinent empirical grounding in the literature. Despite portraying adequacy to justify explorative study, the study is limited by its proposal context in which only properly designed scientific inquiry can factually ground. To guide future studies, a non-conventional perspective for assessing the dynamics of converging practices as the drivers of GCP was demonstrated using the theory of practice. Developing from the multiple layers of networks between knowledge and other practice elements, improving knowledge development is not only strategic to achieving a cost-effective SB but would require intelligent modelling to embed structured understanding of the trajected relationship. Beyond problematising, the study advocates soliciting practice dynamics from the local contexts using practitioners' viewpoints in addition to theoretical variables in order to produce a robust research instrument. Amidst its seminal findings, the relationship between GCP and SB practice is hypothetical as the extent to which improved practices or otherwise can moderate GCP is indeterminate.

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