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CHALLENGES TO RETROFITTING AND ADAPTATION OF EXISTING BUILDING WITHIN THE MAJOR CENTRAL BUSINESS DISTRICT IN GHANA

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ABSTRACT
Adaptation and retrofitting of existing buildings in recent times has gained increasing recognition as an acceptable alternative to new buildings. The aim of this study was to identify the challenges to retrofitting and adaptation of existing buildings within the major central business district in Ghana. Questionnaires were distributed to clients, contractors and construction consultants within Accra, Kumasi and Sekondi-Takoradi Central Business Districts. Out of the 300 questionnaires administered, 55% of responsive rate was achieved. Data generated from the survey was analysed using mean score ranking to determine the level of severity regarding its significance. The high cost of adaptation and retrofitting process, poor maintenance culture of building owners, health and safety requirements during retrofitting, building tenants' resistance to disruptive processes, inadequate government legislation among others were identified as some challenges to retrofitting and adaptation of existing buildings. It was therefore suggested that policy makers and practitioners should put in place measures for curbing such occurrences.

Keywords: Retrofitting, adaptation, challenges, Central Business Districts (CBDs), existing buildings

1. INTRODUCTION

Nature and structural buildings are increasingly becoming ineffective without the required comfort. Thus, if effective measures are not put in place to achieve the needed comfort, it will lead to inhabitable buildings. Simply put it, such building become unexciting for human accommodation. Building obsolescence then becomes the next trigger event (Wilkinson, 2011). Building obsolescence is the subject of

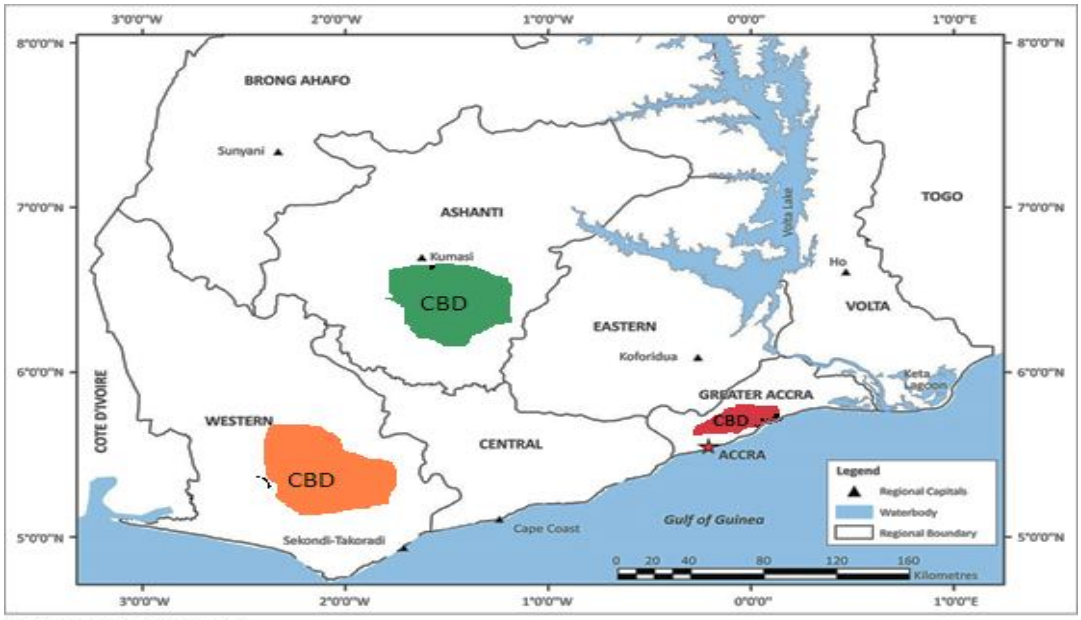
much research (Baum 1991). This happens when building has no utility whatsoever and demolition remains the only viable option. Notwithstanding, sustainable approaches are meant to create a healthy built environment using resource-efficient and ecologically-based principles (Bullen 2007). Based on this concept of sustainable construction, Wilkinson (2011), also reported on the four cardinal parameters namely: social sustainability, economic sustainability, technical sustainability and biophysical sustainability. Demolish as the only remaining viable option does not hold in terms of sustainable construction. Hence, obsolescence distressing any building at any time during its lifecycle can trigger an opportunity for retrofitting and adaptation. One way of deferring obsolescence in buildings is to adapt them either through a change of use or within the existing use (Kincaid 2002). Adaptation is also considered to be an effective strategy to improve the sustainability of existing facilities (Kohler, 1999; Kohler and Hassler, 2002; Douglas, 2002). One method of reducing mankind's environmental impact is to adapt existing buildings rather than default to demolition and rebuild. Global warming is a severe and pressing issue. Building retrofitting remains one of the most realistic approaches to reduce the present energy demand in existing buildings (Wang et al. 2012). There is now an irresistible body of scientific evidence that human activity is causing global warming, with the main sources of greenhouse gases (Stern, 2006). Facing global environmental issues such as declining resources and climate change, it is essential to greatly reduce the energy demand of these buildings, for example by retrofitting a better insulation (Jansson, 2013). Building retrofit programs can provide substantial benefits to both service providers and customers.

Arguably, most existing literature show adaptation and retrofitting as western concepts for green agenda of climate change adaptation and retrofitting (Tienda and Osei-Mensah, 1981). It suffices to mention here that, in Ghana, as developing country; building adaptation and retrofitting is akin to building transformation/ extensions (Adarkwa, 2012; Oppong and Brown, 2012; Adarkwa and Oppong, 2005) with little or zero emphasis on retrofitting. In the developed world, adaptation and retrofitting places emphasis on green agenda. Apparently, Ghana, as a developing country with serious energy challenges, retrofits and adapt existing building just to gain more space for commoditization (Adom and Bekoe, 2012; Perez-Fortes et al., 2012). Building construction and its associated operations have extensive direct and indirect impact on our society. Miller and Buy (2011) stated that buildings could account for approximately half of all annual energy and greenhouse gas emission and

this has become one of the major targeted areas in addressing climate change. However, there is also a strong view that dense cities are essential component in man-kinds attempt to mitigate the effect of global warming. Furthermore, most of our urban buildings are constructed without the consideration for sustainability (Wilkinson, 2012). Demolishing is often selected when the life expectancy of an existing building is estimated to be less than a new alternative, despite any improvements that adaptation may present (Douglass, 2002). Buildings are demolished because they no longer have any value (Kohler and Yang, 2007).

1.2. Why Central Business Districts?

Globally, Central Business Districts (CBDs) have been seen as the most populated regions in the urban development with intense activities especially in developing countries (Yaguang, 2011; Amoako et al.,2013). This area serves as an immerse contributor for various social, economic and institution activities. According to Amoako et al. (2013), it represents the heart of the urban area, which performs major economic activities that sustain the urban environment regarding employment and income generation. Amoako et al. (2013) further argued that in the middle of 20th century its development expanded to include office space, banking, shopping malls and government institutions. However, in recent times, CBDs have become cosmopolitan areas with diverse activities including commercial, retail, educational, entertainment, financial, local governance, political, health, tourism, civil and cultural purposes. Also, due to the amalgamation of gentrification and redevelopment CBDs have now been developed to include residential facilities. Similarly, CBDs within Ghana have seen massive redevelopment and change of the use of the various infrastructure which existed since independence. These developments are still on-going, and developers anticipate it will not end soon. Such redevelopment consists of retrofitting and adaptation of existing buildings within CBDs. Due to the nature and developmental anticipation of urban planners, there are a number of challenges faced by the authorities in undertaking such works. Therefore, the aim of the paper was to identify the challenges to retrofitting and adaptation of existing buildings within CBDs in Ghana. In view of that, the three (3) busiest cities (Accra, Kumasi, Takoradi) were chosen for the study. In the selection of the case cities, the study also considered the high rate of retrofitting and adaptation in these CBDs. (see Figure 1 for the map of these areas).



Source: Survey and mapping division, Ghana

FIGURE 1: Location of the study area along the Ghana coast.

MAP SHOWING THE CENTRAL BUSINESS DISTRICTS (CBDs) IN ACCRA, SEKONDI-TAKORADI AND KUMASI

Figure 1: Map of three major cities

1.2.1.1. Accra Central Business District

The Accra Central Business District resembles the European development due to colonisation. The central business district of Accra contains the city's main banks and departmental stores, and an area known as the Ministries, where government business is concentrated. After independence, the Accra CBD has seen massive expansion and remains busiest in Ghana. According to United Nations Centre for Human Settlements (1999) and Grant and Yankson (2003), the rate of urbanisation makes it one of the fastest-growing cities in West Africa. As a result, the area is congested with various activities including buying and selling, hawking, waste among others (Broadbent,2012), it remains one of the chaotic city in sub-Sharan Africa. Furthermore, there is an increasing urbanisation and rapid population growth in urban Accra, and as a result, there is considerable pressure on the limited infrastructure. This pressure has led to redevelopment of Accra CBD to contain such volume of population demand for more spaces. Also, technological and climate change has rendered most of the existing buildings not able to cope with current societal needs. It is, therefore, worth noting that there is a need for drastic changes in the CBDs, to accommodate various environmental, economical and societal demand through retrofitting and adaptation of the existing buildings (see Figure 1 and 2).

Figure 2 : Old-Then

Figure 3: New- Now

1.2.2. Takoradi Central Business District

The Takoradi Central Business District is located on the south-western of Ghana, about 242km west of Accra, the capital city. It is also approximately 280 kilometres from the La Cote d'Ivoire border to the west. The Metropolis is bordered to the west by Ahanta West District, to the north by Mpohor Wassa East District, to the east by Shama District and the South by the Gulf of Guinea. Similar to Accra Central Business District, it is faced with congested, high rate of population growth due to the discovery of oil in commercial quantities, it is one fastest growing Central Business Areas within Ghana (Composite Budget, 2012). A walk through, the CBD comes with a lot of difficulties as all spaces have been occupied with intense trading activities (Figure 4 and Figure 5). House owners, in seeing such development are currently modifying their existing buildings to accommodate the much-needed facilities such as banking halls, office space, educational and health facilities. These developments which is termed as retrofitting and adaptation has come with challenges which the paper seeks to identify.

Figure 4: Old-then

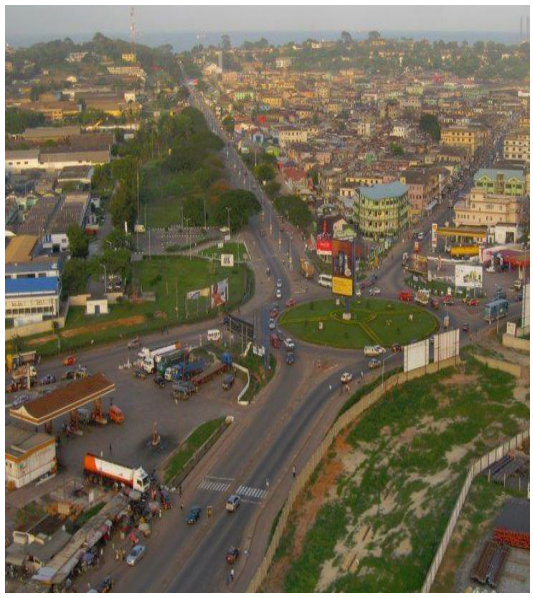


Figure 5: New-now

1.2.3. Kumasi Central Business District

Kumasi central business district has existed over the years traceable from the colonial days. Due to its economic activities, there has been rapid development everywhere in the district. According to Adarkwah and Oppong (2004), the area is mixed with various properties with majority of them being shops, offices and mixed commercial and residential development. They further reiterated that the area had seen major development including remodelling, renovation or refurbishment of the old structures to fit modern purposes. The Central Business District (CBD) of Kumasi is made up of Adum, Central market and Kejetia. Adum is approximately made up of about 75% stores, 15% offices and 10% residential Central Market, on the other hand, it's made up of 80% table top stores and 20% stores. Kejetia is made up of 60% commercial parking area/commercial vehicles, 30% stores, 5% offices and 5% residential. Kumasi is strategically located in relation to the whole of Ghana. All major roads and rail lines run through Kumasi, making the city a commercial nerve centre and the second most important city in Ghana. The strategic location of the central business district of Kumasi attracts a lot of buying and selling activities from all over the country (Togbi, 2008). According to Afram and Olympio (2009), there is a myriad of problems which are progressively impinging on the proper workings, growth and sustainability of such a vital resource. These problems include congestion of both, human and vehicular traffic, inadequate sanitary facilities, poor

refuse management, swarms of ubiquitous hawkers, lack of parking spaces.

Figure 6: Old-then

Figure 7: New-now

2. PREVIOUS STUDIES ON RETROFITTING AND ADAPTATION

Retrofitting existing buildings for sustainability is more challenging, however, than designing a new sustainable building from scratch" (Miller & Buys, 2011). Retrofitting for Sustainability is typically viewed as expensive and disruptive process, also building owners are often suspicious about design challenges and cost. In view of that, building users also show resistance to change and the disruptive process (Miller & Buys, 2011). Conventional upgrading or retrofitting techniques which usually includes the addition of existing walls, foundations and strengthening of frames often leads to costly consequences such as heavy demolishing, lengthy construction time and occupant relocation. Such costly, environmentally hostile and intrusive approach associated with these conventional processes usually deters building owners from retrofitting their buildings (Cheung et al., 2000). Dixon et al. (2014) stated that, in the UK, the most important barrier or challenge to retrofitting is related to economic factors, organisational issues (where retrofit project may be competing for funds) and lease structure. Concerning funding as challenge to retrofitting, Nishita and Pynoos (2006) cited in Oppong and Masahudu, (2014) added

that legislation, programming and funding have been hindering the retrofitting of existing buildings. The authors further emphasised that, most often, the legislation that supports the retrofitting has been slow to evolve and it is usually limited to large buildings. Internationally, many government agencies and private organisations are mandating the integration of Environmentally Sustainable Development (ESD) principles in commercial buildings and enforcing sustainability benchmarks for buildings (Madew, 2003). Yet Miller & Buys, (2011) argued that, whiles it is relatively easy to incorporate sustainability into new buildings, retrofitting existing buildings for sustainability is much more difficult. The retrofitting of existing buildings often requires an appreciation for the technical, economic and social aspect of the issue at hand. The changes in construction technologies and innovation in retrofitting technologies in our present day have added a number challenges. This is especially so when engineers have to select or develop a technical and socio-economic acceptable solution (Cheung et al., 2000). In the process of designing or developing retrofitting techniques, engineers are required to comply with the building codes. These techniques that are being adopted must also fulfil the minimum requirement of the building code, such as detailing, strengthening among others (Shrestha et al., 2000). Notwithstanding this, Shipley et al. (2006) argued that developers often complain about the inflexibility of the building codes and other regulations in requirement for building retrofitting.

It was identified by Manu (2012), cited in Danso et al. (2015) that, demolition and refurbishment are often associated with a higher risk than new buildings, and given that health and safety control measures must commensurate with the risk associated with the project. It is now without doubt that the health and safety measures that are needed for the adaptation and retrofitting of existing buildings must reflect the kind of risk that workers are likely to be exposed to. Thus, adaptation and retrofitting will need some extra force of health and safety defence in the form of measures and guidance to deal with the inherent health and safety issues. The challenge of the location of existing buildings to retrofitting is argued by (Wilkinson, 2012) that "whether a building is detached or attached affects the ease off or desirability for retrofit". Thus, buildings with less attachment help contractors work faster and cause less disruption to users. Table 1 presents the summary of the challenges.

Table 1: Challenges of adaptation and retrofitting of existing buildings

Challenges	References
High cost of adaptation and retrofitting process	Miller & Buys (2011)
Building user's resistance to disruptive processes	Miller & Buys (2011); Cheung et al., 2000
Lack of funding	Dixon (2014). Oppong & Masahudu (2014).
Inadequate legislation	Oppong & Masahudu (2014)
The difficulty in incorporating new technologies into existing buildings	Miller & Buys, (2011)
The demand for full compliance with building codes and regulations	Shrestha et al.(2000)
Health and safety requirements during retrofitting process.	Danso et al.(2015).
The location of building and its adjoining features	Wilkinson, (2012).

3. METHODOLOGY

The research adopted a mixed methodology approach. Thus, qualitative and quantitative paradigms were the underpinning philosophies considered. The qualitative approach involved the use of semi-structured questions among top industry players including contractors, consultants and clients. The reason for the use of the semi-structured interview was to triangulate literature review findings in order to improve and expand the depth of the results. This was done by elaborating and exploring the experience of the practitioners in relation to the phenomena under consideration. This helped in achieving variables that were peculiar to conditions about these central business districts. The second stage considered quantitative technique which involved the collection of primary data based on the twelve (12) identified variables in the previous stage. The sample for the data collection consisted of clients, contractors and consultants thus, representing the population of people who were associated with such developments. The questionnaire utilised closed-ended questions to explore challenges of retrofitting and adaptation. This was done by measuring respondents' perceptions on the level of severity using a Likert items, where: 1 = lowest (challenge); 2 = low; 3 = high; 4 = higher; and 5 = highest. Thus, the numerical representation, statistical analysis and subjective were the underlying individuals' perceptions.

3.1. Sample Size and Sampling Technique

The semi-structured interview was administered to ten (10) top industry players who have had not less than five-years practical experience on adaptation and retrofitting projects. The second section involved the use of closed-ended questions, which were also administered to three-hundred (300) professionals involving contractors, consultants and clients who have been involved or were doing such projects within the central business districts. Respondents had enough working experiences as more than half of the total sample size have more than five years. Added to their experience is their level of education, as majority had a Bachelor of Science and Higher National Diploma degrees in building technology. These questionnaires were administered using purposive snowballing sampling technique, which helped in reaching professionals who have an in-depth understanding on retrofitting and adaption, and those who were far from been reached. Out of the 300 questionnaires administered, 166 were retrieved with a valid response rate of 55%.

3.2. Data Analysis

The survey was conducted to identify the challenges to retrofitting and adaptation of existing buildings based on respondents' opinion. The results were then analysed using mean score ranking to determine the significant levels based on obtained means of various variables relative to one another. This method has been widely used in the construction management studies (Chan & Kumaraswany, 1996; Fugar and Agyakwah-Baah, 2010; Ameyaw, 2014; Kissi et al.,2016). In establishing the relevance, the variables were ranked based on the obtained mean, however, when two or more variables scored the same mean, the highest ranking is assigned to the one with least standard deviation (see Table 2). Similarly, the significance level was set at 95% in accordance with orthodox risk levels.

Table 2: Mean score ranking of the challenges

Challenges	Mean	Std. Deviation	Ranking
Building owners' refusal to adhere to planning regulations	*3.58*	*.986*	***1***
Poor maintenance culture of building owners	*3.49*	*1.169*	***2***
Lack of funding	*3.39*	*1.025*	***3***

High cost of adaptation and retrofitting	*3.29*	*1.056*	***4***
Lack of resources	*3.24*	*1.068*	***5***
Inadequate government legislation	*3.24*	*1.171*	***6***
Demand for full compliance with building codes and regulations	*2.95*	*.952*	***7***
The difficulties of incorporating new technologies into existing buildings	*2.89*	*1.194*	***8***
How to develop economically and socially accepted techniques in the process of retrofitting	*2.87*	*1.010*	***9***
Location of the existing building and adjoining features	*2.86*	*1.005*	***10***
Building tenants" resistance to disruptive processes	*2.84*	*.923*	***11***
Health and safety requirements during retrofitting	*2.66*	*.976*	***12***

4. DISCUSSION

4.1. High cost of adaptation and retrofitting process

The financial implication of adaptation and retrofitting existing buildings was a key driving force affecting the decision to undertake such works. Respondents agreed that a high-performance standard relates to a higher cost. It was deduced from the interviews that buildings were normally not built to standard due to the poverty levels in developing countries such as Ghana. This meant that it involves a higher cost in adapting and retrofitting existing buildings to standards. Findings from the interviews showed that a high cost of adaptation and retrofitting an existing building is a significant impediment affecting owners' decisions. One of the participant's interviewed stated that

> ***"The direct and indirect cost involved is huge. I don't think I will ever undertake such works. Aside from the direct cost of doing the works, there is also an added cost of losing business money due to the disruptions during the adaptation and retrofitting process''.***

This view was also shared by the professionals, that the huge cost deters owners from undertaking such a process. This they argued was also partly due to the cost variations that normally occur with such works. This assertion is in line with Bradley et al. (2008) who argued that the cost variation largely depends on a number of factors such as the type of structure, where it is located, characteristics of the building, desired performance level and other works triggered by retrofit decisions.

4.2. Poor maintenance culture of building owners

From the findings of the study across the cases, it was realised that generally maintenance culture within the Ghanaian society is poor. This relates to Obeng-Odoom and Amedzro (2011) work, which states that the problem of maintenance management practices plagues Africa as a whole "African Poor Maintenance Culture". In a discussion on BBC in the year 2006 titled "Is Africa's architecture dying? The participants argued that the problem with Africa was not its architecture but its poor maintenance practice (BBC 2006 cited in Obeng-Odoom and Amedzro 2011). This poor maintenance culture poses a huge challenge to adaptation and retrofitting of existing buildings as it leads to a higher cost of undertaking the works. The poor maintenance culture also triggers other works not originally planned for in the process. One of the consultants interviewed argued that,

> ***"Maintenance is not something that owners are too keen on. Owners would want to defer maintenance to the future as long as the facility can still be used. Once the building is put up there is no plan for maintenance works. At some point in time, it leads to obsolesce, and the only feasible option will be to demolish and build new facilities".***

This corroborates Douglass (2002) who asserts that demolishing is often selected when the life expectancy of an existing building is estimated to be less than a new alternative despite any improvements that adaptation may bring about. Buildings are eventually demolished because they no longer have any value (Kohler and Yang, 2007).

4.3. Health and safety requirements during retrofitting

Health and Safety remains one of the rampant issues that has bedeviled the construction industry in general not to talk about retrofitting and adaptation. According to ILO (2001) causalities in the construction industry has led to devastating effect on health and safety issues in both developed and developing countries. In Ghana Kheni et al. (2010) argued that the construction industry is highly labour intensive with majority of its site workers being illiterates with low skills. It is, therefore, interesting to note that retrofitting and adaptation are labour intensive, where health and safety requirement must be adhered to. On the contrast, practitioners find it difficult to adhere to such practices when it comes to such activities due to unpredictable nature of retrofitting and adaptation of existing buildings. Health and safety practices in adaptation and retrofitting as opposed to

traditional practices is quite different, hence, a more concerted effort need to be put in place to achieve accident-free working environment.

4.4. Building tenants' resistance to disruptive processes

Occasional resistance to change remains a bane in retrofitting and adaptation practices, which has been acknowledged by Miller and Buys (2011) in developed countries and more acute in developing countries. Building tenants in anticipation of remaining in their rented apartment, resist furiously any attempts in looking for new place. This is as a result of stress and time to be wasted in searching for a new place. In addition, building owners' in their quest to develop the old facilities refuse to pay the needed compensation, which could afford tenants the opportunity to acquire a new place. In some cases, tenants who choose to stay in the facility while the process of retrofitting is on-going tend either to disrupt the process through pilfering, physically assaulting workers, insulting among others.

4.5. Inadequate government legislation

Building Regulations (BR) in Ghanaian building industry do not work. Even though the BR are established legislation, they are not thoroughly implemented and authorities sit unconcerned. Compounding this problem is the fact that a careful scrutiny of various building legislations shows shortfalls in regulations on adaptation and retrofitting of existing buildings (Oppong & Masahudu, 2014). Due to this, city authorities use arbitrary rules in dealing with such occurrence. There is growing awareness of the retrofitting and adaptation. it will therefore be necessary for city authorities to inculcate the general accepted regulations of retrofitting and adaptation practices in terms of the safety and environmental practices.

5. CONCLUSION

The study has presented issues associated with challenges of retrofitting and adaptation of existing buildings within the three major cities in Ghana; that is Accra, Kumasi and Takoradi central business district. This study presents current phenomena of the development within these areas due to several factors such as population growth, urbanisation among others. This has therefore triggered change or adaptation to various facilities which include the modification, maintenance, refurbishment and renovation among others. Such redevelopment of infrastructure at the central business district leaves much to be desired as practitioners are faced with

various challenges. This study has therefore brought to the fore various challenges including high cost of adaptation and retrofitting process, poor maintenance culture of building owners, health and safety requirements during retrofitting, building tenants' resistance to disruptive processes, inadequate government legislation among others. The implication of the findings is that practitioners and researchers should develop effective medium in dealing with the identified challenges. Policy makers are also advised to the take cognizance of these new developments in implementing laws and regulations that will ensure effective administration of such developments.

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