Kaduna State University Environmental Science Journal (KESJ)
Website: *https://kesj.org.ng* ***ISSN:*** *2734-2751*

Volume 5, Issue 1, June 2025
DOI: https://doi.org/10.66884/kesj.2025.pt14088n

PREMATURE BUILDING OBSOLESCENCE: IDENTIFYING AND PRIORITISING KEY FACTORS FOR SUSTAINABLE BUILT-ENVIRONMENT

Ahmed Ade Ibrahim[1] and Aliyu Makarfi Ibrahim[2]
[1] Department of Building, Kaduna State University, Kaduna State, Nigeria.
[2] Department of Building, Ahmadu Bello University, Zaria, Kaduna State, Nigeria.
*Corresponding email: ibrahim.ade@kasu.edu.ng

ABSTRACT

Purpose: *This study aims to evaluate the causes of premature building obsolescence and prioritise the factors with the most severe impact for effective management.*

Design / Method / Approach: *A quantitative research methodology was employed, utilising a structured questionnaire administered to 60 fully registered professionals from the Kaduna state chapters of the Nigerian Institute of Architecture (NIA), Nigerian Institute of Builders (NIOB), Nigerian Society of Engineers (NSE), Nigerian Institution of Estate Surveyors (NIES), and Nigerian Institute of Quantity Surveyors (NIQS), with 50 completed responses. Data analysis included descriptive statistics (frequency, mean, and percentages) and inferential statistics through Pareto analysis to identify the most significant obsolescence factors.*

Findings: *The findings reveal that within Physical obsolescence, "poor materials and workmanship" ranked first, with Pareto analysis identifying the top 19 factors as severe. For Functional obsolescence, the "failure to inspect/supervise architectural work" was the primary cause, with 21 factors classified as most severe. In Economic obsolescence, the "failure to study life-cycle costs" topped the list, with the first 19 factors deemed most severe. Under Technological obsolescence, "Fast rate of technology change" was ranked first, identifying the top 20 severe factors. In Environmental obsolescence, "poor town planning" was the leading cause. Lastly, in Legal/Social obsolescence, "deterioration of buildings" was ranked first.*

Research Limitation/Implication: *The study relies on a Purposive sample of 60 professionals from Kaduna state chapters, with 50 valid responses, which may limit generalizability to other states or regions. Self-reported data may be subject to response bias. Findings suggest priority areas for*

[1] Email: kesj@kasu.edu.ng

policy refinement, standards development, and targeted training to mitigate premature obsolescence.
Practical Implication: *The study provides guidelines for effective management of building obsolescence, enhancing sustainability within the built environment.*

Originality / Value: *The study provides actionable guidance for practitioners and policymakers to focus resource allocation on the most impactful obsolescence drivers, supporting sustainable asset management and building performance in the Nigerian built environment.*

Keywords: Built-environment, Building obsolescence, Evaluation, Pareto analysis, Sustainability

1.0 INTRODUCTION

Obsolescence is described as the loss or decline in utility, performance, values or usefulness of an object, building or product (Ahmad et al., 2005; Kintrea, 2007; Mansfield and Pinder, 2008; Thomsen and Flier, 2011; Grover and Grover, 2015; API, 2017). Obsolescence is not just about wear or tear of an object; rather, it is due to an object declining in usefulness, thereby bringing its life to a premature end. Premature obsolescence happens suddenly as a result of changes in technology or consumer demand, or more gradually over a longer period of time until the advantages of replacing the object outweigh the costs of doing so. It can even happen to a new property which is never actually used for the purpose for which it has been constructed (Grover and Grover, 2015). Building obsolescence poses a significant challenge in real estate and construction, as a result of decline in utility, performance, or value of structures over time. This decline can occur even when buildings are physically intact, often driven by rapid technological advancements, shifts in consumer preferences, or changes in regulations towards sustainability (Ahmad et al., 2023).

Identifying the causes of building obsolescence early is crucial for effective management and mitigation of risks. A commitment to sustainable building practices emphasises the need for historical understanding and proactive measures to address obsolescence. Failing to address these challenges can jeopardise not only individual investments but also the overall integrity of urban development and the built environment. The severity of losses stakeholders experienced from building obsolescence can be significant and sometimes occurs over a relatively short period of time (Pourebrahimi and Eghbali 2020) resulting in substantial financial losses for stakeholders and undermining the long-term viability of properties.

According to Pourebrahimi and Eghbali (2020), obsolescence poses huge risk to the built-environment and appropriate measures need to be taken to avoid or at least mitigate the phenomenon. Grover and Grover (2015) noted that Prevention can be the most effective and efficient approach for avoiding obsolescence. Due to its immobility, long lastingness and capitalintensive character in addition to its societal and cultural significance on one hand and the high uncertainty about their future lives on the other, minimising obsolescence is indispensable for the sustainable management of the physical, economical and societal investments involved (Thomsen and Flier, 2011).

Despite the recognised risk posed by obsolescence, current literature remains scarce and fragmented, lacking a unified framework for identifying and prioritising the factors that significantly contribute to obsolescence of obsolescence. Existing studies often conflate

obsolescence with depreciation, yet these concepts differ significantly. While depreciation refers to the gradual loss of asset value over time, obsolescence captures broader factors leading to decreased usefulness, driving home the importance of distinguishing between the two.
This paper aims to fill these gaps by evaluating the perceptions of built-environment professionals in Nigeria regarding the causes of premature building obsolescence. The study will specifically identify and prioritise the factors that significantly contribute to obsolescence, utilising Pareto Analysis for effective management strategies that promote sustainability.

2.0 LITERATURE REVIEW 2.1 Built-environment Sector

In the context of built environment, obsolescence can be defined as depreciation in value and/or usefulness of a human-made system as a whole (e.g., a building, transport infrastructure, etc.) or its component (e.g., a boiler of the building) due to an impairment of desirability and/or function. This loss of value or amenity could be from a multitude of causes such as: new inventions, current changes in design, technological development, improved process of production, change in use or end-user demands, climate change (e.g., global warming). Other social factors may also play a role, for instance, instability in politics of a country or tightening of environmental legislation can render a part of a given built environment, e.g., a property or built asset less desirable and valuable for a continued use (Butt et al., 2015).
Representing over 50% of global wealth, Built-environment plays a vital role in every aspect of human endeavour. Through taxation and other revenue, it is a major source of public and private income. However, it is also a complex sector, involving many stakeholders and interlinking elements, and affected by fragmentation in policymaking. Further holistic approach will unlock the enormous potentials of the sector to serve as the driving for economic growth and sustainability. Built-environment provides physical space of buildings and supporting infrastructure, in which people live, work, interact and play. Also, within its properties are developed, valued, financed, transacted, managed and eventually deconstructed. It is a robust sector with an enormous enabling impact on jobs and economic growth, and with great potential for the realisation of sustainability (REBE, 2016).
Price-water cooper (2020) predicted changes to built-environment and real estate landscape that are likely to have significant effects for the built-environment stakeholder in 2020 and beyond, one of which is that, Technology innovation and sustainability will be key drivers for value. Suggesting buildings will need to have ‘sustainability’ ratings, while new properties will need to be ‘sustainable’ in the broadest sense, by providing their occupants with pleasant places to live. Technology will disrupt built-environment economics, making buildings that are not sustainable to be obsolete.

2.2 Definitions of building obsolescence

Obsolescence in buildings is the gradual process of a building of not being able to meet up with the contemporary standards in terms of functionality, statutorily, physically, and/or economically with in a particular place or time causing the building to be obsolescent (Nwoko, 2010). The Premature building obsolescence is the early termination of the economic life of real estate assets and unanticipated losses in their value. The level of losses investors experience from premature obsolescence can be significant and occur over a relatively short period of time Grover and Grover (2015). Building obsolescence has been described as a very difficult concept to explain perhaps due to its diverse nature (Smith, 2004; Mansfield & Pinder, 2008). Nevertheless, one simple fact about the concept is that its appearance or manifestation in buildings; be it social, physical, functional or economic has the tendency of negatively impacting on the values of such building particularly where inefficiency is incorporated into its management. Considering the primary objective of property development and management – to achieve optimum return - any negative impact on the building may definitely threaten this objective from been realised (Olajide and Ijagbemi, 2019). According to the International Organisation for Standardisation ISO (2011) building obsolescence is describe as the loss of the ability of a building element to function or perform satisfactorily owing to changes in performance requirements. Several authors such as Mansfield (2000) and Thomsen and Flier (2011) refers to building obsolescence has the loss of performance or utility of buildings which can be caused by their physical deterioration or motivated by factors such as: economic factors, social factors, technological or political changes, or due to fluctuations in users' needs. Silva et al, (2022) opined that, an obsolete building element may not be damaged or dysfunctional, but instead, it can no longer satisfying the users' needs considering more recent and up-to-date standards. In excess, a newly completed building can fall into obsolescence if the primary functions it's meant to accomplish is not realised.

The term obsolescence and depreciation are sometimes used interchangeably to refer to loss of value after the construction of an asset. Nwanekezie and Nwanguma (2020) stated that, the concept of obsolescence is often interlaced with depreciation by many professionals and scholars of the built-environment. Though, the two concepts are different. Depreciation is primarily seen as an object diminishing in value over certain period of time, while obsolescence on the other hand means the property or object is no longer produced or used, or is out of date or has fallen into disuse. There are several definitions of building obsolescence in literature with ambiguities, as the meaning tends toward the type of obsolescence one is describing at a particular point in time. For illustration, from the physical obsolescence, it can be defined as the loss in the usefulness of a building as a result of wear and tear. While, viewing obsolescence from the economic perspective, it is referred to as inability of buildings to yield the expected income (depreciation in value) as a result of an internal or external defect. Similarly, functional obsolescence relates to inability of a building to perform its expected function efficiently as a result of defect in design. Additionally, social obsolescence perceives building obsolescence as a situation whereby a building (even if there are newly built) is rendered inhabitable as a result of not meeting the minimum requirement of the development authorities or such building being declared as hazardous to human occupancy; may be for not observing the right of way or proximity of setback to power or gas pipe line. Also, building can be obsolete due to cultural or superstitious beliefs. Hence from these reviews, it can be inferred that obsolescence in buildings has to do with the followings; wear and tear, inability of a building to perform its original purpose, internal and external forces leading to reduction in values and lastly where a building is abandoned as a result of not meeting building regulations (Olajide & Ijagbemi, 2019).

2.3 Concept of obsolescence in building

Thomsen and Flier (2011) proposed that the conceptualisation of obsolescence could be represented by the quadrant-matrix Figure 1. In which four parameters were correlated using a quadrant matrix, similar to the one used for building evaluations (Leaman, Stevenson, and Bordass, 2010). Thus, establishing a conceptual model to describe a building's obsolescence and considers the correlation between them. Quadrant A (physical building obsolescence) represents the Internal or endogenous factors which are related to processes distinct to the building itself. The processes can be a physical degradation and deterioration over time, such as; natural wear and ageing process, inadequate design, fatigue of materials and structures, or by poor construction methods, lacking maintenance and adaptations. Quadrant B (physical location obsolescence) represents external or exogenous factors which are related to influences from outside environment. They manifest physical effects, like the impact of changing conditions in the environment by activities of adjacent constructions site such as; noise, traffic of heavy construction equipment, air pollution etc. or by changes in government regulations such as new building codes and fiscal rates, emerging standards and additional functional requirements and new technologies. Quadrant C (behavioural building obsolescence) represents behavioural conditions related to the occupant's attitudes toward usage of building such as; as misuse or changes to initial required functions of buildings, overloading, maltreatment etc. The last quadrant of the matrix is Quadrant D (behavioural location obsolescence) which represents behavioural effects due to changes in local conditions occasioned by increase in crime and criminality within an environment can cause social depreciation of the neighbourhood, loss of market status and value, availability of better options.

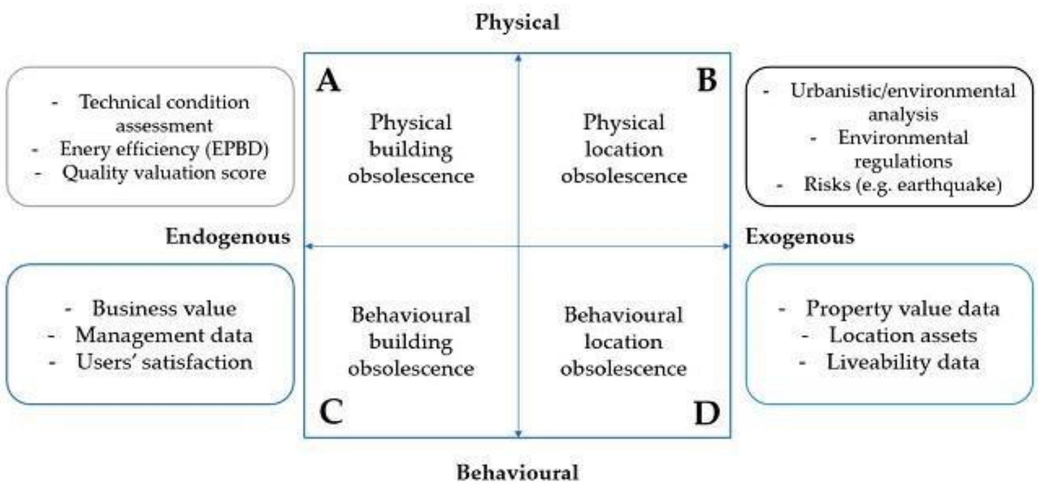


Figure 1: Obsolescence, conceptual model (Thomsen and Flier 2011 & Silva et al, 2022)

2.4 Previous studies on built-environment obsolescence

Attempts have been made in the reviewed literature to identify and categorise various types of building obsolescence by different authors. But there is neither a comprehensive nor a unanimous agreement in the classification of the types of building obsolescence in the literature, as some of the obsolescence types have similar and overlapping causal factors. Smith, (2004); Mansfield & Pinder, (2008); Olajide, (2017); and Olajide & Ijagbemi, (2019) categorises obsolescence into two classes namely; major obsolescence and minor obsolescence. The major obsolescence has five (5) types; they are; physical, functional, economic, social and environmental. However, the classification of the minor obsolescence is unexhausted. Physical obsolescence is said to occur when a building loses value due to old age, gross mismanagement and physical neglect leading to deferred maintenance that is usually too expensive to repair. Functional obsolescence on the other hand arises when a buildings value declines as a result of its architectural design, building style, size, out-dated facilities; local economic conditions and changing technology. Economic obsolescence manifests when buildings value diminishes due to external factors such as local traffic pattern changes or the construction of public nuisance type properties and utilities such as sewer treatment plant, prison, and refuse dump site on adjoining properties. Social obsolescence, which is also known as legal obsolescence, arise from the enactment of new legislations or new standards introduced to control matters related to health and safety, fire control and so on, which in many cases may render a building obsolete.

In an attempt to distinguish between the social and legal obsolescence, Olajide and Ijagbemi, (2019) cited CALUS and Baum which were of the opinion that changes in social needs leads occupants demanding for buildings with high and compatible image, good neighbourhood and infrastructure. While, legal obsolescence occurs when a building fails to meet new legislation requirement and the costs involved in bringing the building up to the required standard are excessive. In this case, legislation will advance demolition beyond the building's physical life causing premature obsolescence to the building. Environmental obsolescence of a whole neighbourhood may happen when the conditions in a neighbourhood render it increasingly unfit for its current use. Changes in the character of an area may make a building unsuitable for its original intended use.

Environmental obsolescence will normally be of greater relevance to depreciation of land than to the depreciation of buildings.

Similarly, environmental change such as high pollution, road congestion and urban decay may result into environmental obsolescence. Other forms of premature building obsolescence are superstitious beliefs obsolescence (when a building is render obsolete due to spiritual injunctions); technological building obsolescence (when the building in no longer technologically superior to alternatives and replacement is undertaken because of lower operating costs or greater efficiency); locational building obsolescence (when an area and the buildings located in it suffers from devaluation because it is considered less fashionable or attractive by occupiers; aesthetic obsolescence (buildings may deem unacceptable by occupiers if the appearance is out-dated and incompatible with their corporate image); external obsolescence (when some outside forces affect the real estate property like if the neighbourhood around the property goes downhill, then the value of such property may go downhill as well) Olajide & Ijagbemi,(2019). Other authors such as Cheong, (2010) and Reed and Warren-Myers (2010) also categorise obsolescence into the broad classification of; physical, functional and economic. Others types of obsolescence identified in the literature include technological, locational, social, market, legal, building, historical and professional (Mansfield and Pinder 2008, Reed and Warren-Myers 2010 and Thomsen and Flier, 2011). Recent study by Pourebrahimi & Eghbali (2020) identified and compiled 33 types of building obsolescence into ten (10) categories; economic obsolescence, functional obsolescence, locational obsolescence, physical obsolescence, legal obsolescence, social obsolescence, technological obsolescence, aesthetic obsolescence, environmental obsolescence, tenure obsolescence.

The reviewed literature reflects non-availability of specific information regarding the specific classification of causes of building obsolescence to be focussed on in order to minimise effect of premature obsolescence. In other to overcome this gap, this paper came up with summary of a comprehensive identification of premature building obsolescence types under Six (6) premature building obsolescence categories with variables factors and then uses Pareto Analysis to determine the specific cause of building obsolescence to be eliminated to reduces premature building obsolescence occurrences.

Table 1 summarises the various types of premature building obsolescence identified from the literature, with similar and overlapping obsolescence as follows;

Table 1: Reviewed Premature Building-Obsolescence with Similarities and Overlapping

S/N	Premature Obsolescence	Similar & Overlapping Obsolescence Identified	Authors
1	Physical	Aesthetics, Architectural, Design, Image, structural, style.	Mansfield and Pinder (2008) Cheong, (2010) Reed and Warren-Myers (2010) Grover and Grover (2015) API (2017) Chen et al. (2017) RICS (2017) Thomsen and Flier (2011) Wilkinson et al. (2014) Olajide & Ijagbemi, (2019) Pourebrahimi & Eghbali (2020)
2	Functional	Utility, Use/Usage,	Flanagan *et al.* (1989) Baum (1991) Mansfield and Pinder (2008) Cheong, (2010) Reed and Warren-Myers (2010) Grover and Grover (2015) API (2017)
			Chen et al. (2017) RICS (2017) Johnston (2016) Thomsen and Flier (2011) Olajide & Ijagbemi, (2019) Pourebrahimi & Eghbali (2020)
3	Economic	External, Financial, Market	Cheong, (2010) Thomsen and Flier (2011) Flanagan *et al.* (1989) Baum (1991) Mansfield and Pinder (2008) Reed and Warren-Myers (2010) Grover and Grover (2015) API (2017) Chen et al. (2017) RICS (2017) Wilkinson et al. (2014) Olajide & Ijagbemi, (2019) Pourebrahimi & Eghbali (2020)
4	Technological	Equipment, Technology	Flanagan *et al.* (1989) Baum (1991) Reed and Warren-Myers (2010) Grover and Grover (2015) API (2017) Chen *et al*. (2017) RICS (2017) Johnston (2016) Caccavelli and Gugerli(2002) Sarja (2006) Aksozen *et al*. (2016) Kalligeros (2003) Grigsby *et al.* (1983) Olajide & Ijagbemi, (2019) Pourebrahimi & Eghbali (2020)
5	Environmental	Locational, Site	Flanagan *et al.* (1989) Baum (1991) Mansfield and Pinder (2008) Reed and Warren-Myers (2010) Grover and Grover (2015) Thomsen and Flier (2011) Wilkinson et al. (2014) Olajide & Ijagbemi, (2019) Pourebrahimi & Eghbali (2020)
6	Legal/social	Cultural, Spiritual/superstitious beliefs, Tenure, Political, regulatory, legislation, statutory,	Flanagan *et al.* (1989) Baum (1991) Reed and Warren-Myers (2010) R. Grover and C. Grover (2015) Chen et al. (2017) Thomsen and Flier (2011) Downs (1995) Lemer (1996) Kalligeros (2003) Williams (1986) Douglas (2006) Thomsen et al.

(2015) Olajide & Ijagbemi, (2019) Pourebrahimi & Eghbali (2020)

3.1 Data source, survey instrument, and sampling strategy

This study uses primary data collected through a questionnaire purposively administered to registered professionals within the built-environment in Kaduna state. The choice of the study area is based on the numerous ongoing urban renewal project by Governor Nasir El-rufai of Kaduna State as a tool for sustainable development, this increases the rate of construction activities across the state. In anticipation of sampling acceptability, state chapters of the various professional bodies were consulted for numbers of registered members which resulted to the study population of 152. The state chapter of Nigerian Institute of Architecture NIA has 40 fully registered members, the Nigerian Institute of Builders NIOB 21 registered members, Nigeria Society of Engineers NSE 40 registered members, Nigerian Institution of Estate Surveyors NIES 10 and Nigerian Institute of Quantity surveyors NIQS 41 fully registered members. The sample size for the research was calculated using kish formula for finite population found in Agbodjah (2008);

Equations

$$n = \frac{M}{1+\frac{M}{N}} \qquad (1)$$

Where n = Sample Size N = Total population

$$M = \frac{\sigma^2}{V^2} \qquad (2)$$

$$\sigma^2 = P \times (1 - P) \qquad (3)$$

Where V is the standard error of the sampling distribution and σ is the maximum standard deviation of the population element. P is the proportion of population elements belonging to the defined class. Taking V = 0.05, P = 0.5 and N = 152.

$$M = \frac{0.25}{0.0025} = 100$$

Therefore;

$$n = \frac{M}{M} = n = \frac{100}{100} = 60$$

$$1+ \frac{}{N} \qquad 1+ \frac{}{152}$$

Thus; 60 questionnaires were established as the adjusted sample size for the survey and A sample size of 60 professionals was computed using Equation (1), Sixty (60) questionnaires were administered to the respondent but fifty (50) were properly completed and returned, representing a response rate of about 83% of respondents found to be accurate and useful for this study.

3.2 Data analysis technique

The Statistical Package for the Social Sciences (SPSS) was used for data coding, data entry as well as data cleaning. Analytical techniques include descriptive methods of data analysis; Descriptive Graph Mean, percentages were adopted for the demography and Ranking method of data analysis (Likert Scaling) with a 5-point scoring format (1 = Not Important, 2 = Fairly Important, 3 = Neutral, 4 = Important, 5 = Very Important) was employ to rank the variable factors under each category of Premature Building Obsolescence. Next, Pareto analysis was applied to identify the specific premature obsolescence types with most severity that must be focussed on in other to minimise the menace of the phenomenon.

3.3 Pareto analysis

Pareto analysis is a statistical technique in decision-making used in choosing limited number of factors that are responsible for significant overall effect. The results of a Pareto analysis are typically represented through a Pareto chart, which is a graphical tool that helps in breaking down large tasks into parts and identify parts that are most significant (Talib et al, 2010). Bojan et al (2015) Applied the Pareto Analysis in project management to identify the most common problems during project implementation. The outcome of the study shows that only 5 items accounted for 80% of all problems. This is very important information for project manager and the entire project team. Since the projects are constrained by time, budget and resources directing attention and resources on the "vital" problems can greatly contribute to the successful implementation of the project. This study adopted the Pareto Analysis as each categorise of premature building obsolescence contains large numbers of casual variable factors and for effectiveness in the management of obsolescence, emphasis must be placed on the few most significant causal factors responsible for premature building obsolescence. The Pareto analysis is likewise known as the 80/20 rule, because the principles states that "for many events, about 80% of the effects come from 20% of the causes" (Bojan et al 2015). Thus, premature building obsolescence in each categorise in this study are caused by the effect of 80% of the variable factors under them.

4.0 PRESENTATION AND DISCUSSION OF RESULTS

1.1 Respondents Demography

The demographic information and outcome of the respondents revealed that Builders ranked the highest with 30% of the total sample size, Architects and Engineers with 20% each, while 26% of the respondents were Quantity surveyors and Estate surveyors, 4%. In academic qualifications, the majority of the respondents are bachelor's degrees (96%), while only 2% respondents have Doctoral degrees and National diploma respectively.

1.2 Evaluation of premature building obsolescence

Table 2: Causes of Premature Physical Obsolescence in Buildings

S/N	Factors	Response Frequency (f) 5	4	3	2	1	F	Total	Mean	Rank	Cum.%
1	Poor materials and workmanship	30	17	0	3	0	50	224	4.48	1	5.38
2	Improper site supervision	23	20	7	0	0	50	216	4.32	2	10.57
3	Inadequate knowledge about material for construction	20	28	0	0	2	50	214	4.28	3	15.71
4	Engagement of unqualified builders	22	20	4	2	2	50	208	4.16	4	20.71
5	Patronage of quacks	22	21	1	1	5	50	204	4.08	5	25.61
6	Design error	14	28	4	1	3	50	199	3.98	6	30.39
7	Non-compliance with design information/specification	20	20	0	4	6	50	194	3.88	7	35.05
8	Poor maintenance syndrome	24	12	3	2	6	50	187	3.74	8	39.54
9	Environmental impact on construction materials	18	16	6	2	8	50	184	3.68	9	43.96
10	Lack of maintenance analysis	18	16	0	8	8	50	178	3.56	10	48.24
11	Faulty building design/lack of buildability analysis	14	12	14	2	8	50	172	3.44	11	52.37
12	Time factors in relation to age of the material used in building	10	20	9	0	11	50	168	3.36	12	56.41
13	Communication gap between designers and site operatives	12	15	6	6	10	50	160	3.2	13	60.25
14	Non-compliance to approved drawings	14	13	1	10	12	50	157	3.14	14	64.03
15	Wear and tear resulting from human activities	14	8	8	8	12	50	154	3.08	15	67.73
16	Unethical practice of professionals	18	8	8	2	15	50	145	2.9	16	71.21
17	Constructability issues	10	9	10	4	19	50	143	2.86	17	74.21
18	Failure to carry out soil test prior to construction	9	8	8	10	15	50	136	2.72	18	77.21

19	Lack of quality control plan	9	7	8	11	15	50	134	2.68	19	81.13
20	Material with insufficient data on their longevity	7	7	10	10	16	50	129	2.58	20	84.23
21	In appropriate use by occupants	5	6	10	14	15	50	122	2.44	21	87.16
22	Failure to carry out feasibility study	9	0	11	10	20	50	118	2.36	22	90.00
23	Failure to inspect material delivered to site	3	4	8	18	19	50	110	2.2	23	92.64
24	Failure to carry out test as at when due	5	5	2	18	20	50	107	2.14	24	95.21
25	Construction based on preliminary drawings	5	2	8	10	24	50	101	2.02	25	97.64
26	Owner constructor syndrome	4	1	7	14	25	50	98	1.96	26	100

1 = Not Important, 2 = Fairly Important, 3 = Neutral, 4 = Important, 5 = Very Important Source: (Field Survey 2022)

Table 2 shows the mean and ranking of the professionals' perception on the causes of premature physical obsolescence. The table indicates that poor materials and workmanship and improper site supervision were ranked 1st and 2nd with mean values of 4.48 and 4.32, respectively. These finds is similar to Flanagan et al (1989) and Ashworth (2004), who in turn suggested that such threats can be controlled to some extent by selecting suitable materials and components at the design stage, implementation of appropriate construction methods and good maintenance during building operation. Conversely, construction based on preliminary drawings and owner-constructor syndromes were ranked 25th and 26th with mean values of 2.02 and 1.96, respectively. Lack of quality control plan and inappropriate use by owner/occupier were ranked 19th and 21st. This is an aberration as lack of quality control and improper use patterns have been established to significantly impact on building physical obsolescence.

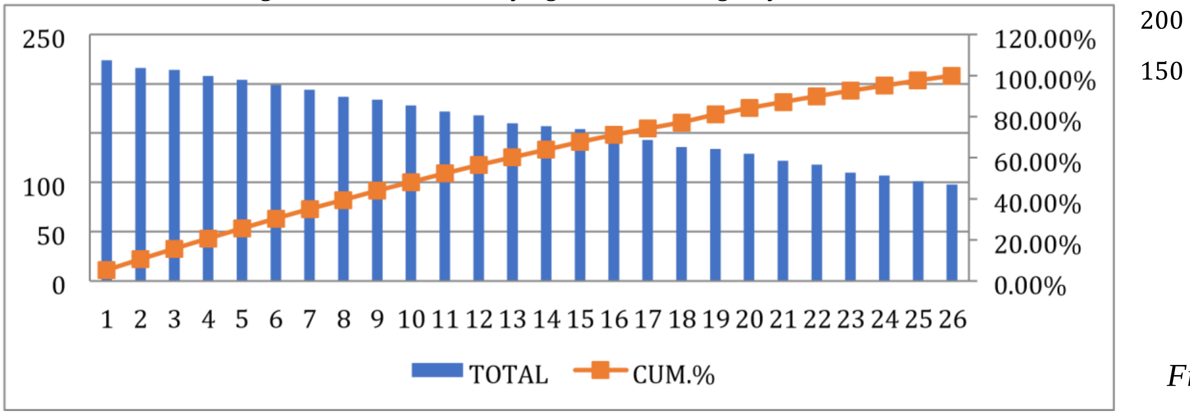


Figure 2: Pareto Analysis of Causes of Premature Physical Obsolescence in Building Source: (Field Survey, 2022)

Figure 2 shows a Pareto analysis of the causes of premature physical obsolescence in buildings. In order to identify the most severe causes of physical obsolescence in buildings. For this study, the first 19 items (causes) (73%) accounted for 81.13% of effect on physical obsolescence in buildings. This implies that Building professionals perceive the first 19 items have 81.13% chance of causing physical obsolescence in buildings. Hence, by eliminating the first 19 items the plausibility of premature building obsolescence would be reduced by about 81%.

Table 3: Causes of Premature Functional Obsolescence in Building

S/N	Factors	Response Frequency (f) 5	4	3	2	1	∑f	Total	Mean	Rank	Cum.%
1	Failure to inspect designs for functional/aesthetic qualities	22	24	1	3	0	50	215	4.3	1	5.03
2	Inadequate plan for operations and maintenance work	14	34	1	0	1	50	210	4.2	2	9.94
3	Improper choice of material in relation to it functionality	20	24	3	1	2	50	209	4.18	3	14.83
4	Faulty designs	25	15	3	3	4	50	204	4.08	4	19.61
5	Unclear design brief.	18	18	10	1	3	50	197	3.94	5	24.22
6	Failure to conform to the building code of practice	10	28	8	1	3	50	191	3.82	6	28.69
7	Inappropriate design & detailing of building element	16	20	4	6	4	50	188	3.76	7	33.09
8	Owners' decision to change	16	20	1	6	8	50	183	3.66	8	37.37

	the use of building										
9	Poorly arranged floor plan	20	12	2	6	10	50	176	3.52	9	41.49
10	Failure to convert design language to constructional term	16	12	10	4	8	50	174	3.48	10	45.56
11	Failure to conform to the planning and zoning law during design	22	9	0	0	19	50	165	3.3	11	49.42
12	Miss-use of building-by-building occupant	6	26	5	1	12	50	163	3.26	12	53.24
13	Frequent changes of functional requirement by client	16	14	0	0	20	50	156	3.12	13	56.89
14	Deficiency in necessary/required features in a building	20	3	2	10	15	50	153	3.06	14	60,47
15	Inadequate circulation consideration in design	8	22	0	0	20	50	148	2.96	15	63.93
16	Inadequate forecast of maintenance and operating requirement	5	21	0	8	18	50	143	2.86	16	67.28
17	Poor forecast of use intensity of building	10	10	2	13	15	50	137	2.74	17	70.48
18	Use of out-dated equipment	10	10	4	6	20	50	134	2.68	18	73.68
19	Time impact on design features and aesthetic	8	6	7	12	17	50	126	2.52	19	76.57
20	Development trend and fashion in vague area	6	6	10	10	18	50	122	2.44	20	79.48
21	Rate of technological changes in building services	5	5	10	10	20	50	115	2.3	21	82.12
22	Failure to document design concept to be used by contractor	6	2	10	10	22	50	110	2.2	22	84.19
23	Over/under improvement	3	5	10	10	22	50	107	2.14	23	87.19
24	miss-match communication gap between design & construction team	4	3	10	9	24	50	104	2.08	24	89.63
25	Demand shift in line with latest technical facilities and	4	1	10	10	25	50	99	1.98	25	91.94

	amenities										
26	Demand shift in high quality space	4	0	8	11	27	50	93	1.86	26	94.12
27	Poor future development forecast	2	0	10	10	28	50	88	1.76	27	96.18
28	Rate of change in space technology	2	0	8	10	30	50	84	1.68	28	98.15
29	Poor environmental impact assessment forecast	2	0	6	9	33	50	79	1.58	29	100

1 = Not Important, 2 = Fairly Important, 3 = Neutral, 4 = Important, 5 = Very Important *Source: (Field survey, 2022)*

Table 3 shows the mean score, rank, and cumulative percentage for premature functional obsolescence in buildings. From the table failure to inspect and supervise architectural work to meet functional and aesthetic qualities (with a mean score of 4.30) and failure to prepare specification for works related to operation and maintenance (with a mean score of 4.2) were ranked first and second respectively. On the other hand, poor environmental impact assessment forecast (with mean score of 1.58) and rate of change in space technology, (with a mean score of 1.68) where ranked 29th and 28th respectively Surprisingly, inadequate forecast of maintenance and operating requirement and poor forecast of use intensity were ranked 16th and 17th with mean scores of 2.86 and 2.74 respectively. This is unusual as operating and maintenance requirement have been shown to generate significant social, environmental, and economic burden on the owner/occupier of a building thereby substantially affecting its functional life (Thomsen and Flier, 2011).

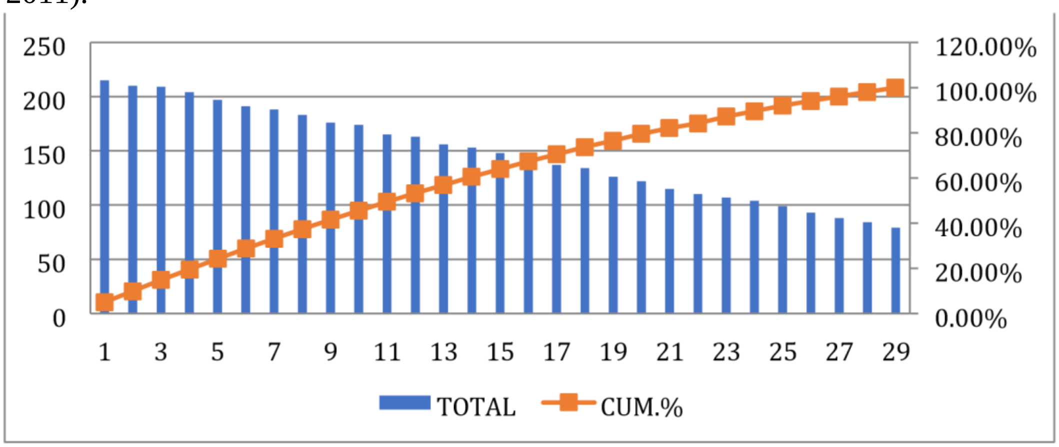


Figure 3: Pareto Analysis of Causes of Premature Functional Obsolescence in Buildings
Source: (Field Survey, 2022)

Figure 3 shows a Pareto analysis of the causes of premature functional obsolescence in buildings. In order to identify the most severe causes of physical obsolescence in buildings. For this study, the first 21 items account for 82% of effect on premature functional obsolescence in buildings. This implies that by mitigating the first 21 items chances of premature functional obsolescence in buildings could be reduced by 82%.

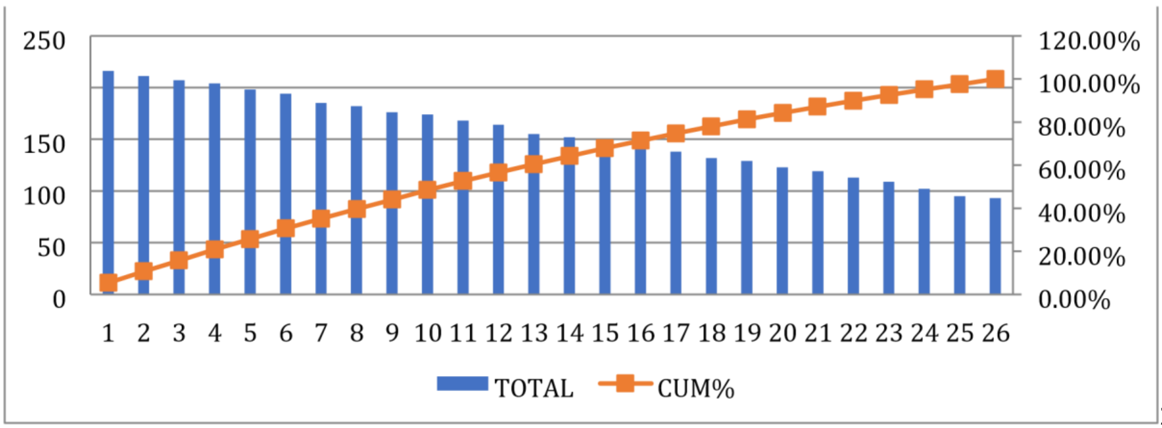
Table 4: Causes of Premature Economic Obsolescence in Building

S/N	**Factors**	**Response Frequency (F)**					**F**	**Total**	**Mean**	**Rank**	**Cum %**
		5	**4**	**3**	**2**	**1**					
1	Failure to study life cycle cost in use	22	22	6	0	0	50	216	4.32	1	5.36
2	Failure to prepare budget for the project	19	24	6	1	0	50	211	4.22	2	10.60
3	Insecurity in an area	18	25	4	2	1	50	207	4.14	3	15.74
4	Failure to seek professional advice on financial plans and procurement	18	20	10	2	0	50	204	4.08	4	20.84
5	Site location/project mismatch	22	20	0	0	8	50	198	3.96	5	25.73
6	Failure to identify client objective and priorities	14	20	12	4	0	50	194	3.88	6	30.55
7	Failure to prepare specifications & consider cost efficiency	14	20	8	3	5	50	185	3.7	7	35.14
8	In adequate fund	19	10	10	6	5	50	182	3.64	8	39.66
9	Failure to arrange work to be measured valued and certified regularly		336	0	6	5	50	176	3.52	9	44.03

10	Failure to establish a cost control system	12	24	0	0	14	50	174	3.48	10	48.36
11	Emphasis on initial capital cost.	10	26	0	0	14	50	168	3.36	11	52.53
12	Environmental hazard	15	18	0	0	17	50	164	3.28	12	56.60
13	Government policy on design	17	11	2	0	20	50	155	3.1	13	60.45
14	Neighbourhood environmental changes e.g. free noise, and air pollutant	14	10	8	0	18	50	152	3.04	14	64.23
15	Failure to identify optimal time of purchase and disposal of buildings	3	28	0	0	19	50	146	2.92	15	67.85
16	Inaccurate forecast of macro-economic variables	14	10	1	3	22	50	141	2.82	16	71,36
17	Failure to produce and update cash flow analysis	10	12	2	8	18	50	138	2.76	17	74.78
18	Failure to establish measure for variation into the overall cost budget	6	15	2	9	18	50	132	2.64	18	78.01
19	Escalations in maintenance and operating costs	8	13	3	2	24	50	129	2.58	19	81.27
20	Economic shift in relation to change in living standard	7	9	6	6	22	50	123	2.46	20	84.32
21	Demand shift in building accommodation	5	9	6	8	24	50	119	2.38	21	87.13
22	Development trend and fashion in an area	6	3	10	1 0	21	50	113	2.26	22	89.94
23	Over/ Under investment in buildings	6	7	3	8	26	50	109	2.18	23	92.64
24	Specialized building not in great demand	0	9	10	5	26	50	102	2.04	24	95.18
25	Too many building in a particular area thus low demand	0	5	10	1 0	25	50	95	1.9	25	97.54
26	Problem in job markets	0	5	9	1	26	50	93	1.86	26	

1 = Not Important, 2 = Fairly Important, 3 = Neutral, 4 = Important, 5 = Very Important *Source: (Field survey, 2022)*

Table 4 shows the mean score, rank, and cumulative percentage for premature economic obsolescence in buildings. “Failure to study life cycle cost” was ranked 1st with mean value of (M= 4.32), suggests a strong consensus that overlooking life cycle costs significantly contributes to economic obsolescence. This aligns with Kibert (2013) which emphasis that understanding the total costs associated with a building beyond initial capital outlay can greatly affect its long-term sustainability and utility, ultimately leading to obsolescence. The 2nd ranked economic obsolescence in buildings is “Failure to prepare budget for the project" (M=4.22) this according to Hwang and Ng (2013) can result in low quality and loss of investor confidence, which might accelerate economic obsolescence. The 3rd economic obsolescence is "Insecurity in an area" (M=4.14) the high rating of environmental factors, such as insecurity, aligns with findings in urban studies that suggest socio-economic conditions heavily influence property value and longevity. Study by Haworth et al. (2015) also highlighted how insecurity can impact not just immediate economic conditions but also long-term investment decisions in a region, contributing to property obsolescence. On the contrary, "problem in job market" with mean value of (M=1.86) was ranked last, implying it is considered the least causes of economic obsolescence in building. This relatively low mean score indicates that issues in the job market are seen as lesser contributors to economic obsolescence. This might suggest that while a strong job market can enhance property values, it is not perceived as a direct cause of obsolescence. Existing literature often focuses more on tangible and immediate factors like infrastructure and maintenance than on broader economic conditions like job availability. Bourne (2019) supports this by discussing how immediate physical conditions often take precedence over economic factors in real estate evaluations.



200

Figure 4: Pareto Analysis of Causes of Premature Economic Obsolescence in Buildings Source: (Field Survey, 2022)

Figure 4 presents the Pareto analysis of the causes of premature economic obsolescence in buildings. In order to identify the most severe causes of economic obsolescence in buildings. For this study, the first 19 items account for 81% of effect on premature economic obsolescence in buildings. Hence, by mitigating the first 19 items (causes) the effect of premature economic obsolescence in buildings would be reduced by 81%.

Table 5: Causes of Technological Premature Obsolescence in Building

S/N	Factors	Response Frequency (F)					F	Total	Mean	Rank	Cum. %
		5	4	3	2	1					
1	Fast rate of change in technology	22	20	8	0	0	50	214	4.28	1	5.27

2	Desire for complex and advance in technology	20	20	6	4	0	50	206	4.12	2	10.35
3	Use of out-dated equipment and amenities	18	20	8	4	0	50	202	4.04	3	15.33
4	Failure to adhere to operation & maintenance requirement	10	30	8	2	0	50	198	3.96	4	20.22
5	Failure to prepare preliminary engineering drawing and equipment specification	12	24	10	4	0	50	194	3.88	5	25.00
6	Failure to produce building production information	4	32	10	4	0	50	186	3.72	6	29.74
7	Inadequate access for the installation of new technologies	8	28	4	10	0	50	184	3.68	7	34.27
8	Failure to prepare as-built drawings and documentation	6	24	10	10	0	50	176	3.52	8	38.61
9	Emergence of more efficient technology in the market	10	18	8	12	2	50	172	3.44	9	42.86
10	Incompatible electrical, services and component systems	3	22	14	11	0	50	167	3.34	10	46.97
11	Incompatible structural design features of buildings	9	16	10	8	7	50	162	3.24	11	50.97
12	Incompatible Architectural design features	4	18	12	14	2	50	158	3.16	12	54.87
13	Lack of skilled craftsmen and operative for a piece of technology	14	10	7	1	18	50	151	3.02	13	58.59
14	Poor technical capacity	11	10	11	2	16	50	148	2.96	14	62.24
15	Non availability of building production document	4	20	10	6	0	50	142	2.84	15	65.74
16	Failure to document construction methodology	9	10	6	10	15	50	138	2.76	16	69.14
17	Lack of maintainability analysis during design/ production stage	5	15	5	5	20	50	130	2.6	17	72.35
18	Poor operation and maintenance of facility to support technology	7	10	9	4	18	50	128	2.56	18	75.51
19	Failure to manage supply of technological installations	7	4	12	4	25	50	120	2.4	19	78.47
20	Exorbitant operating and maintenance cost	4	10	8	4	24	50	116	2.32	20	81.33
21	Lack of understanding of the various mechanisms of deterioration in a building	6	8	5	4	27	50	112	2.24	21	84.09
22	Incompatibility technology with building facilities	1	8	10	10	21	50	108	2.16	22	86.75

23	Building materials unsupportive of new technology	7	4	5	4	30	50	104	2.08	23	89.75
24	Age of a building unfit for new technology	4	5	6	5	30	50	98	1.96	24	91.73
25	Lack of necessary amenities to support new technology	6	4	2	3	35	50	93	1.86	25	94.03
26	Scarcity of spare parts	6	2	2	4	36	50	88	1.76	26	96.20
27	Desire for latest technical facilities	2	1	8	6	33	50	83	1.66	27	98.24
28	Government policies related to technologies in building	4	0	3	5	38	50	77	1.54	28	100

1 = Not Important, 2 = Fairly Important, 3 = Neutral, 4 = Important, 5 = Very Important *(Source: Field survey, 2022)*

Table 5 shows the mean score and rankings of causes of technological obsolescence in building. The results indicated that “faster rate of change of technology” was rated very high with mean value of 4.28, this high mean score indicates a significant consensus that the rapid pace of technological advancement is a major factor contributing to technological obsolescence. This aligns with Khan and Pannell (2020), which argues that fast-evolving technology often outdates existing systems and infrastructure quickly, compelling building managers to continually update their facilities. Desire for complex and advance in technology (M=4.12), this finding suggests that the trend toward more complex technologies further exacerbates obsolescence, as it creates an ongoing need to integrate new features and functionalities. Tzafestas (2014), noted that as consumers and builders seek more sophisticated technologies for reasons of efficiency and attractiveness, the life cycle of existing technologies shrinks. The 3rd ranked cause of technological obsolescence is “Use of out-dated equipment and amenities” (M=4.04) this high mean score reflects a conscious acknowledgment that maintaining older systems can lead to increased obsolescence. Studies by Zhou et al. (2015) indicate that failing to replace outdated technology can hinder operational efficiency and lead to higher maintenance costs over time, further stating that buildings equipped with older technologies experience decreased functionality. The Least ranked cause of technological obsolescence is “Government policies related to technologies in building” with mean score (M=1.54) this suggests that respondents perceived these policies as less relevant to immediate technological obsolescence. Studies such as that of Chen et al., (2020) often indicates that while governmental regulations and initiatives can shape the overall direction of technology adoption in building sectors, they are less influential on the rapid changes experienced at the ground level.

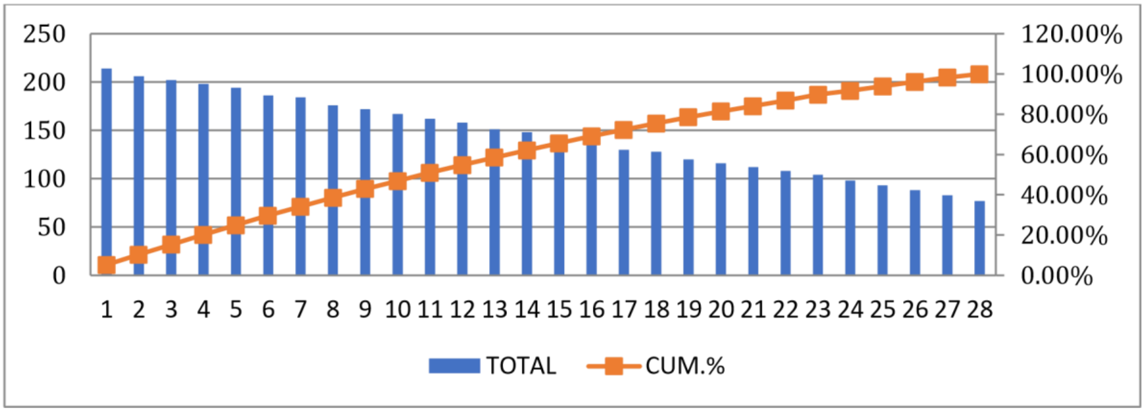


Figure 5: Pareto Analysis of Causes of Premature Technological Obsolescence in Buildings Source: (Field Survey, 2022)

Figure 5 shows a Pareto analysis of the causes of premature Technological obsolescence in buildings. In order to identify the most severe causes of Technological obsolescence in buildings. The Pareto analysis for this study indicates that the first 20 items (causes) accounted for 81.33% of effect on technological obsolescence in buildings. This implies that Building professionals perceive the first 20 items of Premature Technological Obsolescence in Building are the Items to concentrate on in Minimising technological obsolescence in Building to achieve 81.33% of the desired output.

Table 6: Causes of Environmental Obsolescence in Building

S/N	Factors	Response Frequency (f)					F	Total	Mean	Rank	Cum. %
		5	4	3	2	1					
1	Town planning	20	18	4	8	0	50	200	4.00	1	12.24
2	Incidence of natural disaster in an area	14	26	4	6	0	50	198	3.96	2	24.37
3	Land use legislations and regulations	16	16	12	6	0	50	192	3.84	3	36.12
4	Changes in environmental regulations	14	18	12	4	2	50	188	3.76	4	47.64
5	Conflict between development and Human activities of an area	12	22	8	2	4	50	180	3.6	5	58.66
6	Negligence on the part of development authority	11	22	4	10	3	50	178	3.56	6	69.56
7	Regulation of the activities of the population in a special area	10	14	16	8	2	50	172	3.44	7	80.09
8	Non availability of layout for building construction	8	21	8	8	5	50	169	3.38	8	90.44
9	Lack of environmental impact assessment.	10	10	12	12	6	50	156	3.12	9	100

1 = Not Important, 2 = Fairly Important, 3 = Neutral, 4 = Important, 5 = Very Important (Source: Field survey, 2022)

Table 6 indicated that poor “town planning” (M=4.00) is viewed as a significant factor influencing environmental obsolescence. This aligns with literature suggesting that strategic urban design and planning can mitigate obsolescence by promoting sustainable land use, environmental resilience, and community needs. According to Grodach (2017), well-planned urban areas can enhance property value and longevity, while poorly planned developments are more susceptible to obsolescence due to inadequate infrastructure. “Incidence of natural disaster in an area” with a mean value of (M=3.96) is ranked 2nd, suggesting that environmental threats significantly contribute to obsolescence. Kahn (2005) also supports this view, emphasising how buildings in disaster-prone areas often face reduced desirability and increased insurance costs, which can accelerate environmental obsolescence. The 3rd ranked cause of environmental obsolescence according to respondents is “Land use legislations and regulations” with a mean score of (M=3.84). This suggests that regulatory frameworks play an essential role in shaping environmental factors that affect buildings’ longevity. Studies by Babcock and Watzold (2016) illustrate how zoning laws and land use policies can contribute to obsolescence by restricting development or failing to adapt to contemporary needs. On the contrary, “Lack of environmental impact assessment (EIAs)” (M=3.12) was the least ranked cause of environmental obsolescence. This suggests that practitioners perceive this factor as less critical compared to Town planning and regulatory frameworks. However, Glasson et al. (2013) emphasise the importance of EIAs in identifying potential adverse environmental effects before they arise. EIAs can guide decision-making processes, ultimately reducing the risk of obsolescence by ensuring buildings meet evolving environmental standards and community needs.

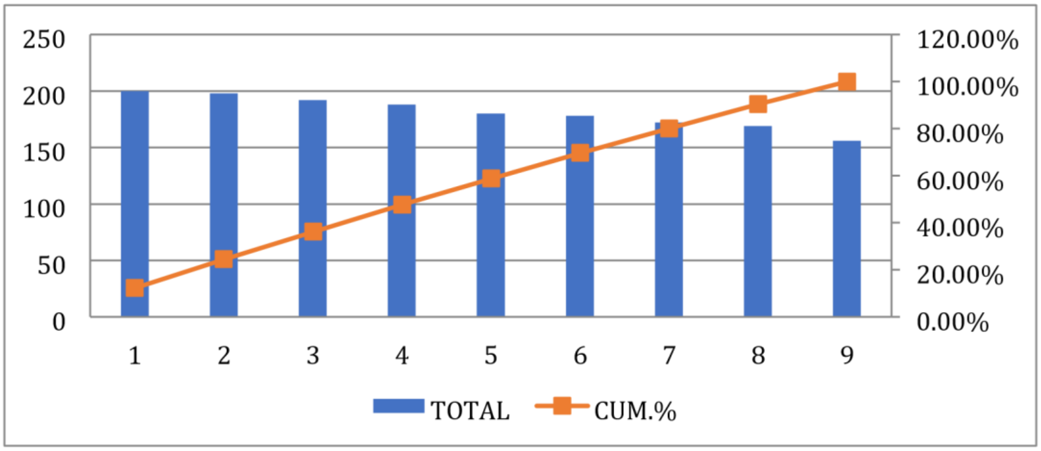


Figure 6: Pareto Analysis of Causes of Premature Environmental Obsolescence in Buildings
Source: (Field Survey, 2022)

Figure 6 presents the Pareto analysis of the causes of premature environmental obsolescence in buildings. In order to identify the most severe causes of environmental obsolescence, the Pareto analysis for this study indicates that the first 7 items (causes) accounted for 80.09% of the effect on environmental obsolescence in buildings. This implies that Building professionals perceive the first 7 items of Premature environmental Obsolescence in Building as the Items to concentrate more on in Minimising environmental obsolescence in Building.

Table 7: Causes of Legal/Social Premature Obsolescence in Building

S/N	Factors	Response Frequency (f) 5	4	3	2	1	∑f	Total	Mean	Rank	Cum. %
1	Deterioration of the building	28	14	6	2	0	50	218	4.36	1	6.15
2	Environmental hazards	16	26	6	2	0	50	206	4.12	2	11.96
3	Time factor in relation to building age	14	28	6	0	2	50	202	4.04	3	17.60
4	Loss of value due to building location	16	20	10	4	0	50	198	3.96	4	23.25
5	Building a fashion trend in vogue	14	22	10	2	2	50	194	3.88	5	28.73
6	Social lifestyles of the population	6	32	6	6	0	50	188	3.76	6	34.03
7	Building with outdated materials	12	18	12	6	2	50	182	3.64	7	39.17
8	Development trend in an area	12	20	10	2	4	50	178	3.56	8	44.19
9	Building construction	6	20	10	12	2	50	166	3.32	9	

	methodology										
10	Location of the building in relation to the building types in the area	7	22	6	6	9	50	162	3.24	10	48.88
11	Introduction/changes in legal regulation in relation to buildings	10	15	10	1	14	50	156	3.12	11	53.45
12	Usage of the building	10	10	15	1	16	50	153	3.06	12	57.86
13	Features and facilities of a building	20	0	4	10	16	50	148	2.96	13	62.17
14	Building/facility management methodology	9	15	5	5	16	50	140	2.80	14	66.35
15	Design of the building	10	10	6	4	20	50	136	2.72	15	70.30
16	Change in building use/functionalities	7	10	10	6	17	50	134	2.68	16	74.14
17	Technological changes and advancement	1	15	10	8	16	50	127	2.54	17	77.92
18	Aesthetic nature of building	4	10	12	4	20	50	124	2.48	18	81.51
19	Nature of society where building is located	8	7	4	4	27	50	115	2.3	19	85.05
20	Social economic standard of an area	7	5	8	4	26	50	113	2.26	20	88.25
21	Location of building	6	6	5	5	28	50	107	2.14	21	91,44

22	Nature of building occupant/owners	1	10	10	0	29	50	104	2.08	22	94.46
23	Human activities	3	5	5	5	32	50	92	1.84	23	100

1 = Not Important, 2 = Fairly Important, 3 = Neutral, 4 = Important, 5 = Very Important (Source: Field survey, 2022)

Table 7 presented the causes of legal/social obsolescence in building. The result indicated that "deterioration of building" was ranked 1st as the most important cause of legal/social obsolescence with mean score of (M=4.36) implying that physical deterioration is viewed as a critical factor contributing to legal/social obsolescence. This aligns with existing literature that emphasises how poorly maintained buildings can lead to safety concerns, legal liabilities, and decreased social value. According to Rodriguez et al. (2018), deterioration not only impacts the utility of a building but also subjects it to increased scrutiny under building codes and regulations, which can accelerate obsolescence. The 2nd-ranked cause of legal/social obsolescence is "Environmental hazards" (M=4.12) the high ranking for "environmental hazards" as a major cause of legal/social obsolescence aligns with studies that show how external factors like pollution, flooding, and natural disasters contribute significantly to legal obsolescence. Research has documented the growing legal implications of neglecting environmental considerations in building maintenance and design.

A study by Zhou et al. (2020) emphasises that buildings facing environmental hazards are at a higher risk of legal challenges and reputational damage, which can lead to obsolescence. The 3rd ranked cause of legal/social obsolescence is "Time factor in relation to building age" (M=4.04). The recognition of the time factor demonstrates an understanding that aging buildings often face challenges related to legal compliance and social expectations. As buildings age, they may fail to meet modern codes or aesthetic standards, leading to social obsolescence. Hedman and Karadimitriou (2017) stated that older buildings are often perceived as less valuable and may require significant investment to be modernised for them to meet current legal and social expectations. While "Human activities" with mean score of (M=1.84) was the least ranked causes of legal/social obsolescence in building. The notably low score for "Human activities" suggests that respondents perceive this factor as having the least influence on legal/social obsolescence. This could be interpreted in a couple of ways such as; Perception of Control, many human activities, such as maintenance and management practices, may be viewed as controllable factors. Since these can be actively managed or improved upon by stakeholders, respondents might not see them as significant causes of obsolescence. Foster & Mathur, (2019) supports the notion that proactive building management can mitigate risks associated with human factors. Neglect of Social Factors, Similarly, the low ranking of "Human factors as a major cause of legal/social obsolescence might indicate a broader societal tendency to overlook how social behaviours and community practices impact buildings. Drew & Hodge (2018) suggests that social dynamics, including cultural habits, community cohesion, and user engagement, can significantly influence a building's relevance and usability over time.

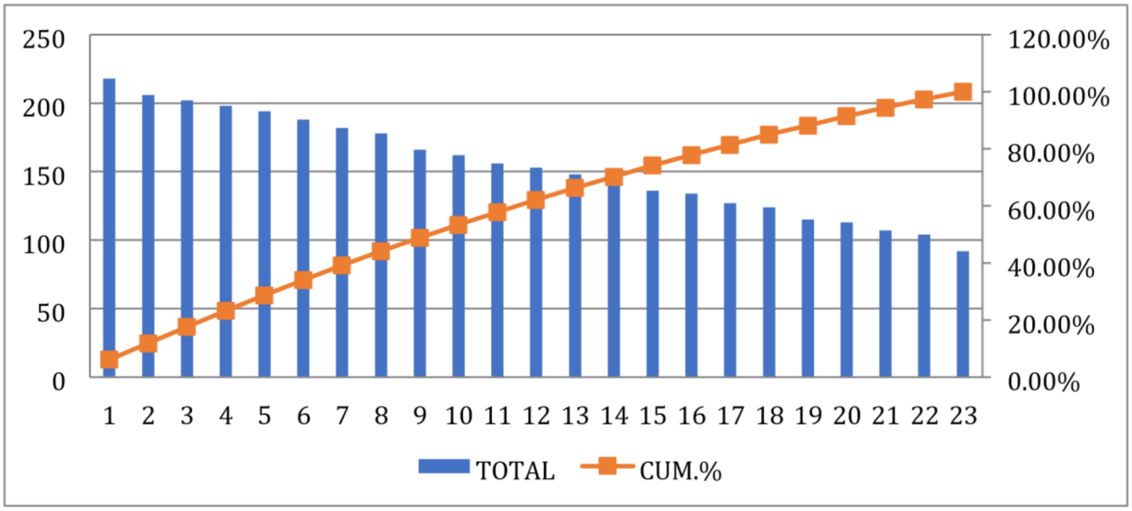


Figure 7: Pareto Analysis of Causes of Premature Legal/Social Obsolescence in Buildings
Source: (Field Survey, 2022)

Figure 7 presents the Pareto analysis of the causes of premature legal/social obsolescence in buildings. In order to identify the most severe causes of legal/social obsolescence, the Pareto analysis for this study indicates that the first 17 items (causes) accounted for 81.51% of effect on legal/social obsolescence in buildings. This implies that Building professionals perceive the first 17 items of legal/social Obsolescence in Building as the Items to concentrate more on in Minimising legal/social obsolescence in Building.

5.0 CONCLUSION AND RECOMMENDATIONS

This study aimed to identify and analyse the key factors contributing to premature obsolescence in buildings across multiple dimensions: physical, functional, economic, technological, environmental, and legal/social. The findings make significant contributions to the understanding of building obsolescence and underscore the importance of implementing targeted strategies in building management to mitigate these risks.

Based on the findings, it is pertinent to make recommendations on ways to minimise premature building obsolescence in line with the Pareto analysis result, on the items to put effort on that will lead to 80% achievement on controlling the causes of premature building obsolescence.

i. Invest in stringent quality control measures throughout the construction process to ensure high standards of materials and workmanship. This can be achieved through third-party inspections, adherence to industry standards, and providing ongoing training for construction personnel. Also, efforts should be concentrated on the top 19 causes identified in the study to minimise physical obsolescence. This requires an organised strategy that regularly assesses and addresses these critical issues.

ii. Implement systematic inspection schedules that ensure architectural works meet the required functional and aesthetic qualities. Engage qualified inspectors who can enforce compliance with design specifications. Concentrate on the first 21 factors identified as critical to functional obsolescence to streamline efforts for improvement.

iii. Promote a culture that values long-term investment in building quality and sustainability as opposed to short-term savings on construction costs. Furthermore, address the first 19 identified items related to economic obsolescence, implementing measures to monitor and correct these issues effectively.

iv. Environmental Impact Assessment EIA should be made a standard procedure for all new developments and significant renovations to identify potential environmental impacts and develop mitigation strategies beforehand. Similarly, focus should be placed on the first 7 identified factors influencing environmental obsolescence to create a more sustainable built environment.

v. Foster community involvement in the maintenance and management of buildings to ensure on-going relevance and engagement with the occupants' needs and preferences. Emphasis should be on first 17 identified factors that significantly contribute to legal/social obsolescence, implementing targeted strategies to address these areas urgently.

6.0 CONTRIBUTION TO KNOWLEDGE

This research provides a comprehensive overview of the multifaceted nature of building obsolescence, identifying essential components within each category that professionals must address. The application of Pareto analysis not only highlights the most impactful factors but also informs where efforts should be focused for optimal effectiveness in mitigation strategies.

7.0 LIMITATION OF THE STUDY

The study relies on a convenience sample of 60 professionals from Kaduna state chapters, with 50 valid responses, which may limit generalizability to other regions or sectors. Self-reported data may be subject to response bias. The cross-sectional design captures obsolescence factors at a single point in time and may not reflect temporal changes.

REFERENCES

Ahmad, N., Aspden, C. and Schreyer, P. (2005), “Depreciation and obsolescence (23)”, Paper prepared for the meeting of the Canberra Group on Non-Financial Assets in Canberra.

Ahmad, I., Shakir, M. Z., & Ali, S. A. (2023). Understanding Building Obsolescence: A Critical Review. Journal of Architectural Engineering, 29(1), 04023002. https://doi.org/10.1061/(ASCE)AE.1943-5568.0000470

Agbodjah, L. S. (2008) A Human Resource Management Policy Development (HRMPD) Framework for Large Construction Companies Operating in Ghana. (Unpublished PhD Dissertation). Kwame Nkrumah University of Science and Technology, Accra, Ghana.

Aksozen, M., Hassler, U., Rivallain, M. and Kohler, N. (2016), “Mortality analysis of an urban building stock”, *Building Research and Information*, 45(3), 1-19.

API (Australian Property Institute), 2017 API Definitions, available at: www.api.org.au. Definitions. accessed 17.06.2022.

Ashworth, A. (2004), Cost Studies of Buildings, 4th ed., Pearson/Prentice Hall, Oxford.

Babcock, B. A., & Watzold, F. (2016). Land-use policy strategies to cope with climate change. Environmental Science & Policy, 66, 67-74. https://doi.org/10.1016/j.envsci.2016.09.004

Baum AE. (1991) Property Investment depreciation and Obsolescence, *Routledge*, London.

Bojan, S., Živče Š., Dragan L., Danijela, M, (2015) Application of The Pareto Analysis In Project Management. *9th International Quality Conference*. Centre for Quality, Faculty of Engineering, University of Kragujevac. 655-658.

Bourne, L. S. (2019). Land and property markets in the urban economy: A resilience framework for educating city planners. International Journal of Urban Sciences, 23(2), 171-187. https://doi.org/10.1080/12265934.2018.1524699.

Caccavelli, D. and Gugerli, H. (2002), "TOBUS — a European diagnosis and decision-making tool for office building upgrading", Energy and Buildings, 34(2), 113-119.

CALUS. (1986). Depreciation of Commercial Property, CALUS, College of Estate Management, Reading, England,

Chen, C. J., Juan, Y. K. and Hsu, Y. H. (2017), "Developing a systematic approach to evaluate and predict building service life", *Journal of Civil Engineering and Management*,23(7),890901.

Chen, Z., Liu, J., & Zhang, Y. (2020). The role of government policy in technology advancement and adoption in the construction industry. International Journal of Construction Management, 20(3), 264-272. https://doi.org/10.1080/15623599.2020.1734166.

Cheong, E.S. (2010). A study of Building Obsolescence in Standard Design Terrace Houses in Perale. Available at www.ukessays.com/essays/property/a-study-of-buildingobsolescence,php.

Douglas, J. (2006), Building Adaptation, 2nd ed., Spon Press, Abington

Downs, A.H. (1995), "The hidden impacts of obsolescence", National Real Estate Investor, 37 (8), 18-20.

Drew, D. S., & Hodge, C. (2018). The role of social factors in urban area development: An analysis of community engagement practices in urban regeneration projects. Urban Studies, 55(13), 3040-3056. https://doi.org/10.1177/0042098017718091

Flanagan, R., Norman, G., Meadows, J. and Robinson, G. (1989), Life Cycle Costing Theory and Practice, BSP Professional Books, Oxford.

Foster, J., & Mathur, V. (2019). The impact of proactive building management on reducing obsolescence risk. Journal of Property Management, 37(3), 22-31. https://doi.org/10.1108/JPM04-2019-0029

Glasson, J., Chadwick, A., & Elson, M. (2013). Environmental Impact Assessment. Routledge. https://doi.org/10.4324/9780203071986

Grigsby, W., Baratz, M. and Maclennan, D. (1983), "The dynamics of neighborhood change and decline (*Research Report Series*:(4)", University of Pennsylvania, Philadelphia.

Grodach, C. (2017). The role of urban design in the emergence of creative clusters: Evidence from a comparative analysis of two neighborhoods in the United States. Urban Studies, 54(5), 11441160. https://doi.org/10.1177/0042098016667242

Grover, R. and Grover, C. (2015), "Obsolescence – a cause for concern?" Journal of Property Investment and Finance, 33(3), 299-314.

Hedman, L., & Karadimitriou, N. (2017). The impact of age on property value in the residential real estate market. International Journal of Housing Markets and Analysis, 10(2), 163-179. https://doi.org/10.1108/IJHMA-09-2016-0044

Hwang, B.-G., & Ng, W. J. (2013). Project management knowledge and skills are critical to project success. International Journal of Project Management, 31(3), 224-237. https://doi.org/10.1016/j.ijproman.2012.06.004.

International Organization for Standardization ISO 15686-1 (2011). Buildings and Constructed Assets—Service Life Planning—Part 1: General Principles and Framework; International Organization for Standardization: Geneva, Switzerland, 2011.

Johnston, K. (2016), "Obsolescence and renewal: transformation of post war concrete buildings", master thesis, University of Maryland

Kahn, M. E. (2005). The death of distance? The impact of natural disasters on the residential real estate market. Business Economics, 40(4), 50-56. https://doi.org/10.2145/2004780

Kalligeros, K. (2003), "Framework for the optimal design of corporate facilities for contracting operations", *6th SMESME International Conference*, Athens, Greece.

Khan, W. Z., & Pannell, C. (2020). The impact of fast technological change on built environment: Making sense of continuous change. Smart and Sustainable Built Environment, 9(4), 525-541. https://doi.org/10.1108/SASBE-11-2019-0105.

Kibert, C. J. (2013). Sustainable Construction: Green Building Design and Delivery. John Wiley & Sons.

Kintrea, K. (2007), "Housing aspirations and obsolescence: understanding the relationship", Journal of Housing and the Built Environment 22(4), 321-338.

Leaman, A., Stevenson, F., and Bordass, B. (2010). Building evaluation: practice and principles. Building Research & Information 38(5), 13.

Lemer, A.C. (1996), "Infrastructure obsolescence and design service life", Journal of Infrastructure Systems, 2(4), 153-161.

Mansfield, J.R. (2000) Much Discussed, Much Misunderstood: A Critical Evaluation of the Term "Obsolescence". *In Proceedings of the RICS Cutting Edge Conference, London, UK*.

Mansfield, J.R. and Pinder, J.A. (2008), "'Economic' and 'functional' obsolescence: their Characteristics and impacts on valuation practice", Property Management, 26(3), 191-206

Nwanekezie, O. F., and Nwanguma, R. W. (2020) Assessing the Effect of Building Obsolescence on Property Values in Uyo, Nigeria. *Architecture Research*, 10(1): 21-26 DOI: 10.5923/j.arch.20201001.0. Published by Scientific & Academic Publishing

Olajide, S. E and Ijagbemi, C. O. (2019) Review of the impact of obsolescence on residential property values. *International Journal of Multidisciplinary Research and Development.* 6(8), 92-99. www.allsubjectjournal.com

Oyeyoade, S. F., and Aroloyin F. M (2019). The Influence of Sustainability and Green Management Concepts on Educational Facility Performance in Nigeria, *Real Estate Management and Valuation*. 27(2), 77-96. DOI: 10.2478/remav-2019-0017.

Pourebrahimi, M and Eghbali S. R (2020) Identifying building obsolescence: Towards Increasing Buildings' Service Life. *International Journal of Building Pathology and Adaptation* © Emerald Publishing Limited 2398-4708 DOI 10.1108/IJBPA-08-2019-0068.

Price-waterhouseCoopers (2020) Collection of Statistical Information on Green Public Procurement in the EU – Report on Data Collection Results. PricewaterhouseCoopers, Amsterdam, Netherlands.

REBE (Real Estate and Built-environment sector in the EU) (2016). Factsheet- The contribution of the real estate and built environment sector in the EU.

Reed, R. and Warren-Myers, G. (2010), "Is sustainability the 4th form of obsolescence? 16th *Pacific Rim Real Estate Society", (PRRES) Conference*, Wellington.

RICS (Royal Institution of Chartered Surveyors) (2017), RICS Valuation – Global Standards, www.rics.org/globalassets/rics-website/media/upholdingprofessionalstandards/sectorstandards/valuation/red-book-2017-global-edition-rics.pdf.

Rodriguez, J., Dorsey, M., & Yen, J. (2018). Deterioration and its effect on the social value of buildings. Journal of Building Performance, 9(3), 58-66. https://doi.org/10.21834/jbp.v9i3.214

Sarja, A. (2006), Predictive and Optimised Life Cycle Management, Taylor and Francis, London.

Silva, A.; de Brito, J.; Thomsen, A.; Straub, A.; Prieto, A.J.; Lacasse, M.A. (2022). Causal Effects between Criteria That Establish the End of Service Life of Buildings and Components.*Buildings*. doi.org/10.3390/buildings12020088.

Smith, T. (2004), 'Fend off professional obsolescence' in Journal of Property

Management,1,1.

Talib, F., Rahman, Z., & Queresi, M.N. (2010). Pareto analysis of total quality management factors critical to success for service industries. International journal for quality research, 2, 155-168.

Thomsen, A. and Flier, K.V.D. (2011), "Understanding obsolescence: a conceptual model for buildings", Building Research and Information, 39(4), 352-362.

Tzafestas, S. (2014). Human-centered automated systems: Challenges and prospects. Automation in Construction, 42, 1-10. https://doi.org/10.1016/j.autcon.2014.03.014.

Wilkinson, S.J., Remøy, H. and Langston, C. (2014), Sustainable Building Adaptation: Innovations in Decision-Making, 1st ed., John Wiley & Sons, West Sussex.

Zhou, P., Chen, X., & Hwang, B.-G. (2020). The impact of environmental hazards on building obsolescence. Sustainable Cities and Society, 56, 102077. https://doi.org/10.1016/j.scs.2020.102077

Zhou, H., Wang, C., & Arif, M. (2015). Factors influencing the sustainable control of technological obsolescence in buildings. Engineering, Construction and Architectural Management, 22(1), 72-89. https://doi.org/10.1108/ECAM-05-2014-0074