

# Effectiveness of Risk Management Instruments by Project Team for Sustainable Construction Projects in Nairobi Kenya

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**Abstract:** Construction is one of the sectors that contribute to economic wellbeing of a country. However, when a building collapses, it results in the loss of lives and investment. This is counterproductive when the construction product not only does not fulfill its objective but results in severe loss. The study was conducted to evaluate the effects of risk management instruments of sustainability of construction in Nairobi, Kenya. The research problems were formulated from the concern that there exists risk management instruments namely professional indemnity, why does the construction industry continue to suffer severe losses due to collapsed buildings? Case study and empirical reviews was used to conduct the study; Whereby various studies on risk management and sustainability were reviewed. From the studies it was established there is diversity with regards to sustainability concept which increases its scope of application. However, research gaps were found from the studies. Both the empirical and case studies supported the objective that project professionals have a role to play in vice of collapsed building. A conceptual framework was proposed with corruption identified as mediating variable.

**Keywords:** Project Team, Project Sustainability, Construction Projects, Risks, Risk Management.

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## 1. INTRODUCTION

According to the Project Management Body of Knowledge (PMBOK), a project is a temporary endeavor undertaken to create a product or service that have a definite beginning and an end. Kenya Bureau of Statistics, stated that in the year 2016 the Gross Domestic Product (GDP) of Kenya was Kenya Shillings Seventy million. Contribution from the Construction Sector was sixty-one million shillings. Construction sector was ranked as the fourth largest GDP contributors after Agriculture, Manufacturing and Transport Sector hence critical sector [22]. Unfortunately, Construction review in 2016/2015 reported that in Kenya the construction sector is counting losses to the tune of Kenya Shillings twenty billion due to collapsed construction projects. Not only loss of investments but also loss of lives.

In the year 2015, the president of Kenya commissioned an audit of all buildings in Nairobi [39]. Unfortunately, the commission found out that only forty two percent of the buildings structures are fit for habitation [38]. This statistic means that 58% of the buildings in Nairobi are not suitable for human habitation in their current state. Further, it will be erroneous to assume that fifty eight percent of these buildings are newly constructed and thus fall within the contractor's defects liability period.

In 2016, a high-density building collapsed in Huruma whereby forty people lost their lives. Huruma is one of the satellite areas of Nairobi, the capital city of Kenya. Regrettably, the collapsed building phenomenon is not isolated to one area, they have been witnessed across the borders of Kenya from Kisii, Kirinyaga, Nairobi in Embakasi area, Kayole and even in Central Business District. Cases of buildings collapsing in the country have become so common that whenever one happens, the common comment is usually a sigh accompanied with the words 'Not again!' [21].

PMBOK focus of project success in terms of delivery within budget, time and quality. This seems to overlook a critical aspect of sustainability. A project is supposed to not only to survive the intended life span and also to continuously meet the need of which the project was initiated. A building that collapses and or develops structural defects few years after

construction, has not met the sustainability threshold. It may have been “successful “by being delivered within time and budget.

Risk management is a knowledge area in project management. According to PMBOK Project Risk management exist to minimize the impact of negative event and or increase the impact of positive event. In construction, tools used to minimize negative impact include professional indemnity, performance bond, contractor all risk policy, defects liability insurance in conjunction with proper approvals for implementing the works. Concern is why the construction industry continue to experience these losses while these instruments exist. How effective are these instruments in a bid to promote sustainability of the constructed buildings? These instruments are currently in use and their validity lasts up until the implementation of the project is done. Here is a mismatch mostly because the lifespan of a building is about fifty years. The project team should be infused with the project lifespan.

### Statement of the Problem

In the year 2012, United Nations Development Program (UNDP) launched the Sustainable Development Goals (SDGs), a shift from Millennium Development goals [45]. The SDGs essence is to promote partnership and pragmatism practical initiative to improve lives in a sustainable way [44]. The concept of sustainability being advocated is in the analogy of a bridge. A link of current activities and future impact [44]. One of the SDGs is Sustainable Cities and Communities [39].

Aysha Fleming (2017) [2] in their study “The sustainable development goals: A case study”, notes that the practical challenge of SDGs is the implementation of the change. The shifts to SDGs is that it goes further to address the root cause of poverty, universal needs and the goals are universal incorporating both the Developed and developing economies [44].

PMBOK notes that projects are launched in response to opportunities, which in tandem increases associated risks that must be addressed. Construction being an ancient activity, one can assume that the associated risk is well known. The question is, are the strategies applied on those risks sufficient?

*Further reports of three case studies of collapsed buildings in Kenya were reviewed to assist in the conceptualization of the loss experienced in the Kenyan construction sectors.*

**Table 1: Case study of collapsed building in Kenya**

Project	Description
Huruma building tragedy - 2016	In 2016 the building collapsed and it had one of the highest causalities. The diagnosis of the building included; failure to observe riparian way leave (the distance from the center of a river to the edge of a building), soil type alluvial soil, shallow foundation, corruption, excess number of units to plot size, poor workmanship, short construction period, weak columns and flouting structural soundness
Kisii building tragedy -2017	The tragedy occurred in October 2017 resulting to seven fatal casualties. The diagnosis reports cited low capacity for supervision, exceeding the five-floor limit to 10 floors and failure to enforce two suspension orders from the National Construction Authority
Nakuru four building tragedy- 2017	The building came down in October 2017. It is not clear if the disaster had any causality(s). This is because notice to tenants to move out/vacate had been issued earlier after cracks developed and later on the building partially collapsed. Preliminary reports indicated that the building was declared unfit for occupation.

Source: [39]

There is, therefore, need to study the effectiveness of risk management instruments in promoting sustainable construction by eliminating current losses of lives or of investments.

## 2. THEORETICAL REVIEW

The paper will consider the following theories: Contingency theory, Agency theory, and Risk management theory.

### Contingency Theory

Kaplan 2012 [21] states that under Contingency Theories, there is no correct style or approach of leadership. In principle, Contingency theories promote diversity and innovation. They encourage leaders to understand their current circumstances and adapt their approach accordingly [21]. However, in practice, many managers find it difficult to vary their leadership

approach on a regular basis instead simply find a style that they are comfortable with and stick with it [21]. The contingency theory of management accounting concurs with the contingency theories of leadership. This is in the similarities of approaches; premises that there is no universally appropriate system applicable to all circumstances or company [4].

The contingency theory focuses not only on the leader but also on the situation in which the leader is interacting with others [3]. The Fiedler contingency model has been criticized for its rigidity by failing to explain why leaders with certain leadership styles are effective in some situations but not others. It also criticized that Least Preferred Co-worker Scale (LPC scale) validity as it does not correlate well with other standard leadership measures. The contingency theory also fails to adequately explain what should be done about a leader/situation mismatch in the workplace [28]. The goal of an audit is to test the reliability of a company's information, policies, practices and procedures. This is important in the study whereby there is need to evaluate the sufficiency of existing risk management instruments in construction project.

The instruments used to mitigate risk in construction projects are dependent on project professionals which in turn lead to sustainable projects. A contractor will be required to hold public liability insurance, while an architect and other professional require Professional Indemnity insurance cover. All of these instruments are time bound. The Contractor's All Risk Policy is generally obtained by the contractor on behalf of the employer, with both names on the policy. It is restricted to a specific project and rarely extends past project implementation phase.

A mismatch arises when the instrument has a short-term validity period vis a vis the long term life span like the permanent structures.

### **Agency Theory**

An agency relationship arises when one or more principals (e.g. an owner) engage another person as their agent (or steward) to perform a service on their behalf. Key players of the project team include Engineers, Land Surveyor, Architect Structural consultant, Quantity Surveyor, Project Manager, Clerks of Works and the builder/contractor. These players act as agents of the client who is primarily the project sponsor. Agency theory acts as framework for resolving conflict between the principal and the agent by offering the best industry standards for benchmarking [42]. In construction projects the principals party keeps rotating with key responsibility oscillating between the approving authority being the government and the project sponsor. It is expected that the agent should always act in the best interest of the nations citizens who are the consumers parse of the end products.

Donaldson (1990) [13] criticized the agency theory dominance in terms of methodology individualism, narrow-defined motivation model, regressive simplification, disregarding other research, ideological framework, organizational economics and corporate governance's defensiveness. The challenge of Agency theory is that it goes against the opportunistic human nature. This is evidenced by the rough contractor and project sponsor who flaunt construction rule to gain an extra dollar.

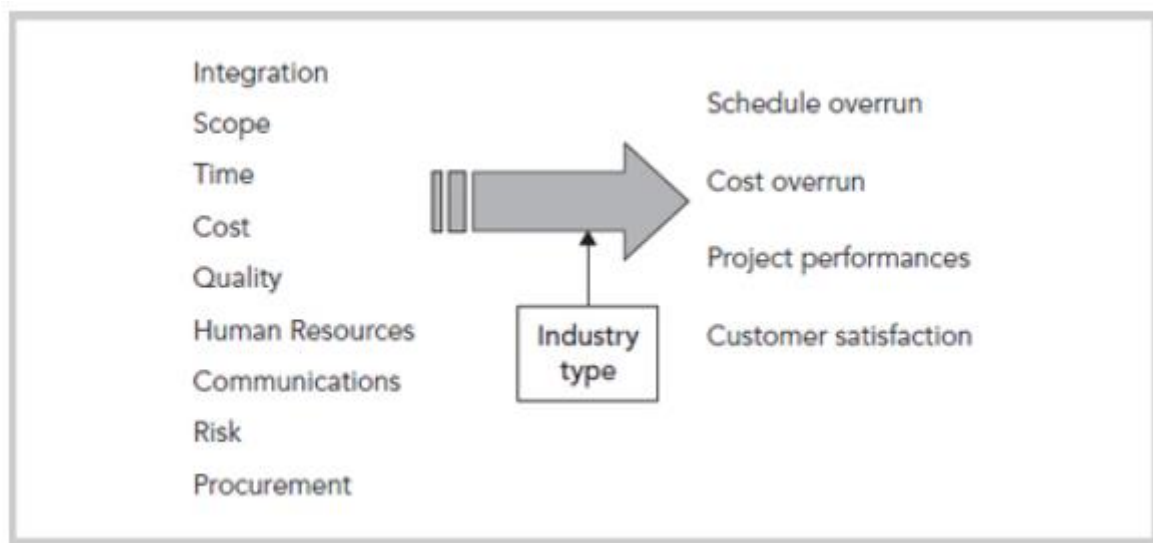
Proponents of agency theory state that control mechanisms are obligatory for directing opportunistic managerial behavior, although empirical researches confirm that control generates stronger individualistic behavior, reduces proactive organizational behavior and trustworthiness, and lastly results with distrust. Analyzing phenomena only within agency theory framework may result in: 1) disregarding of principal's obligation towards agent; 2) ignoring distrust development and disrespect of agents; 3) neglecting ethical aspects and 4) overlooking of prospective solutions consistent with ethical norms. The failing corporate governance system, excessive risk-taking and the greedy manager which have all been cited as reasons for the recent construction tragedy.

### **Risk Management Theory**

Zhang 2011 [48], presents a new dimension on viewing risk. He categorized risk into two schools of thought namely objective fact and subjective construction. The basic aim of Zhang study was to explain the diversity and significance of project risk management. In support of the two schools of risk Kutsch and Hall (2005) [25] find that project managers sometimes do not "rationally" manage risks although they have identified them. Rather, they intentionally or unintentionally (driven by culture) deny, avoid, delay, and ignore risks. This response matches PMBOK risk response strategies which as per Kutsch et al (2005) [25] are not sufficient.

Zwikael, O. (2009) [50] study on relative importance of PMBOK nine knowledge area during project planning, concludes that if project managers are aware of the importance of this knowledge area then they make better decision in terms of resource allocation. The benefits of risk management in projects are huge. One can gain a lot of money if they deal with uncertain project events in a proactive manner.

The study seeks to review current risk management instruments applied in construction management in response to the identified risks. This is targeted to ensure that ensured all construction project stakeholders maximize the returns of project implementation. The result will minimize the impact of project threats and seize the opportunities that occur. This allows the project team to deliver the project on time, on budget and with the quality results that the project sponsor demands. Further stress levels will be low due to reduction of firefighting crises management, less rework, needed to repair work that could have been prevented. Zwikael et al (2009) [50] model, illustrated under figure 1 mirrors the benefits of risk management to the project. Over and above these benefits is what UNDP now brings in sustainability dimension. Sustainability is not only about review and assessing what has been achieved, but also to build upon it and revive its promise of integration, unity and aspiration [44].



**Figure 1: [50]**

PMBOK list four categories of risk. This mirror the key risk in construction project. First there is Technical or performance risks category. Second is the Project management risks such as poor allocation of time and resources, inadequate quality of the project plan, poor use of project management disciplines. Organizational risks is the third category. It entails items such as cost, time, and scope objectives that are internally inconsistent, lack of prioritization of projects, inadequacy or interruption of funding, and resource conflicts with other projects. Fourth is the External risks arising from shifting legal or regulatory environment, labor issues, subcontractors and suppliers, country risk and weather.

### 3. EMPIRICAL REVIEW

#### Risk Management

Zhang, J. and Wei, W. X. (2012) [49], study on managing Political Risks of Chinese Contracted Projects in Libya. Noted with concern that Chinese constructors are not good at political risk management due to their traditional attitudes toward risk. Case study was conducted to assesses the political risk for Chinese contracted projects at three levels and also studies their countermeasures to this emergency and the effects of political risks .The author concluded that the Chinese businesspersons do not have a realistic attitude toward political risks whereby they usually refuse to spend any small amount of extra money in order to transfer risks to insurers in the future, because the Chinese government used to reimburse any losses incurred. Another reason why Chinese constructors did not buy political risk insurance is political risk insurance products and services are limited, and few insurance companies can provide advice on risk management in China.

Project risk management is an important aspect of project management. According to the PMBOK, Risk management is one of the ten knowledge areas in which a project manager must be competent. Further PMBOK outlines the process of risk management involving risk identification, categorization based on scale of probability and impact then plan risk response which is either risk avoidance, risk transfer, risk diversification and risk mitigation/limitation.

Another study by Chuing Loo, S., Abdul-Rahman, H. and Wang, C. (2013) [8], was about sources of risk in an international project; namely external risk and domestic risk. The study was conducted using a questionnaire survey and case studies among the construction professionals which includes; architectural, engineering, and construction (AEC) firms operating in the Gulf. This study found 36.5% external risk factors that should be contemplated before the award of contracts and 53.9% afterward to ensure smooth running. Chuing Loo et al (2013) [8] notes that the allocation of risk among project participants is an important determinant of innovation in construction projects. This study was based in the energy sectors and does review pertinent issues in mitigating risks. The study did examine the capacity of risk allocation to encourage the implementation of environmental innovation, particularly sustainable energy innovation (SEI), within the private finance initiative (PFI) project delivery model

Construction project environments are mainly characterized by two types of risk: project-related risk and innovation-related risk [26]. Project related risk encompasses a wide range of categories all concerned with the possible events that could endanger the planned course or objectives of the project. Innovation related risk includes a number of unavoidable risks such as technical risk [47], financial risk [27], and capital cost risk [20]. Project- and innovation-related risks are interconnected and largely affect the outcome of the attempt to innovate [26]. The study proposed the use of contracts to share projects risks. The specifics about the contracts was not addressed in the study nor the duration of liability.

### **Sustainable Construction**

Chaturvedi, S. (2016) [6], notes that in the recent past new trends have emerged establishing new frontiers. One of those development is the Green Economy. This is one of the concepts of sustainability. The green economy is defined as an economy that aims at reducing environmental risks and ecological scarcities, and that aims for sustainable development without degrading the environment [46]. Green construction is earning popularity in many countries. Hwang, and Tan (2012) [18], study was on Green Technology in Singapore. Using survey and interview as instruments of data collection, the authors sample of thirty-one construction industry experts. The study's aim was to identify common obstacles encountered during management of green construction projects and propose some solutions to overcome the barriers. The study proposed a threefold solution package after establishing that the biggest hindrance of green technology was project cost and not technical knowledge on sustainable construction. To deal with the cost related problem, the author advised the use of government incentives to encourage uptake and usage of green products and technologies.

The main variables in the Hwang, et al (2012) [18] study was Green technology namely energy, legislation and regulation, building material and building design as the dependent variables. The authors experienced the usual research challenges including respondent refusing to divulge information for fear of victimization.

Herazo, B., Lizarralde, G. and Paquin, R. (2012) [17], study reviewed the Sustainable Development in the Building Sector using a case study in Canada. The other problem concern was how sustainable development contributes to aligning longer-term strategic management of clients in the building sector with their short-term needs for construction project management. The case study involved three construction projects developed from concept to contract awarding. The key deficit of the study is that it did not evaluate sustainability after successful implementation of the project. The authors concluded that the principles of sustainable development transcended both short-term needs and long-term responsibility, facilitating the alignment of the strategic and tactical plans.

Herazo et al (2012) [17] variables were decision making and corporate strategies. The authors line of thought was that sustainability will be achieved if the organization align day to day activities with strategic foresight. Thus, it was more of a managerial study on construction companies. Their view of sustainability is still critical more so in the building sector because "the construction industry has been accused of causing major environmental problems ranging from excessive consumption of global resources both in terms of construction and building operations to the pollution of the surrounding environment.

Brooks, A. and Rich, H. (2016) [5], brings in a new twist in sustainability. This is because not only does the author review mega projects and evaluates drivers. The authors concern of sustainability is similar to Hwang et al (2012) [18] study.

Both the studies observe that Sustainable construction attempts to mitigate the destructive impacts of building on the global environment. The authors used interviews and questionnaires to collect data from six leading contractors involved in some of London's mega property and transport infrastructure projects. Data was analyzed with some of the items being reviewed under sustainable dependent variable being procurement, design and technology.

A similar dimension on sustainability with regards to environmental conservation was undertaken by conducting contractors' surveys in United States of America and Korea. Son, Kim, Chong and Chou (2011) [35], surveyed contractors on their level of awareness of sustainable construction measures that could be implemented during the actual construction phase, and on their level of preparedness to implement such measures.

One of the studies proposed the use of innovation when allocating risk supported by government guidelines [36]. Herazo et al (2012) [17], however the focus was on construction companies and not the end product of the construction which is the main concern of the sustainability being promoted by SDGs. Hwang, et al (2012) [18] study reviewed the utilization of Green technology. It did not go to the next level to evaluate on the longevity of these initiative as a building could be Green compliant in terms of design and still have defects.

### **Risk Management Instruments by Project Team for Sustainable Construction**

Hwang, Zhao, See, and Zhong (2015) [19], conducted study using triangulation method dubbed 'Addressing Risks in Green Retrofit Projects'. Retrofits is to add a component or accessory to something that did not have it when manufactured [10]. The objectives of the study by Hwang et al (2015) [19] was to identify the risks in green retrofit projects in Singapore; analyze their risk criticalities; compare the risk criticalities between conventional and green retrofit projects; and provide mitigation measures for the critical risks. Twenty risks and thirty seven mitigation measures were identified from a literature review. A questionnaire survey was performed with thirty professionals experienced in green retrofits, and five post-survey interviews were conducted. The results indicated "post-retrofit tenants' cooperation risk" was the top risk, and that 19 risks were more critical in green retrofits than in conventional retrofits. Additionally, 28 mitigation measures obtained significant agreement.

Hwang et al (2015) [19] pointed out the post implementation risk being among other, structural defects, building degradation and building destruction. This supports the need to focus on post implementation risks. Oyedolapo Ogunbiyi, Jack Steven Goulding, Adebayo Oladapo, (2014) [30] greatly contributed to the concept of sustainable construction. The author proposed that use of lean construction techniques should be enshrined in government policy. This supports the study direction that for effectiveness and avoid ambiguity, there is need to review current Risk management instruments utilized in construction for enhance effectiveness. The study was conducted using exploratory research with the dependent variables being lean technology. Oyedolapo et al, (2014) [30] has some similarities with the current review of risk management instruments for sustainable development. Similarities are in the independent variable and use on technology to influence the independent variable. The shortfall of the study is that technology is one of the methods to implement project; not the end product.

### **Proposed Conceptual Framework**

#### **Key**

DV-Dependent Variables

Risk management instruments

- Professional indemnity
- Defects liability insurance
- Warranty

IV-Independent variable

Sustainable construction

M-Mediator

Corruption

### **Proposed Methodology**

The study proposes adoption of agile methodology with set benchmarks on extent and duration of liability for property defects. In order to level the playing ground for all stakeholder and to reduce pointing the accusing figure these expectations should be entrenched in the law of the land. The same provisions will be cascaded into the contracts of the project team. Triangulation methodology should be used in data collection due to the sensitivity of vice being studied. The study should transverse the whole country, as housing is a basic need for humans.

#### 4. FINDINGS AND DISCUSSIONS

PREVIOUS WORK	COUNTRY	PHILOSOPHICAL FOUNDATIONS	STUDY TYPE	INHERENT GAPS
Herazo, B., Lizarralde, G. and Paquin, R. (2012), Sustainable Development in the Building Sector	Canada	The focus of the study was on alignment of strategic management to tactical management during the project concept stage.	Case study	The scope of the study did not include post implementation of the project
Hwang, B.-G. and Tan, J. S. (2012), Green building project management	Singapore	The study focus was on the end product, reviewing the uptake of green technology	Survey and interviews	The study was focusing on the end product i.e. the actual construction product. However, it was limited to if green technology was applied not on the lifespan of the end product.
Brooks, A. and Rich, H. (2016), Sustainable construction and socio-technical transitions in London's mega-projects	London	The focus of the study was on the main drivers and barriers to embracing sustainability concept on mega project. The unique factor about the study it that it identified factors that act as both drivers and barriers to sustainability like client buy in. In total there were twelve factors.	interviews and questionnaires	The study did not focus on the end product parse but on factors that drives and/ or hinders embracing sustainability concept
Zhang, J. and Wei, W. X. (2012), Managing Political Risks of Chinese Contracted Projects in Libya.	Libya	The study aimed assesses the political risk for Chinese contracted projects at three levels and also studies their countermeasures to this emergency	Case study	The study was reviewing only one risk, political risk during project implementation. The other risks were not reviewed, while they are material or substantial in relation to sustainability
Chuing Loo, S., Abdul-Rahman, H. and Wang, C. (2013), Managing External Risks for International Architectural, Engineering, and Construction (AEC) Firms Operating in Gulf Cooperation Council (GCC) States.	Gulf	The study was on two broad categories of risk i.e. namely external risk and domestic risk. It included a variety of project professionals and it complied with the PMBOK risk management process.	questionnaire survey and case studies	The study did identify common construction project risk and proposed a solution that the risk allocation should be captured in contractual documents. However, it did not elaborate on the duration to which the professionals are liable.
Oyedolapo Ogunbiyi, Jack Steven Goulding, Adebayo Oladapo, (2014) " <u><a href="#">An empirical study of the impact of lean construction techniques on sustainable construction in the UK</a></u> "	United Kingdom	The study was on the use of lean construction techniques to promote sustainability proposed that for effectiveness lean technology should be enshrined in government policy	Exploratory research	The shortfall of the study is that technology is one of the methods to implement project; not the end product

## 5. CONCLUSIONS AND RECOMMENDATIONS

The study has highlighted diversity in terms of interpretation and application of the sustainability concept in construction industry. This diversity is positive and in line with the SDG spirit in that each party applies that which is most relevant to their environment. This concurs also with the principal of Contingency theories. Reports from the case studies above can be broadly categorized as defects caused by failures in design, poor workmanship, inferior materials and insufficient supervision. These are preventable reasons and have the corruption as the underlying factor. Impunity, contempt for life, greed, arrogance and utter negligence thrives in corrupt environment.

Collapsed building continue to plague Kenya due to lack of the long term “responsible” effect. Legislature and laws governing construction should be revamped and extend the liability of the project professionals to match the building design lifespan. This will stem the prevailing menace of corruption and professional negligence. If the project professionals were to be held solely responsible, situations would be different. The project professionals would then take different steps to avoid the side effects of noncompliance

Proper risk management should be sufficient to address the threat identified especially after it has been established that the probability of occurrence is high with grave consequences. Risk management instrument to be enhancing to address emerging trends. The study responds to an important gap in knowledge as there has been no attempt to explore the relationship between PFI and sustainability innovation, including those for sustainable energy. Therefore, the descriptive case studies, and their subsequent analysis and findings should prove valuable to both public and private sector actors interested in the delivery of sustainable buildings, not only within BSF but for the PFI sector at large. The research falls short in addressing longevity of the projects. Therefore incorporating the factors that support project durability with reference to time, will reverse the trend seen (from the data on collapsed buildings and review of all papers talking about sustainability). This will have a positive impact and go a long way in promoting the sustainability concept. All sustainability concept/aspect should be encapsulated inside longevity.

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