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# Myth or gold? The power of aesthetics in the adoption of building integrated photovoltaics (BIPVs)

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ABSTRACT

BIPV has gained a lot of attention in the solar world especially in recent times as the push for Net Zero Energy Buildings (NZEB) and concerns about landscape aesthetics increases. Aesthetics plays a critical role in the adoption of BIPVs as it is one of the fundamental components architects and home owners look out for. This paper discusses the primacy of aesthetics by using the elements and principles of design as guide in BIPV applications. Essential elements of design such as colour, shape, and texture have been discussed. Principles of design such as variety, balance, rhythm, contrast and proportion have also been discussed as useful tools in BIPV adoption by home owners and architects. It is emphasised that the essence of BIPV is to introduce 'beauty' in Photovoltaic application and the earlier aesthetic is treated as 'Gold' and given primacy, the better for BIPV adoption. This paper identifies the basic elements and principles of design as the "building blocks" of BIPV design, application and adoption. Finally, it is argued that aesthetics plays a cardinal role in consumer purchasing decision. This paper offers an exceptional design perspective to BIPV application as various attempts have been made by several researchers to address the issue of aesthetics in BIPVs.

## 1. Introduction

Climate change and its ramifications have forced the world to adopt various Green House Gas (GHG) abatement approaches of which Renewable energy is part. Understandably, due to the increase in CO2 emissions as a result of a booming global economy and rising energy demand [1], it is imperative that a conscious effort is made to pare these emissions in especially the energy sector. The energy sector has therefore received massive attention particularly in the areas of transport and electrification. Notable amongst them is the adoption of Renewable sources such as solar energy. Solar energy has not only come to save nations from energy crises but to reduce over-reliance on fossil fuels as well as to introduce competitive energy prices [2]. The Photovoltaic (PV) technology after its emergence in the 19th century, has gone through massive growth in areas of efficiency, aesthetics, market penetration and cost [2,3,4,5,9,17]. PV technology works in a very simple way; by converting sunlight into electricity through semi-conductors. Fig. 1 gives a visual representation of how solar PV works. PV application has evolved over the years, from large scale PV farms and PV integration in vehicles, to domestic appliances such as TV sets, radios, air conditioners and torches [6].

In the architectural space, PVs have been applied to various buildings for both domestic and industrial purposes. Advancement in solar technology has seen the emanation of Building Integrated Photovoltaics (BIPVs), a modern and economical way of utilising solar energy [8]. The growing concern on environmental space, land usage and aesthetics has given credence to the widespread of BIPVs. Concerns about landscape distortions is of yore and there have been an outcry by the public and various stake holders especially on hydropower landscape, electricity transmission lines, landscape distortions and wind turbines [9,10,11]. In recent years, legitimate agitations about landscape and energies, especially as the quest for renewables increases [12] has been heightened. For instance, there have been an outcry from farmers and landowners on solar PV deployment taking over their lands [13]. Architects and homeowners have also criticised PV application as a distortion of landscape, therefore they need to find a better approach to merge solar PVs into buildings [14].

The idea of BIPV is to introduce a more efficient way of utilising solar Photovoltaics (PVs) to produce electricity in buildings while considering architectural appeal. The advantages are numerous and the rapidity with which the technology is pullulating promises to make it a viable energy source for domestic and industrial building construction projects

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**List of Acronyms and Abbreviations**

| | |
|---|---|
| BAPV | Building Applied Photovoltaic |
| BIPV | Building Integrated Photovoltaic |
| GHG | Green House Gas |
| NZEB | Net Zero Energy Buildings |
| PV | Photovoltaic |
| SMART | Selectively Modulated Aesthetic Reflectors Technology |

in the nearby future [15]. Cost, reliability, efficiency and aesthetics are key factors consumers consider in the choice of every product. Many researchers believe that the projections and hope for BIPVs have not been met yet partly due to issues such as high cost, aesthetics, socio-cultural factors and psychological factors [16,17]. There have been several studies highlighting fundamental issues in BIPV adoption such as cost, reliability and efficiency [2,9,17], however, same cannot be said for aesthetics. The scanty nature of literature on aesthetics of BIPV reflects the minimum attention manufacturers and academics have given to it. Even the few works on aesthetics have only explored for instance; aesthetic premiums on BIPV roofs, specific case studies on aesthetics, advise on balancing aesthetics with efficiency and coloured BIPV technologies. This paper therefore fills in the gap in literature by offering an exceptional design perspective to BIPV manufacturers and adaptors in order to achieve an aesthetic value. In other words, the paper seeks to give insight on *"the road to achieving aesthetics."*

Aesthetics forms a critical role in the acceptance of BIPVs, hence turning blind eyes and deaf ears, and only treating it as a myth will slow down the adoption of BIPVs. Afterall, the essence of BIPV is to introduce "Beauty" in Photovoltaic adoption and application. The earlier aesthetics is treated as "Gold" and given primacy, the better for BIPV adoption.

This paper presents a comprehensive review of the critical role of Aesthetics in the adoption of BIPVs. The subsequent sections briefly throw light on the meaning and categories of BIPV, theoretical and philosophical background of aesthetics, the influence of aesthetics in BIPV application, element and principles of design in BIPV systems. A section is also created to discuss aesthetics as a competitive driver for BIPV companies and consumer minds. The paper concludes and makes some recommendations for BIPV developers. The structure of the article is presented in Fig. 2 below.

### *1.1. What are BIPVs?*

BIPVs have been known in the solar world for decades, yet still considered as a niche area. In short, BIPVs are photovoltaic materials that are incorporated into building structures and used to replace orthodox building materials rather than applying them on buildings after completion [18]. The rationale behind BIPV that makes it standout from its counterpart Building Applied Photovoltaics (BAPV) is the fact that it envelopes harmoniously into the structure of the building without pouting visibly. In the architectural world, the finesse and final outlook (beauty) of a building is as important as the functionality [19], therefore BIPVs

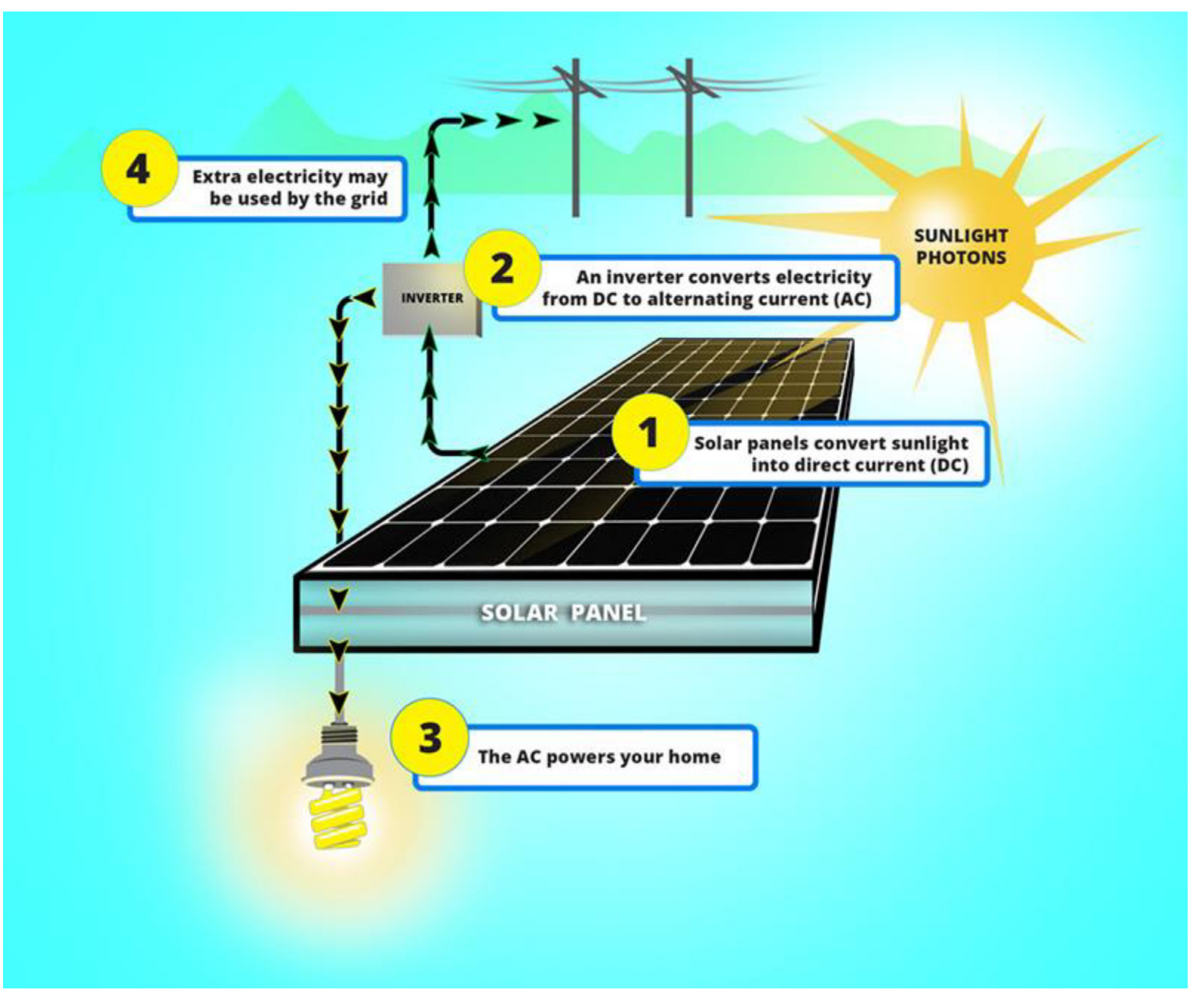


**Fig. 1.** How solar PV works [7].

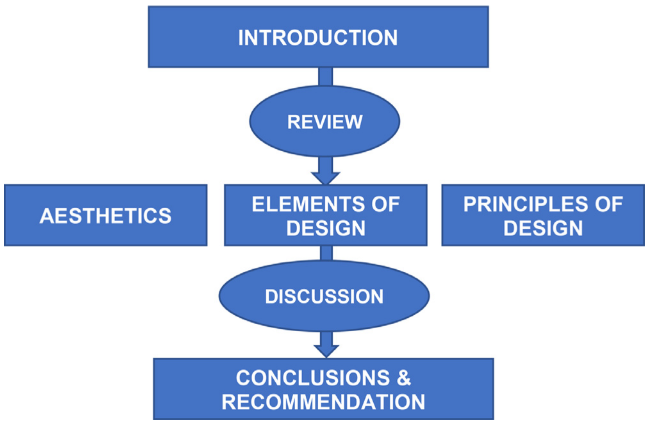


**Fig. 2.** Article Structure – Authors own curling.

come up as an advantage. BIPV provides a glamourous touch of beauty and efficiency as well as a relatively cheaper option should one consider energy and conventional building material cost. BIPV promises to be the hope for Net Zero Energy Buildings (NZEB) in the future considering the headway it's made so far. Indeed, although the primary aim of many energy consumers will be ensuring efficiency and cutting down cost, the final outlook has become an issue of concern especially should PV cells be applied on buildings. Evidently, the star quality of BIPV is its appearance [18]. BIPV has therefore become a pivotal material that marries both clean energy with architectural facelift.

### *1.2. Categories of BIPVs*

Although, photovoltaic cells can be generally categorised into two; silicon based and non-silicon based [8], BIPVs categorisation is a bit more open. BIPVs can be categorised depending on the solar cell type and mode of application as well as the names used to identify them on the market. Depending on the application, BIPV can be grouped into curtain wall, pitched roof system and glazing. Others can be categorised depending on their thickness, shape, efficiency, colour and degree of transparency [20]. On the market, BIPVs can sometimes be categorised into cell glazing, modules, tiles, foils, concentrated and non-concentrated. This can vary depending on the manufacturer or perhaps the most active material used in manufacturing [21]. Fig. 3 below depicts some of the various categorisation of BIPVs.

## 2. Aesthetics; the art of beauty

Aesthetics, coined from the Greek word "aesthesis" which is originally linked to "sensory perception" is a hoary philosophical concept that examines the art of beauty and taste. Aesthetics has been further concocted to mean various things by art Philosophers, for instance Baumgarten gave a new meaning which implied satisfaction of senses or sybaritic fulfilment [23]. The idea is to substantiate the fact that artworks are produced for satisfaction, fulfilment and self-gratification. Based on these divergent perspectives, aesthetics has been applicative in the art field and has served as the yardstick for judgement, evaluation, understanding and emotions [24]. Aesthetics is originally intertwined with design and art, but has recently been used to imply different things in different disciplines, however it still remains a basic principle in assessing nature, people and art.

As technology advances, industrialisation increases, and humanity explores better ways of solving problems, aesthetics has gradually become a bedrock underlining these developments. The quest for beauty in products and nature has increased compared to the olden days when functionality was the core of everything. In the same manner with which good looks earns people a 'beauty premium', beautiful product outlook earns a product a natural consideration in the minds of many consumers. Although functionality, cost, brand, ergonomics and hedonics are core in product choice, aesthetics plays an equally crucial role [25]. The first impression tends to ward off or invite potential consumers especially in the choice of a product. Assuming two products with similar content are presented in different packages, one with a low aesthetic value and vice versa, there is a high tendency that consumers will rush for the "beautiful" product irrespective of prior knowledge of the content. This is what some researchers have coined as *"amelioration effect of visual design and aesthetics on content credibility"*, giving justification to the ligature between credibility and aesthetics [26]. Consumers mostly liken beauty to quality. Until people take time to try a product out, or based on testimony of other consumers, aesthetics and beautiful outlook mostly serve as the criteria for selection. Appeal is as important as functionality in the world of architecture. Aesthetics can be for commercial, comfort, positive brain stimulation and pleasure, although may require consumers to pay more. Compromising aesthetics can be related to shooting one's self in the foot. Eventually, consumers will look out for aesthetically pleasant products once they have options. Various researchers have highlighted the importance of aesthetics in BIPV adoption. For instance;

[27] investigates the balance between aesthetics and efficiency in BIPVs in Tropical areas. A live study was conducted on a BIPV building in Singapore for a period of one year to ascertain the influence of aesthetics on efficiency. The authors findings demonstrated that, efficiency is not compromised should BIPV aesthetics be explored to full capacity. Infact, the losses determined were relatively minor and advised that prominence is given to the aesthetics of BIPV. In a paper by [28] shed light on BIPV within the architectural world in China. The findings of the paper reveal that aesthetics, cost, technology and function are fundamental in BIPV application apart from focusing solely on integration. It also proposed a maintenance culture for PV cells rather than focusing on prolonging the life span of PV. Therefore, the authors developed a PV structure that makes maintenance easy without compromising the aesthetical value of the building. [29] also evaluated the aesthetical value of BIPV for roofing. The paper offered an estimate of the cost of aesthetics and established the fact that although BIPV is costly, compared to other options, consumers are willing to purchase them because of their visual appeal. A case study was used to access the investment cost and the economic benefit of aesthetics. It was realised that manufacturers tend to focus more on the functionality, installation complexities, and exorbitant maintenance thereby giving less attention to aesthetics. This intend hinders acceptance by consumers. [30] again analysed two Brazilian airports and accessed the performance of BAPV and BIPV respectively. The rational was to establish the aesthetic impact of BIPV over its counterpart BAPV when it comes to efficiency and performance. It was realised in both cases that the installed peak power was 100% and 87% respectively. It was concluded that it is worth compromising slightly on efficiency in order to meet the aesthetic requirements of PV application and to make it attractive to various stake holders within the built environment. Last but not the least [31] considers the opportunities and challenges of BIPVs in Southeast Asian countries. The study identified that aesthetics is amongst other factors have impeded the acceptance and growth of BIPV acceptance.

It is evident that, most of the previous studies conducted on the aesthetics of BIPVs do not tackle the basic approach to improving aesthetics itself in BIPV application, but rather focuses on highlighting the mere relevance of aesthetics in BIPV application. The difference here is that, this paper offers an exceptional knowledge from a design perspective by exploring the elements and principles of design and their role in BIPV development and application. Considering the relevance of aesthetics in BIPVs, it is important that designers and artists add their voice to the discourse in order to maximise beauty and push BIPVs to an enviable design standard that can duly replace modern building materials without struggle.

In the application of BIPVs, the idea of aesthetics cannot be overlooked, else there would have been no need for its development. Consid-

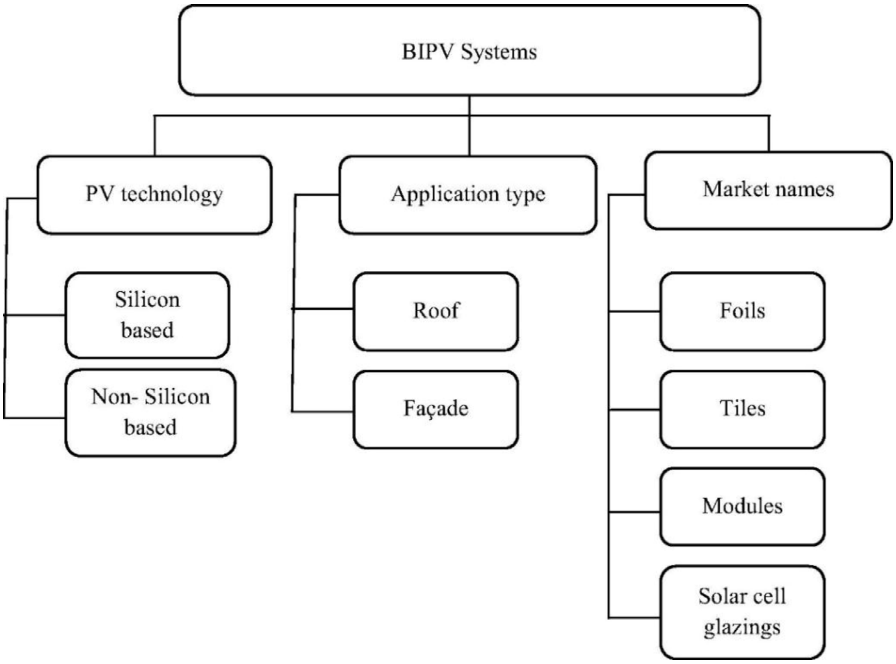


**Fig. 3.** A key review of building integrated photovoltaic (BIPV) systems – Source [21].
For instance, in Fig. 4, BIPVs have also been categorised based on their usage and product type.


**Fig. 4.** Classification of BIPVs products [22].

ering the fact that BIPV offers a perfect envelope and merge-off PVs into the building by replacing conventional materials, emphasis is placed on the final outlook of the building. Regular application of solar PVs (BAPVs) could have served its main purpose of electrification but as development and industrialisation increases, there have been a pressing demand to modify PV application to suit modernity. Architectural aesthetics, innovation, creativity and face-lift have become a priority in the 21st century compared to centuries ago when functionality was the core aim [32].

Although not much difference, aesthetics has direct bearing on other factors that influence the adoption of BIPVs such as efficiency and cost [27]. Just like in product enhancement and packaging, *the extra finesse attracts extra cost* and in certain cases compromises on efficiency [23]. With the aim of introducing PVs to replace conventional building materials such that they form part of the building envelope, BIPV consumers must be prepared to make up for the aesthetic additions. However, the difference in cost and efficiency as a result of aesthetics have been realised as minimal [27,28,29,30].

## 3. General rules of aesthetics and design (Visual aesthetics)

Aesthetics cuts across various areas and cannot be restricted only to the arts, although art forms a critical part in the philosophy of aesthetics. In the Western world of art, visual art has gained massive attention compared to other forms, thereby making it very easy to associate it to aesthetics. However, it is worthy to note that, aesthetics goes beyond visual art, as it captures the sense of pleasantness in general. For example;

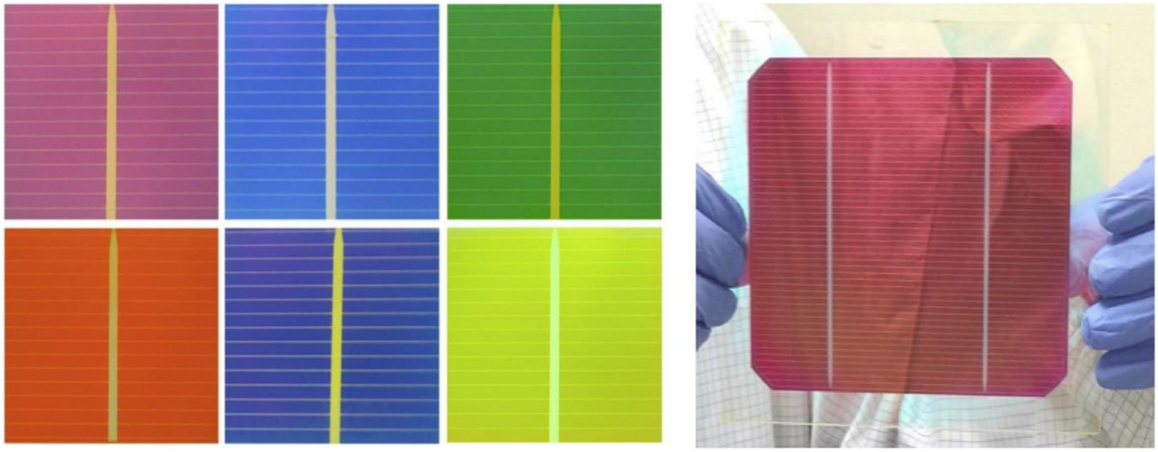

**Fig. 5.** Visual representation of coloured cell coating [35].

landscapes, humans, sun and moon can strike beauty, therefore equally qualify to be tagged as aesthetically pleasant [24].

Naturally, consumers prefer shiny and beauteous things and therefore may sometimes desire them even above functionality. Aesthetics gives pleasure when perceived and vision gives substance to aesthetics. However, there is more to aesthetic design than what is merely perceived. For the purpose of evaluating the role of aesthetics in BIPV adoption, aesthetics shall be limited to visual and landscapes. In visual aesthetics, various elements and principles trigger beauty. In other words, for one to appreciate beauty, there are some underlining elements and principles that formulate beauty. The build-up of a design for visual impact usually goes through various stages of consideration and development. This gives credence to the elements and principles of design; which are the foundation and building blocks of every design. This section shall discuss three of these elements, namely colour, shape, and texture. Design principles such as variety, balance, rhythm, emphasis, contrast, and proportion shall also be discussed. Gaining some substantial understanding of the elements and principles of design will serve as the building blocks for appreciating aesthetics in the contest of BIPV application.

### *3.1. Elements of design*

#### *3.1.1. Colour*

Colour forms a basic visual base in product design and consumer choice. Colour is what the eye perceives when light falls on an object. It is estimated that, there are over ten million colours, making it difficult to determine specific shades of a colour [33]. Colour comes up basically in the area of design, architectural finishing, nature and almost all aspects of life. Theoretically, colour can be grouped into many systems. From a graphical perspective, colour has been grouped fundamentally into primary, secondary and tertiary. Primary colours are red, blue and yellow and secondary colour comprises of orange, green and violet. Tertiary colours on the other hand are the mixtures of a primary and secondary colours [34]. Colour forms a fundamental aspect of product beauty, and helps artwork or product to gain its full glory and appeal.

In PVs, it is possible to explore various colours in order to meet the aesthetic requirements especially in the architectural world. [35] explores Selectively Modulated Aesthetic Reflectors Technology (SMART), which is useful in producing variations in cell colours. Figs. 5 and 6 below shows variety of colours for solar cells.

#### *3.1.2. Shape*

Shape is important in design as it serves as the fundamental element and building block for developing an artwork. Shape basically refers to an enclosed space that is defined by a perimeter. Every single element of design exists in a form of shape. Basic shapes include square, rectangle and triangle. On a broader scale, shapes can be categorised into geometric, organic and abstract [36]. Determining the most appropriate shape fit for purpose is key in the successful execution of an artwork, as well as full acceptance by the set target audience. In a study conducted by [37], it is evident that solar PVs can be explored in various shapes, for instance into moulding somewhat complex shapes such as trees. Shapes in PV application can be basic (A), carved into creative pieces (B) or sophisticated like (C) the proposed solar efficient V3 nectar design.

#### *3.1.3. Texture*

Texture is the general feel of a substrate. In other words, the roughness or smoothness of a surface. Texture comes in two forms; visual and tactile. Visual texture refers to the impression of texture created either through lines, shapes or colour on a substrate or screen, whereas tactile refers to the actual texture that can be felt, for instance smooth or rough [41]. Texture brings life and realism to an object. In product design, tactile texture is important as it serves as the final feel of an object. In PVs, texture can be achieved by plasma etching, laser texturing and metal assisted texturing [42]. In PV design, various textures have been explored to improve its efficiency. For instance, [43] uses the texture of viola flower to enhance the effectiveness of photovoltaics. Fig. 7 shows textures curled from the viola flower for PV development.

However, the choice and application of colour shape and texture as elements of design in BIPV application are partly dependant on external or environmental factors. The surrounding, nature of building, culture, ethos of the people as well as taste may inform the application of these elements.

### *3.2. Principles of design*

#### *3.2.1. Variety*

This usually refers to the ability to match varied elements that have very little or nothing in common to achieve a wholistic composition. Variety brings a different touch, unique from the same element in a composition. It is easy to break monotony through variety, in order to excite and spark the interest of consumers. Variety can come through texture, shape, colour amongst other elements of design [44]. Variety is usually introduced for the purpose of reinforcing the aesthetic magnitude of other elements of design in a composition to enhance user experience. In PV applications, variety can be demonstrated through the juxtaposition of different colours, shapes, textures amongst others.

#### *3.2.2. Balance*

The idea of visual weight and pictorial balance is of true essence in the world of art. Perhaps not to side-line other principles of design,


**Fig. 6.** Shapes of PVs [38,39,40].

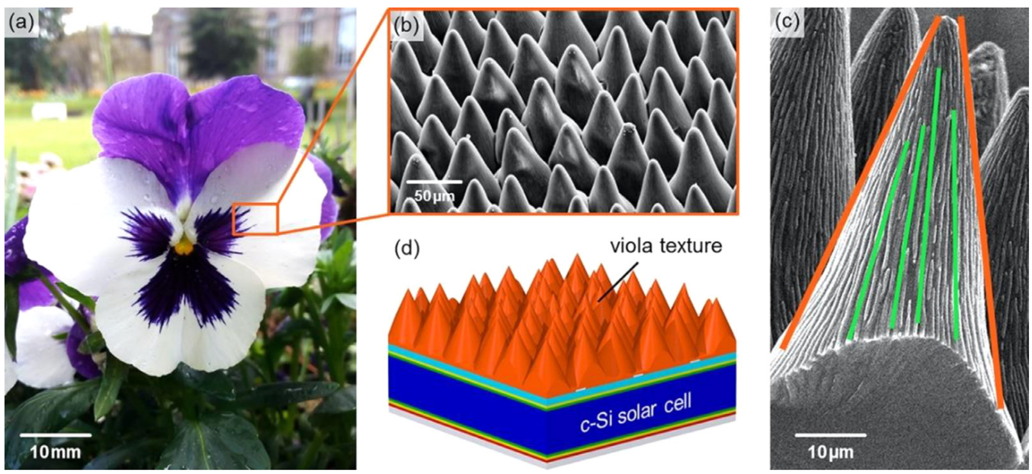


**Fig. 7.** Microscopic Textured image of PV texture curled from viola flower [43].

but it happens to be the easiest the eye can pick [45]. Balance in design to simply put is the even arrangement of elements in an artwork. It constitutes the apportionment of visual weight, such that one side of the design does not present smaller than the other. Balance usually comes in either symmetrical or asymmetrical forms. Symmetrical balance ensures that the components on the left equally match those on the right and vice-versa while in asymmetrical balance elements on one side differs but can still give an illusion of balance. Usually, symmetrical balance is regarded as more appealing and beautiful compared to other forms of balance. This is evident in humans, and patterns as depicted in the works of [46,47]. Visual balance makes compositions interesting, and is capable of holding a viewer's attention since it is aesthetically pleasing [48]. In order to achieve aesthetics in product display, balance is a crucial principle that cannot be compromised. In BIPV application, the ability to balance the various PVs in a given space, such that harmony is achieved is key. For instance, balance can be achieved by evenly distributing shapes or colour of PVs during application in order to make it aesthetically appealing.

### 3.2.3. Rhythm

Rhythm is the repetition of a specific or several components of a design in order to intentionally create movement. The Phenomenology of rhythm basically coordinates the idea of repetition to how viewers perceive them. In real life, rhythm ends up creating balance and stability in a work of art. In the world of design, rhythm may reflect in the repetition of structures, function, movement, growth and process [49]. The idea of rhythm mimics duplication or re-creation. Once an element is repeated, with the overall aim of creating a pattern, pleasant for visualization, then rhythm is created. Rhythm demonstrates consistency, and dominance in practicality. In BIPV application, various panels can be arranged to create an illusion of repetition which intend rhymes when perceived. This makes it seemingly attractive for onlookers. A classic example is figure 11 below, where panels have been vertically mounted on the façade to depict rhythm (Fig. 8).

**Fig. 8.** PV mounted on the façade to depict rhythm [50].

### 3.2.4. Contrast

Contrast means being different. The idea that different elements can be peacefully composed unto a substrate to give a homogenous effect and a sense of agreement is not new in design. However, achieving contrast requires a considerable skill and conscious aesthetic effort. Contrast could be in colour, text, shape, style, texture amongst others. The most important thing to look out for is the combination of different elements for a wholistic outcome [51]. Contrast introduces emphasis on a particular point of interest.

#### 3.2.5. Proportion

This is a fundamental principle of design which basically highlights the relationship between the sizes of elements in a composition. Proportion somehow highlights the most essential elements in a work. For instance, bigger elements are given prominence and vice-versa. A perfect playout of proportion in a composition emphasises harmony. There is a high tendency that all elements of design may not be on the same scale in a composition. However, prominence or emphasis may be given to specific element depending on their relevance. A perfect balance of the scale of the elements in surface design helps achieve a perfect proportional application [52].

## 4. The role of elements and principles of design in BIPV application

Drawing from the elements and principles of design as discussed above, it is evident that there is a direct correlation between PV model development and application, whether in BIPV or BAPV application. Fundamentally, they form the building blocks of every product design. Elements such as colour, shape and texture as discussed above form the basic component of every structural design. The final outlook i.e. the colours of photovoltaic is as essential as the efficiency. If a less attractive colour is used for the finishing of photovoltaic materials, there is a high tendency that architects and home owners might not patronise them. This is partly due to its aesthetic outlook, which may result in either a mismatch or unworthy replacement of an otherwise colourful original building façade, window or roof material. For instance, assuming most home owners like bright roofing materials like burgundy, blue or any other brighter colour, having a black standardized BIPV as the only option for a roof material will automatically turn off potential consumers.

An element such as shape forms a componential part when it comes to aesthetics. Exploring various shapes such as oval, circle, trapezium, square, rectangle amongst many others have a high tendency to make photovoltaic materials highly tradable in the architectural world. Considering the hope and expectation on BIPVs, the aim is to push PV materials as perfect substitutes for conventional building materials, such that similar shapes can be easily accessed for same architectural purposes without compromising the efficiency of energy produced by these PVs.

The visual texture of PV materials is also a very important aspect of aesthetics that cannot be ignored. How a product feels visually gives an illusion of roughness, smoothness, patterned or otherwise is important. Architects and home owners pay critical attention to the texture of their façades; therefore, PVs can mimic the texture of conventional building materials for façades in order to enhance its viability. Principles of design such as variety, balance, rhythm, contrast and proportion as discussed above play critical role in BIPV application. The final arrangement and outlook basically depend on the arrangement of PVs such that all these principles of design are not compromised as they form an essential part of modern architectural finishing.

### 4.1. Aesthetics as a competitive driver for BIPV adoption

Over the past decades, the adoption of Solar systems has mainly revolved around critical factors such as efficiency and cost. In the BIPV world, the attention is predominantly on the outlook, and not cantered only on efficiency and cost although they still stand as relevant factors for consideration. The general acceptance of BIPV by stakeholders such as architects, home owners and contractors require that detailed attention is given to the final outlook of a product. Principal considerations in colour, shape, texture amongst others are key to BIPV adoption. However, it is important to balance aesthetics, efficiency and functionality in order not to trade off the energy producing ability of PV's for beauty. Striking the balance will not only ensure the full acceptance and glory of BIPVs but give magnitude to Net Zero Energy Buildings (NZEB) and landscape aesthetics. Beauty is mainly the backbone of BIPV applications. The idea that PV systems can be architecturally merged into a building envelope seems like a pleasant option for consumers. Considering technological proliferation and sophistication of BIPV systems, consumers have become privy to the various options which intend informs their purchasing decision. In other words, the more open the market is the more variety consumers get in order ensure maximum satisfaction. Marketers have great interest in aesthetics, as it makes selling of products generally easy. Without hesitation, one would generally assume that when it comes to essential products, performance and cost are key factors of consideration and aesthetics does not matter, however, studies have shown that even in the purchase of industrial and essential products, consumers are more likely to consider aesthetics as well. Consumers are more likely to overlook essential factors such as price when purchasing a product especially when the outward look is beautiful and catchy [53]. This goes on to confirm the long-standing hypothesis that aesthetics plays a fundamental role in consumer choice.

In BIPV application, aesthetics has gained enormous attention especially as the quest for product diversity and technological advancement increases. Architects and home owners look out for specific colours, shapes and other aesthetic values in a potential material especially for finishing of buildings. Solar Photovoltaic manufacturing companies that have accentuated aesthetics in their dealings have gradually worked their way up to the heart of consumers and architects. The future of Green buildings and renewable energy systems in modern architecture depends partly on the diversification in aesthetic values of PV materials [54]. The impression an aesthetically pleasant product gives to a consumer is astounding. Aesthetics has proven to have a direct correlation with price. As the aesthetic value of a product is enhanced, a commensurate price is validated in the minds of consumers. Naturally, consumers are willing to even pay more for products that are aesthetically pleasant and showcase them for public attention [55]. The price sensitivities are likely to reduce especially if product is known to be good, unique and durable.

Aesthetics is a major driver in BIPV adoption and cannot be compromised especially in this era of industrialisation. Evidently, aesthetics has served as a competitive driver in various product designs by stimulating consumer hedonics. BIPVs can flourish best in the architectural world when full attention is given to the aesthetics of Photovoltaics.

## 5. Conclusion and recommendations

BIPV has become a perfect answer for architects and homeowners willing to adopt solar. Gradually, this technology promises to increase the share of renewables in the nearby future especially in the world of architecture. This paper has highlighted the role of aesthetics in BIPV adoption. It is argued that the choice of BIPV over its counterpart BAPV is mainly based on Aesthetics, therefore compromising the final outlook of BIPV system is disastrous. Consumers are naturally enticed to beautiful products, and it can be said same in BIPV application. Although cost and efficiency matters, aesthetics serves as the magnet that attracts potential consumers. Fundamental principles and elements of design have been identified as the building blocks of BIPV application and adoption by homeowners and architects. Colour, shape, texture, variety, balance, rhythm, contrast and proportion have been highlighted as fundamental for the excellent designing and application of BIPVs. This paper has demonstrated that aesthetics plays a fundamental role in consumer purchasing process. The major stake holders in BIPV adoption; architects and homeowners have a definite taste for beauty, therefore the primacy of aesthetics cannot be underrated especially as solar energy has become a major source of energy for electrification.

It is recommended that as far as BIPV is concerned, aesthetics must be treated as an important aspect by manufacturers and PV installers. Fundamental principles and elements of design must be adopted to ensure that overall beauty is attained. It is expected that this paper offers an insightful design perspective to BIPV adoption and application.

## Declaration of interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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