

Assessment of Factors that Determine the Functional Value of Paints on Buildings

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Abstract: *The paper identified factors affecting functional value of paints on buildings. Questionnaire and interviews were adopted for the research. Using purposive sampling, thirty questionnaires were distributed to architects, 63.3% returned and analyzed. The result shows that 100% respondents strongly agreed that aesthetics/protection is basic functional values of paints. 73.7% were unsure of paints for anti-bacterial purposes while 47.4% disagreed on its use as a fire-retardant material. The paper concludes that paint/painting enhances the quality of buildings and boosts the architect's professional status. The paper recommends that architects should increase their knowledge base on paint-colour schemes so as to satisfy clients*

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1. Introduction

Paints and painting technological knowhow is generally on the increase both in industries, offices, institutions, residential and other forms of buildings. This is why in most cases building projects are deemed incomplete until they are painted. Paint generally refers to any form of liquid which helps to add texture and colour to the surface both interior and exterior of a structure, object or building by finishing or covering it with a pigmented (coloured) coating. Paints are chemical substances usually in powder form in different coloured pigments which are either mixed in water, oil or chemicals before they are applied on the surfaces of buildings or objects. Recently, paints have been prepared for direct use after purchase to avoid improper mixture by unskilled persons (Creative Home Owners, 2004; Bently & Turner, 1997). On the uses of paints, Tubb (1979) asserted that if materials used for building are left unprotected from the effect of hard ware and water, they deteriorate and decay; thus, the most economical method of protection is by painting. The use of paints colour as a new dimension in architecture cannot be over-emphasized. The increased interest on the part of the people on the use of paints has given rise to the growth and development of various paints manufacturing industries across the globe.

It is a well known fact that everybody is related to a building as a form of shelter in one way or another; hence whatever affects buildings affects the human beings. Most people feel impressed and they pass their comments when they see a well painted building. Although paints are easy to apply, it is disheartening that paints are poorly used and maintained thereby making the overall appearance of the built environment uninteresting (Atamewan, 2010). This is the reason why certain basic understanding of the use of paints is needed, reasons for its use as well as assessment of the core factors that determine the functional values of paints in buildings within the built environment.

2. Literature Survey

In his contribution on the use of paint and its value in buildings, Hellen (1970) stated that 'paint is one of the first things noticed about the outside and inside of a building'. He further opined that 'a fresh coat of paint can transform an older building enhancing its attractiveness and individuality as well as protecting and preserving the other structural elements of the building'. He elaborated his view by adding that thoughtfully selected colour of paint will bring out the unique character of a house by complementing its architectural style, defining its shape and lines and accenting special decorative features. Also, Tubb (1979) in his view on the reasons for painting stressed that surface/buildings are painted to make them clean and more hygienic, easy to clean and attractive. Similarly, Pramod (2007) stressed that decoration and protection are the most important functions of painting a structure or building. In summary, painting is done for the purpose of protection; decoration/ Aesthetic; Hygiene and for purpose of symbolism and identification.

Nonetheless, the durability or otherwise of paints is determined by some factors. Accordingly, Pramod (2007) outlined heat, moisture and sunlight as the factors that affect paint coatings and durability. He stressed that each of the factor could separately cause paint to deteriorate resulting in the collapse of the binding element called resin in the pigments of the paints thereby leading to failure, but that the effect is worse when the three factors are combined. On the other hand, some factors which affect the user's decision towards painting include colour, style, feeling of motion, meaning balance and texture (Congcong and Tsuhan, 2009).

Paint Classification

Paints commonly in use are classified according to their constituent and medium as follows:-water paints, oil paints, cement paints and bituminous paints (Pramod, 2007; Stephenson, 1989). These classifications gives rise to the different kinds of paints described below:

- 1) **Water paints:** - This term is applied specifically to oil bond water paints. Water paints have a vehicle composed of a drying oil, synthetic or nature resin emulsified in water together with a stabilizer such as glue. They give permeable paints film which is washable when dried or hardened. Most are unaffected by alkaline and is good for interiors.
- 2) **Emulsion paints :-** This kind of paints consist of synthetic resin polymer with the addition of suitable pigments, suspended in a chemical compound emulsified in water, oil, resin and rubber. The drying action of this paint is due to the evaporation of the emulsified liquid. The attractive qualities of emulsion paints are speed of drying which allows further coating to be applied without delay, resistance to alkaline action: - making it suitable for use on new plaster, cement, asbestos sheeting, and tolerance to damp and resistance to mould growth and bleeding.
- 3) **Solvent.** These are made of liquid used in the manufacturing of paints or decoration coating that disperse the film forming constituents with the object of making the mixture then and fluid enough for easy by evaporation of the volatile solvent. Their vapour are often inflammable and may be toxic to uses if inhaled hence care should be taken when using the paints. Its qualities include resistance to water, water vapour and chemicals, are widely used on both metals and alkaline surfaces.
- 4) **Oil paints :-** These are paints in which the binder consist of a drying oil or an oil varnish mixed with a thinner which dries by the oxidation or polymerization of the binder. They are typified by the group based on linseed oil with white spirit, which constitute the traditional ready mixed oil based paints. But often, natural and synthetic oil, and thinners are used. These paints are obtained in wide variety of colours and suits most purpose for both exterior and interior use.
- 5) **Special Paints:** - As the name implies, they are paints used for special purpose and they include the following:-
 - a) **Fire Retarding paints :-** These are paints applied to combustible materials such as timber, fibre board or fabrics for fire protection purpose it will not render an inflammable materials flame proof, but fire retarding paints can make such materials less ignitable, can delay and minimize the spread of flame across the surface and prevent the materials from continuous burning thereby localizing the effect. The paints retard the spread of flame by cutting off the supply of oxygen to the material. The ability of a paints to retard the spread of flame varies according to its composition (use of pigment such as lithopone and lit amine dioxide) and the degree of pigmentation.
 - b) **Chlorinated Rubber paints:** - This type of paints is also known as acid resistant paints. It is used free, non-toxic; air drying coating plasticized to provide maximum flexibility. Exceptional impermeability to water makes it an ideal coating where extreme water resistance is required i.e. submerged conditions. They are also of a high degree of decoration value and used in bathing rooms, bakeries, laundries underground pumps, station in water works, concrete swimming pools etc.
 - c) **Insecticidal Paints:** - These are paints containing an addition substance which forms a bloom on the surface and which destroys any insect that alights upon it. The most advanced of these paints is lethal to flies, wasps, moths, ants cockroaches, mosquitoes, silver fish, fleas etc, but are nonetheless harmless to humans, domestic pets and livestock and it's suitable even where food is prepared.
 - d) **Anti-bacteria paint –** These are paints to which poisonous metallic salts (sodium, mercury, zinc or magnesium salts) have been added to check the growth of bacteria and fungus. If such paints are to be used in bakeries, breweries and other premises where food stuffs are prepared, the advice of the paints manufactures should act as a guide of avoid the risk of contamination and poisoning of the food.

Characteristics of a Good Paint

Paint is normally regarded as good if it possesses the following qualities according to (Heritage, 2007; Morris, 1987)

- It should not damage the painted surface
- It should not crack on drying
- It should work smoothly and freely and be capable of being laid in a thin coat with the brush.
- Colour of paints should not fade or change
- It should have a good spreading power
- It should give a smooth and pleasing appearance showing no brush marks on drying.
- It should form durable, tough and resistant to wear when the film dries.
- It should become surface dry in about 9 hours and hard enough to take up another coat in less than 24 hours.

Paint Colour Schemes

The first impression that hits people on sighting a building for the first time is the paint- colour schemes as colour creates impact and atmosphere. The coldest room/ house ever can be made to appear warm and cosy by the use of warm or hot colours such as red, orange, gold, pink and yellow; while on the other hand, cool colours such as blues, greens, purple, shades of Grey and turquoise can help to create a spacious elegant and sophisticated look in a relatively small room. The third group by hues are the 'Neutrals' made up of gray, beiges, creams, off to crate balances and beat down the effect of several strong or contrasting colours or used alone for sophisticated tone or monochromatic scheme effects (Porter, 1982; Albert, 1978; Wright 1998).

All warm colours advance and as such are used to produce cheerful, warm and intimate surroundings. However, excessive usage creates a claustrophobic appearance. Only one strong advancing colour in a room is enough to create discomfort and eyes-tiring effect if used in a large area in the absence of contrast, thus, one should combine lot colours with neural and complementary colours.

The cooler colour which are the 'receding' colours are easier to live with because they make small space or room appear spacious but can also create an unfriendly, chilly and cold atmosphere cheering up the room can be done by the

use of warm, hot colours complemented with a neutral link produced.

Psychology of Colour

The architect, in an effort to modify the natural environment to enhance comfort needs to bring to mind the psychological effects of paint-colour on people. Research has show that human response to paint-colour is total; affecting our emotions and the whole of our organism. Different paints colour educes different response related to both subjective feelings and objective physical behaviour. Colour perception apart from leading to knowledge about the things of the external world also deeply involve the realm of experience and may influence the inner state, attitude or well-being of the viewer (Creative Home Owners, 2004). Paints-colours therefore affect greatly the treatment of any architectural space. Thus, Albert (1978), Porter (1982) and Wright (1998) outlined some of the commonly used paints colour and how they relate and affect man.

Green: This is well known as 'health colour' it is a growing colour because new growth is green in nature. Persons whose favourite colour is green want large windows in their homes with plants in both the interior and exterior of the house. These people are lovers of gardens, picnics and outings. Red is the complementary colour.

Orange: This is a combination of red and yellow. It is also a health colour. People who need stimulation will find it as an excellent colour. It is vibrant than red and more suitable for persons with an over active heart of a lung condition blue is the complementary colour.

Red: This is the colours associated with blood. It is a leadership colour; and represents many of nature's flowers. Red is vibrant and exciting. Taking a look at something red renews your energy. Small amount of red is needed in most active areas and large quantity of it in least active areas. However, due to the pulsating effect of red, it should be used carefully around people with high blood pressure and nervous disorders. The complement to red is green.

Blue: This represents a teaching colour; and perhaps is the colour of the sky most of the time. Blue people will want spaciousness and large windows in their homes like green-colour lovers. Blue people usually make good instructors, executive and teachers. It is the colour that represents faith in any project. The complement to blue is green.

Yellow: This is a knowledge colour. Yellow denotes genius' thus people whose favourite colour is yellow are usually inquisitive. These people are essentially very good and always want to do the right thing. Purple remains the complement colour.

Scheme for Effective Paint-Colour Usage

On paint colour usage, Atamewan (2010) emphasized that various type of paint-colours possess emotional expressions, that is, they appear joyful and vivacious, exciting and activating especially warm paints-colours such as red yellow and orange or on the other hand have a quieting effect. The selection of a design and the use of its paint- colours are determined by the individual who will

occupy the space. It is often advised that if you intend to spend many hours a day in a given room, it should be much softer and subtle, but if only a few hours for fun make it brighter and intense.

Similarly, depending on what the designer and user wants to achieve, the red and blue paints- colours can be used in varying proportions in any interior space as blue is believed to make things seen further away; that under the influence of blue, one underestimate time and judges weight as beings lighter than they actually are while Red makes things seem nearer (Wright (1998).

The planning of a decorative / aesthetic effect of paints colour in any particular interior space is influence by the duration of time spent there. Hence rooms in which long period of time are spent; need background colours which, as a general rule, require only small accents of red colours. Also, all areas opening into each other that can be partially viewed simultaneously should be in a single colour, this leads to a feeling of spaciousness to the house, but too many paint colours in an area are most unwelcome and should be avoided (Atamewan, 2013).

In schools, children's reaction to coloured surrounding has been closely watched by psychologist and in many European schools dull green colour board have been substituted for the usual black board as the former is found to be less tiring to the eyes.

In bedrooms, Pile (2003) and Wright (1998) opined that paint colours should be soothing, cooling and restful since it is met for sleeping and resting but remember that we must wake up and still want to feel cheerful and optimistic. Children's rooms should be soft in colour until they attain the age of six. Paints colour is equally used in industry and in merchandising. Red and yellow boxes sell so much faster than the blue and green boxes; this is because the former comes out to meet you and the later recedes paints colour is also used to make working conditions more pleasant so that the employee can be more productive.

Factors That Determine the Functional Value of Paints

From the literature review, several authors Weigand (2012), Heritage (2007), Pramod (2007) and Morris (1984) identified and outlined the following factors that determine the functional value of paint, that is, the various categories of uses of paint which includes the following

- 1) Decoration and aesthetics
- 2) Protection and preservation of walls
- 3) Creating an architectural style
- 4) Improvement of quality of environment
- 5) Creating better working environment
- 6) Water resistant application
- 7) Enhancing economic value of the building
- 8) Enhancing hygiene and cleanliness
- 9) Emphasis of building elements
- 10) Symbolism and identification
- 11) Thermal comfort and control
- 12) Defining shapes and lines
- 13) Creating the desired atmosphere
- 14) Insecticidal application
- 15) Safety coding and dissection

- 16) Fire retardant application
- 17) Anti-bacteria application

3. Methodology

A combination of observation, descriptive survey and follow-up interviews were adopted for the study. This was followed by extensive review of literature on paints and paintings. Thirty (30) buildings were purposively sampled by observation in Abuja. The criteria for the selection include; decoration and aesthetics, symbolism and identification, creating a style, creating the desired atmosphere and building elements emphasis. The architects of the selected buildings were contacted and questionnaire administered. Nineteen (19) questionnaires were returned and analysed. This is a 63.3% response. The building categories are as follows; Residential -9, office complex -3, shopping complex-2, Bank-2 and Hotel-4. The responses were measured on likert scale using 1 to represent 'Not Sure' (NS) and 2 for Strongly Disagree (SD); 3 for Disagree (D), 4 for 'Agree' (A) and 5 for Strongly Agree (SA). The data was analysed using descriptive analysis, percentage and ranking.

4. Discussion of Findings

The result of the study in table 1 shows that the entire nineteen (100%) respondent strongly agreed that decoration and aesthetics, protection and preservation of walls, and creating an architectural style are important functional values of paint. All the respondents (100%) agreed that painting helps to improve the quality of the environment. On symbolism and identification 52.6% of the respondents strongly agree, while 36.8% agree and two respondents (10.5%) disagreed. In the follow-up interview one of the respondents who disagreed insisted that symbolism and identification should have been accomplished in the design and that he considers the use of colour for that purpose as an after-thought. He, however, agreed that paint could be used for identification of a building. This implies that a follow-up interview to questionnaire can clarify issues for the respondents and help to understand the respondents' point of view.

However, 26.3% of the respondents strongly agree while 73.7% agree that painting could enhance the economic value of a property. 73.7% of the respondents strongly agree while

26.3% agree that painting is valuable in creating better working environment. A follow-up interview indicated that paints colour can create different moods and psychological effects on people and can make a person comfortable or uncomfortable depending on the setting. 26.3% of the respondents disagreed and 10.5% were not sure how paints can create a desired atmosphere. In a follow-up interview one of the respondents argued that paints alone cannot create the desired atmosphere but the combination of paint, lights and furnishing. This implies that paints can be use as part of the ingredients needed to create a desire environment for work, rest and pleasure.

The result also shows that 42.1% of the respondents agreed that paints can be used for thermal comfort and control while 21.3% disagreed and 26.3% were not sure. In a follow-up interview a respondent who disagreed insisted that thermal control is basically a result of orientation, size and position of windows and ventilation strategies. A respondent who agreed pointed out that some colours can absorb and retain heat while others do not. On anti-bacterial application 73.7% were not sure while 26.8% of the respondents agreed while 31.8% disagreed. On insecticidal application only 36.8% of the respondents agreed while 31.8% disagreed, 15.8% strongly disagreed and 15.8% were not sure. The respondents interviewed who either disagreed or were not sure said that they were not aware of the anti-bacterial, fire retardant and insecticidal value of paints. They noted that it is a good and novel development that will enhance health and safety in the built environment.

A surprise of the research is that five respondents were not sure how paints could be used to define shapes and lines in a building. One of the respondents in a follow-up interview said that even though she is aware of the effects a good architect can achieve with colours but is of the opinion that strongly defined shapes and lines should have been achieved in the design and that paints can only be used to indicate them.

The above findings point to the fact that the value and usefulness of paints is perceived in different ways by different architects depending on the knowledge base and exposure. It is also instructive to note that paints will always play diverse important roles as an architectural material used in different types of buildings designed for different uses.

Table 1: Respondent's rating of factors that determine the functional value of paints

S/n	Factors	Response And Percentage										Total Responses	Ranking
		SA	%	A	%	D	%	SD	%	NS	%		
1	Decoration and aesthetics	19	100	-	-	-	-	-	-	-	-	19/100%	1
2	Protection and preservation of walls	19	100	-	-	-	-	-	-	-	-	19/100%	1
3	Creating an architectural style	19	100	-	-	-	-	-	-	-	-	19/100%	1
4	Improvement of quality of environment	-	-	19	100	-	-	-	-	-	-	19/100%	2
5	Creating better working environment	14	73.7	5	26.3	-	-	-	-	-	-	19/100%	3
6	Water resistant application	4	21.1	15	78.9	-	-	-	-	-	-	19/100%	4
7	Enhancing economic value of the building	5	26.3	14	73.7	-	-	-	-	-	-	19/100%	5
8	Enhancing hygiene and cleanliness	12	63.2	7	36.8	-	-	-	-	-	-	19/100%	6
9	Emphasis of building elements	8	42.1	11	57.9	-	-	-	-	-	-	19/100%	7
10	Symbolism and identification	10	52.6	7	36.8	2	10.5	-	-	-	-	19/100%	8
11	Thermal comfort and control	-	-	8	42.1	6	31.8	-	-	5	26.3	19/100%	8
12	Defining shapes and lines	6	31.8	8	42.1	-	-	-	-	5	26.3	19/100%	8

13	Creating the desired atmosphere	7	36.8	5	26.3	5	26.5	-	-	2	10.5	19/100%	9
14	Insecticidal application	-	-	7	36.8	6	31.8	3	15.8	3	15.8	19/100%	10
15	Safety coding and dissection	3	15.8	6	31.8	8	42.1	-	-	2	10.5	19/100%	11
16	Fire retardant application	2	10.5	5	26.3	9	47.4	-	-	3	15.8	19/100%	12
17	Anti-bacterial application	-	-	-	-	5	26.3	-	-	14	73.7	19/100%	13

Source: Authors field work, 2017

5. Conclusion/ Recommendation

Painting is usually considered the final aspect of the finishes in a building. Because of its functional value the application of paint should be properly planned and specified. A functional colour scheme that should take into consideration the identified functions of paint to enhance the building value is necessary. This should be done with respect to the functional use of the building and its location. It should be noted that the use of inferior quality paints adversely affects the functional value of paint. A well-painted building satisfies the building owner/client, the user and the building team. It also enhances the professional status of the architect.

The following recommendations are made:

- Architects should increase their knowledge base by being exposed to new products through attending building products exhibitions, seminars and workshops.
- Architect should always provide a well-developed and planned colour scheme that will portray the expected outcome of his designs to the construction team.

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