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RESEARCH ARTICLE

MODERNISATION AND VALUE ADDITION OF BUILDINGS REFURBISHED FOR ADAPTIVE REUSE

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ABSTRACT

Construction as a major industry has been found in recent years to leave substantial impacts on the environment. Devices for providing comfort and convenience, circulation facilities and the like are responsible for more than 40 per cent of the global energy used. Emerging trends in urbanization in affluent societies showcase exponential increases in demand for modern energy sucking services in residences, commercial and public service sectors. Ensuring energy efficiency in constructions thus is found to be point in energy security prospects - the first step recommended to enhance the much sort after sustainability. Introducing value addition in buildings to ensure these facts receive global attention now. The study projects the salient findings observed with refurbished buildings and the value addition done to such buildings to qualify them as fit for adaptive reuse.

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INTRODUCTION

In the technology driven society where everything is just a click away some 44 per cent of India's rapidly growing carbon emissions have urban origins, emanating from transport, industry, buildings and waste (The New Climate Economy, 2014). Pursuing energy efficiency in buildings is vital to energy security in developing countries and is the first step toward achieving sustainability in buildings and organizations. Energy efficiency helps control rising energy costs, reduce environmental footprints, and increase the value and competitiveness of buildings.

"The greenest building is the one that is already standing" stated Jacobs (1993)

- Repairing a building rather than tearing it down saves natural resources, including the raw materials, energy, and water resources required to build new.

- It prevents pollution that might take place as a byproduct of extraction, manufacturing, and transportation of virgin materials.
- It would avoid creating solid waste that could end up in landfills.
- Taking up existing structures for reuse can also be equipped with environmentally friendly solutions that will achieve higher operational performance making the workplace energy efficient so that the resource and energy consumption decreases along with the carbon emissions and waste.

In attempts to introduce IGBC ratings for existing buildings, it has been suggested that the focus be on the existing buildings to solve energy and water crisis. India is declared the fourth largest carbon emitter. To tackle the existing problems which have earned the status, an option is to make the existing buildings green. By taking up such projects it is estimated that the country can save 20-30 per cent in energy, 30-40 per cent in water and at the same time, enhance great occupant health and comfort.

MATERIALS AND METHODS

Residences/houses are spaces where adaptive reuse and refurbishment have been in practice for long. Building

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obsolescence, cost on maintenance, dearth of labour and the like, force owners to part with traditional massive structures which the needy business tycoons are either ready to buy or rent for commercial purposes. Their need for an expanse of space in a proactive locality luring clientele has added the necessary pep to this type of contract.

To decipher details on the profile of the establishments, reasons and type of refurbishment and processes followed and green and value addition techniques incorporated, a field survey of the buildings that were reused was found necessary. Coimbatore City which is famous as a 'business-hub', hence, was the locale selected for the study. Specific icon areas within the City road which house many sophisticated commercial and residential buildings that have fallen prey to disuse for many different reasons and have now become hotspot landmarks in recent years were purposively selected for the study. In these areas lay the treasure houses needed for this specific study – 'Refurbished buildings' which now serve different purposes satisfying the concepts of adaptive reuse.

From the treasure, 30 buildings which served different functions were selected for the study based on purposive sampling method. The personal interview method was espoused to enable the interviewer to collect more reliable data on the type and process for refurbishment and adaptive reuse. The tool, an unstructured interview schedule, along with a checklist that requested details to judge the scenario of refurbished buildings and adaptive reuse of the building in use aided in the conduct of the study. As the whole exercise was a means of locating resources from wasted resources and enhancing the building operations using value addition techniques instilled a genuine interest in the investigator to take up the study which was launched to analyze the reasons for refurbishment facilitating adaptive reuse practices in the City and to create a database on the green techniques and measures incorporated to add value to reused buildings.

RESULTS AND DISCUSSION

Reasons Identified for Refurbishment

There are various definitions of the term adaptation and in fact, it typically refers to 'change of use', maximum 'retention' of the original structure and fabric of a building as well as extending the 'useful life' of a property (Mansfield, 2002) and these were the main reasons stated by owners for refurbishment to enable the reuse of the building. Reasons identified for refurbishment are stated in Table 1. Conversion of residences for business purposes predominated. Showrooms of various merchandise (tile, kitchen and bathroom, textile, furniture, wedding card and jewellery), eateries, offices, healthcare and other services were found to have exploited the resourcefulness of the old residences for adaptive reuse. On the other hand former offices and theatres were preferred for conversion into eateries of a larger scale. Evidently former edifices meant for a specific use have assumed significance with the trends in adaptive reuse. Moreover they were found to lend well for refurbishment. Improving aesthetics and usable floor space and modifying for intended use were the reasons

cited, especially by those who meant it for tile and textile business. When residences were adopted for reuse, among all other reasons increasing usable floor space was comparatively less attempted. Eateries and hospitals either had been refurbished to qualify for regulatory mandates and /or to upgrade services respectively.

Efforts on Modernisation and Value addition

The Merriam-Webster dictionary defines the concept of value-addition as that of, relating to, or being a product whose value has been increased especially by special manufacturing, marketing, or processing. A major method of modernisation with respect to buildings is the incorporation of aspects both eco-friendly and technological, contributing to value addition.

Green Technology Aspects Incorporated

Only 37 per cent of the samples knew about or agreed to have practiced the use of eco friendly materials for construction and refurbishment. This part of the study has analyzed the major ways in which they contributed to the global cause under the following headings:

Energy /water conservation measures incorporated

None of the original buildings housed any energy and/or water saving components. Hence, the 37 per cent of the sample who were aware of the importance of eco-friendly/green technology practices had decided to install the following devices to reduce wastage of resources and consumption of non-renewable energy and water (Table 2). A maximum proportion comprising mostly, owners of restaurants, followed by cafes and salons had installed automatic water level controller circuit systems to save energy and water.

Solar water heaters were installed in restaurants and salons to reduce conventional energy use. Other modern devices like dry mist cooling system, solar powered UPS and timers for automated functioning of hoarding lights were also incorporated by a negligible proportion to conserve electric energy. However, these efforts, especially having been established in refurbished spaces are definitely a welcome change. At the same time, measures should also be designed or drafted to rope in the other groups too - ones who never practiced eco friendly methods.

Eco Friendly Aspects Installed

It was very heartening to record that the samples were cautious about eco-friendly aspects in their respective buildings. Overt observation revealed the measures considered and incorporated in Table 3 Eco friendly aspects incorporated included efforts on Site & facility management, Water efficiency, Energy efficiency, other sustainability concepts and Innovation. A considerably good proportion of the sample had focused on energy efficiency by using BEE star labeled lighting fixtures and HVAC equipment (Air Conditioners). Eighty seven per cent of the samples managed to isolate all their polluting equipment and systems so that it would not cause any discomfort to the people.

Intelligent devices like automated devices with sensors for lighting, heating, security, CCTV and alarm systems, access control, audio-visual and entertainment systems, ventilation, filtration and climate control mechanisms and the like were installed by many to introduce innovation in the performance of the existing buildings.

Intelligent Systems Installed

An intelligent system is a machine with an embedded, Internet-connected computer that has the capacity to gather and analyze data and communicate with other systems. Essentially, an intelligent system is anything that contains a functional,

Table 1. Reasons identified for refurbishment

Particulars			Percent responding (n=30)*				
Conversion type			Reasons for refurbishment				
From	To	Specification	Improve building aesthetics	Increase usable floor area	Change in regulation	Change in use	Need to upgrade services
Residence (n = 28)	Showrooms (n = 9)	Tile (n=3)	67	67		100	
		Kitchen and bathroom (n=1)	100	100		100	
		Textile (n=2)	100	50		100	
		Furniture (n=1)	100	100		100	
		Wedding card (n=1)	100	100		100	
		Jewellery (n=1)	100	100		100	
	Eateries (n = 10)	Restaurants (n=8)	100	63	25	100	
		Cafés (n=2)	100			100	
	Offices (n = 3)	Government (n=1)				100	
		Private (n=2)	100	50		100	
	Health care (n = 3)	Hospitals (n=2)	50	50		100	100
		Clinic (n=1)				100	
Services (n = 3)	Play school (n=1)	100			100		
	Salons (n=2)	100	100		100		
Office (n = 1)	Eateries (n = 1)	Restaurant (n=1)	100			100	
Theatre (n = 1)	Eateries (n = 1)	Restaurant (n=1)	100			100	

* Multiple response

Table 2. Energy and/or water conservation devices incorporated

Particulars		Percent responding (n=11)*
Devices installed	To save	
Automatic water level controller circuit	Energy and water	91
Solar water heater	Energy	27
Dry mist cooling system		9
Solar powered UPS		9
Timers for automated functioning of hoarding lights		9

*Multiple Response

Use of low or zero VOC paints and water efficient fixtures for water closets, faucets, taps and urinals followed next. An eye on the 9R's (Restore, Reduce, Renew, Recover, Recycle, Reuse, Rethink, Replenish, and Replace) was also observed. Rain water harvesting systems were installed in only 60 per cent of the buildings despite the concept being a mandate by the State government. A minimum number (10%) of the sample invested on solar powered devices to enable on-site renewable energy production. A similar number committed to provide its occupants with well-being facilities such as gymnasium, aerobics, yoga, meditation and games.

Incorporation of intelligent/smart systems

Incorporation of intelligent/smart systems and assuring uninterrupted power supply are the rules of the day, which are visibly absent in old buildings. An analysis of the details recorded is described under the following heads:

although not usually general-purpose, computer with Internet connectivity. An embedded system may be powerful and capable of complex processing and data analysis, but it is usually specialized for tasks relevant to the host machine (Ogochukwu and Nnamdi, 2015). The various intelligent systems installed are presented in Table 4. Of the 77 per cent who had installed intelligent systems to enhance the building's performance, 87 per cent had installed CCTV cameras for surveillance purposes. Access control systems and automatic water level controller circuits were installed by 27 per cent each and smoke detectors were installed by 17 per cent of the sample. Among the other devices installed by a minority of the population, dry mist cooling system and rodent repellent systems were new systems gaining momentum in markets. Modern building promoters/builders boast of many such intelligent/smart systems as mandatory components that are included in their buildings. It is an agreeable factor that the owners of the refurbished buildings had thought of including them in the refurbishment plans.

Table 3. Eco friendly aspects incorporated

Categories	Eco friendly aspects incorporated	Percent responding (n-30)*
A. Site & Facility Management	1. Waste Collection & Disposal practices (segregation, recycling)	23
B. Water Efficiency	1. Water Efficient Fixtures	73
	2. Rain Water Harvesting	60
	3. Waste Water Reuse (watering landscape gardens)	13
C. Energy Efficiency	1. Lighting fixtures	97
	2. HVAC equipment	93
	3. On site Renewable Energy	10
D. Other Sustainability Concepts	1. Isolation of Polluting Equipment & Systems	87
	2. Use of low VOC paints	73
	3. Facilities for the Differently- abled	17
	4. Reuse of materials/components from site	13
	5. Occupant Well-being Facilities	10
E. Innovation	1. Innovation in performance of existing building	77

*Multiple response

Table 4. Intelligent systems installed

Intelligent systems installed	Percent responding (n-23)*
Surveillance systems – CCTV	87
Automatic water level controller	27
Access control systems	27
Smoke Detectors with alarm systems	17
Dry mist cooling system	4
Timers for automated functioning of hoarding lights	4
Automatic pressure pump	4
Electronic rodent repellent systems	4

*Multiple response

They qualify verbatim for ‘value addition’, because in recent years, inclusion of these aspects had assumed more of an ‘economic value’, eclipsing their real work in terms of safety, security and utility.

Power Backup Devices Used

Humanity has become slaves to electricity. Gone are the days when people banked on other artificial sources of light and power. Assurance for alternate sources of power supply during times of emergency/need has become an unwritten dictum in all buildings. Refurbished spaces cannot be spared. Hence it is not surprising that all the samples had foreseen this plight and had provided for alternate sources of power supply. A major portion of the sample used generators to harness power during power cuts and 33 per cent had installed both generator and UPS to aid during load shedding. UPS was used as power backup by a minimum of 13 per cent of the sample. These devices had become part and parcel of human living. These facts prove that production of these devices have achieved a good take off as everyone used them, especially those who had practiced refurbishment of buildings.

Conclusion

The findings revealed that after incorporating required changes the samples were able to derive the desired contentment in the adaptive reuse of the buildings for the redefined purposes and

make their buildings role model structures for perfectly blending traditional architecture and beauty with 9R’s concepts. However, the range of environmental savings from building reuse is found to vary widely, based on building type, location, and assumed level of energy efficiency. This exercise definitely can help in environmental protection and sustainability in the long run. Despite these, it is clear that they couldn’t do full justice to the ‘eco-friendly’ concept. Yet it is a green signal, a beckon call for others to follow. The covered sample had made a good start. Let all pledge to follow as it can lead us to attain sustainability as.

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